THE METHODOLOGY OF EDUCATIONAL RESEARCH

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PREFACE

This volume is addressed to field workers: teachers, principals, supervisors, and superintendents; graduate students who are preparing to be field workers; and those who supervise the training of such workers. The point of view of the authors is that competent educational workers should participate in the solution of professional problems, either as consumers or producers of research. In the rôle of consumers, emphasis is placed on the application of investigational results to practical field situations and problems. Although some field workers will make significant contributions to the store of educational knowledge as active participants in the production of research, the primary outcomes for the majority of field participants in educational research will be found in the training value of the problem-solving approach, with an increased understanding of the educative process.

To argue that most research should be conducted in graduate schools, laboratories, and research bureaus is to underestimate the importance of field situations in terms of the application of the results of educational investigation and the intellectual and professional growth of approximately one million teachers in this country, through the discovery and solution of important educational problems under normal field conditions. From this point of view, competent field workers have an important dual obligation: one relating to the practice of teaching, supervision, or administration, and the other relating to problem solving in their respective areas of responsibility. Then, too, if children are to learn through problem-solving methods and activities, the teachers themselves should have at least a working knowledge of the scientific method, such as is presented in this volume. Both intelligent consump-

tion of investigational literature and effective participation in the solution of practical problems of teaching, administration, and supervision require an understanding of at least the elementary principles of problem solving and research.

It has not been possible to supply within a one-volume treatment of the methodology of educational research all of the information necessary for the solution of many of the more technical problems of education. For these, the producer of research may need additional advanced training in keeping with the nature of the study undertaken, for example, the statistical analysis of data, construction and use of measuring instruments for the collection of data, and the invention and manipulation of laboratory equipment.

The preceding paragraphs should not be interpreted to mean that all field workers are to do research, without regard to their training and qualifications. In making these statements it is conceded that scientific experimentation is difficult and complicated, much more so than the average lay or even professional worker realizes. It is recognized that not all teachers will rise to the level of making scientific contributions to the study of education. This statement, of course, is also true of many so-called research workers. There is really a tendency on the part of the educational practitioner to put entirely too much faith in the training researches of both teachers and research workers. Unfortunately, supervisors and professors today seem to assume too frequently that they alone are to see problems, solve problems, and do the educational thinking prerequisite to the successful management of school systems. They hand down their solutions in the form of methods to be applied, textbooks to be used, courses of study to be followed, and policies for teachers and students to put into operation. The teachers, then, only teach, acting neither as producers nor consumers of research. If one were to visit a classroom and find the teacher doing all of the thinking, entertaining all of the points of view, and solving all the problems, he would characterize such a worker as inefficient. Judged from this point of

view, much of the supervision, administration, and instruction of to-day is ineffective.[1]

The authors have sought to avoid such a paternalistic attitude in the preparation of this book. An attempt has been made to present the major principles of investigational procedure, together with numerous illustrations and bibliographical references, rather than to formulate research recipes to be followed in routine fashion. Only in this type of treatment, which leaves much to the interest and initiative of the reader, could the authors be consistent with the true spirit of scientific method.

Convinced of the feasibility of improving educational procedure through problem solving, many teachers, supervisors, administrators, and other field workers have lacked the necessary technical knowledge. It is the purpose of the present volume to supply this information so far as possible within the scope of an elementary treatise. It is recognized that a number of helpful discussions of the methodology of educational research have appeared within the past eight or ten years. However, the more general books on investigational procedures have been rather brief and incomplete, while the specialized volumes devoted entirely to a single area, such as tests, statistical methods, the school survey, the questionnaire, historical research, experimental research, the interview, or case work, have covered only a limited portion of the field of research methodology. Also, a large amount of significant literature on research procedures has appeared within recent years, scattered through periodicals, bulletins, monographs, year-books, and theses, which the authors have attempted to assemble and interpret for the benefit of field workers, most of whom do not have access to such materials in the original sources of publication.

This book presents a reasonably complete analysis of the literature dealing with the methodology of educational re-

[1] A. S. Barr, "Research for Teachers," *Journal of Educational Research*, XX (June, 1929), 42-3.

search; moreover, the authors have sought to inculcate in the research student a type of intellectual independence which comes in large part through the development of desirable bibliographical procedures and habits, as keys to the vast stores of educational literature. Therefore, constant reference has been made to library guides such as the *Education Index*, the *Review of Educational Research*, and the annual bibliographies of research published by the United States Office of Education, in order that months or years after this book has appeared in print, the reader may bring its contents up to date by a canvass of current educational literature.

The sequence of chapters here represented may be defended in terms of logical organization, as well as in terms of an analysis of the various possible ways of attacking educational problems, and of the steps in scientific method or problem solving. The introductory chapter presents a characterization of scientific method and its contribution to education. The next three chapters deal with the early stages of research; namely, the selection and definition of the problem, the survey of related information and investigations, and formulation and testing of hypotheses. Chapter V attempts a systematic classification of available investigational procedures, as well as lists many of the classifications adopted by other writers in this field. Chapters VI, VII, VIII, IX, and X discuss in detail the major approaches to problem solving in education; namely, through historical, survey, experimental, and related methods of research. Chapters VII and VIII include descriptions of the various instruments for the collection of data, used quite extensively in normative-survey investigations, and in varying degrees in the other types of research. Chapters XI, XII, XIII, and XIV deal with later steps in the research process; namely, the analysis and interpretation of data, formulation of conclusions and generalizations, writing of the research report, and evaluation of educational writing and investigation. Chapter XV is of concern to apprentices in educational research and to those who supervise their training, whether in the field or in

the graduate school. It is suggested that some readers may wish to begin with the last chapter (XVI) as an overview of the entire volume.

The authors have deliberately avoided use of the term *scientific* on the title page and at many other points where it might have been employed, maintaining that there is no essential conflict between the methods of science and the processes of logic and philosophy. In clarifying the complementary functions of science and philosophy, it has seemed more effective to discuss the contribution of philosophy and logic in connection with the various steps in problem solving (formulation of hypotheses, analysis and interpretation of data, formulation of conclusions and generalizations, and evaluation) rather than to devote a separate chapter to philosophical procedures. The plan of organization followed, therefore, presents philosophy in its functional relationship to a number of steps in problem solving rather than as a separate or self-sufficient method of research.

In order to show more clearly that the various chapters represent, in the main, different aspects of the research pattern or different steps in problem solving, certain related problems and exercises have been carried through a number of chapters. For example, the problem of how the school may adapt its program of instruction to varying needs is treated in terms of the formulation of a problem, the survey of related literature, the application of survey, experimental, and historical techniques, and of other procedures.

It is hoped that this volume may be of service in one or more of a variety of educational situations: (1) possibly in the last year of the undergraduate teacher-training institution, as a preview of graduate work in education or in courses dealing with scientific method; (2) in the first year of graduate study, with an orientation function at an advanced level, somewhat like that of certain introductory courses and texts at the undergraduate level (for example, C. H. Judd's *Introduction to the Scientific Study of Education*); (3) in classes or

seminars which deal with principles of thesis writing and methods of educational research; (4) in institutional or field groups made up of so-called "consumers" of research, since the fundamental principles of investigational procedure should be understood by both producers and consumers of research, although, of course, the former will need a more technical and intensive type of training in the methodology of problem solving; and (5) as a handbook and reference manual for educational workers in whatever problem-solving capacity they may serve. The patterns of research methodology discussed have been drawn from the fields of education, psychology, sociology, philosophy, logic, history, statistics, and other sciences, and organized as an integrated series of functional approaches to problem solving in education.

Acknowledgment is made in footnotes and bibliographies to the large number of authors and publishers who have made possible at least a foundation for the ultimate establishment of education on a sound basis, and who have generously permitted the use of certain of their materials in the present volume.

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EDITOR'S INTRODUCTION

The past quarter century has seen a very great increase in the use of scientific methods in the attack upon educational problems. The results of scientific research have increasingly affected educational procedure in all phases—administration, supervision, and teaching.

The realization has grown that all school workers must know something of the nature and technique of scientific research. This is necessary, first, in order that such workers may utilize sound methods in attacking their own practical problems. All too often these problems have been solved by reference to "experience," which is perforce limited and in many cases misleading. Critically analyzed experience is, of course, valuable. Second, this knowledge is necessary in order that school workers may be better able to distinguish the fundamental from the superficial, the basic from the momentary fad. Possessed of relatively limited and superficial training, too many school workers in the United States are prone to follow the "latest idea," whether it be sound or hopelessly superficial.

More recently there has emerged the idea that classroom teachers must not only make use of scientific methods and know the technical background of teaching, but should also be encouraged to participate in the derivation of this very scientific background itself. This idea is sound psychologically and fully in accord with our democratic school philosophy. Hence, knowledge of scientific methods is necessary not only for the field worker on any level, but also for all prospective school workers in training.

A number of books and manuals have appeared in answer to the need just indicated. Most of them have been commendable, pioneer efforts. The authors of the present volume have

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CHAPTER I

THE NATURE OF SCIENTIFIC THINKING

Man in his search for truth has appealed, in general, to five sources of evidence: (1) custom and tradition, (2) authority, (3) personal experience, (4) syllogistic reasoning from apparently self-evident propositions, and (5) scientific inquiry.[1] These five sources of evidence represent a rough and overlapping chronological sequence in the history of human thinking, man's earliest search for truth being characterized by an appeal to custom, tradition, authority, and personal experience, and later by an appeal to syllogistic reasoning and scientific inquiry. Although it is evident that man has not yet devised any perfect methods of searching for what he calls truth, it appears that, with the passage of time, improvements have been made in this respect. In the appeal to custom, tradition, authority, and personal experience man found a source of truth not without value. As time passed, however, he discovered other sources which seemed to offer new knowledge, understanding, and insight. Thus arose the appeal to syllogistic reasoning and scientific inquiry. These methods of seeking truth have continued to the present time and constitute man's current intellectual equipment for solving the mysteries of life and nature.

The appeal to custom and tradition. Of the totality of man's activities, comparatively few will be brought consciously to his attention in such a manner that he will need to choose between them, to determine their efficacy, or to seek

1 John C. Almack, *Research and Thesis Writing*, pp. 57-63. Boston: Houghton Mifflin Co., 1930.
William A. McCall, *How to Experiment in Education*, pp. 1-3. New York: The Macmillan Co., 1923.
William Clark Trow, *Scientific Method in Education*, pp. 9-27. Boston: Houghton Mifflin Co., 1925.

their ultimate logical justification. The majority of his opinions, attitudes, and actions will be as they are because he knows, desires, or has time to discover nothing better. The customs of his times and the traditions of his people will decide such things for him. His clothes, speech, food, and mode of living are largely determined in the same manner.[2] This acceptance of custom and tradition is to some extent a necessary human economy, but when the fact that a thing is, or has always been so, is employed as its justification, the result may be an appalling intellectual stagnation. When man recognized his own mental inadequacies in this respect, a great step forward was taken in the development of human thinking.

The appeal to authority. In times of storm, pestilence, and conflict man often finds the dictates of custom and tradition inadequate; he is driven from his complacency to newer and better modes of behavior. Savage man with his belief in magic, charms, and the supernatural appealed to the tribal wise men and to his gods in times of crises. These practices have been succeeded in civilized nations by secular and religious authority. In early times in nearly all countries the aim, content, and methodology of education, for example, were determined by the authority of the church. In China the formal education of children began and often ended with a study of the writings of Confucius; in India, with a study of the Koran; in Palestine, with a study of the Old Testament; and in western Europe and America, with the study of the Bible.[3] For centuries the church which had civilized and christianized the western world was looked upon as arbiter in all matters whether religious or secular. It is natural that her pupils would turn to their teacher when doubts arose and accept her authority as final, not to be questioned by the layman.[4] With the growth of strong secular states in western Europe, however, the balance of power passed from church to state, and the appeal was

2 W. C. Trow, *op. cit.*, p. 9.

3 *Ibid.*, pp. 9-27.

4 Samuel Chester Parker, *A Textbook in the History of Modern Elementary Education*, pp. 109-34. Boston: Ginn and Co., 1912.

addressed to kings, parliaments, and legislatures. In recent years, for example, at least three state legislatures in the United States have enacted laws on the validity of the principles of evolution. Other sources of authority are found in the nations' scholars, philosophers, and scientists, the worth-whileness of their counsel depending of course upon their judgment, intelligence, and scholarship. From the dawn of civilization man has appealed (and in the absence of more reliable information, rightfully) to his oracles, his intellectual superiors, his church, his state, his king, and to his God or gods for guidance.

The appeal to personal experience. Although man does appeal to custom, tradition, and authority in his attempts to derive satisfactory solutions to perplexing problems, no single source of evidence is, however, more universally employed in the search for truth than is personal experience. This source of evidence provides knowledge of most ordinary affairs in everyday life. When confronted with a difficult situation, one naturally turns first to his own experiences in similar situations for an idea of what to do. If one's own experiences are inadequate, he may turn to those of friends and acquaintances. If the problem is of sufficient importance and of long standing, and if there are records of the experiences of others with it, one may profit by an appeal to history. History offers, thus, the means by which the experiences of people are extended from the present into remote times and places.

Valuable as the appeal to personal experience is, it is subject, however, to gross inaccuracies. Important sources of error are: (1) argument from a single or limited number of instances; (2) argument from positive instances, and the neglect of negative instances; (3) the omission of evidence contrary to one's opinion; (4) failure to observe important circumstances attending different phenomena; (5) erroneous conclusions due to prepossessions, preconceived ideas, and prejudices; (6) attributing to a single antecedent consequences arising from two or more antecedents; (7) inaccurate instruments of measurement, dependence upon subjective judgment, estimates,

and guesses; (8) argument from analogy; (9) failure to discriminate between material and immaterial circumstances; (10) mistaken inferences of various sorts; and (11) hasty generalizations from insufficient evidence. For a further discussion of these ordinary fallacies of thinking, the reader is referred to almost any elementary textbook in logic.[5]

The aim of the preceding statement is not to minimize the importance of personal experience as a source of evidence in everyday affairs. Science itself, as is generally known, is an appeal to experience. James Harvey Robinson has already referred to the fact that most people do not reason, but rationalize.[6] That is, they employ their own individual experiences to support previously acquired likes and dislikes. This is true, but it is also true that a keen mind, with some knowledge of the fallacies of ordinary thinking, may offer many valuable observations out of the richness of its own experiences and those of others. These observations constitute not only a source of practical guidance, but a valuable source of hypotheses for scientific inquiry. This intimate connection between personal experience and science is frequently overlooked. In many of its undertakings, science merely begins with the distinctions, tentative generalizations, and the suppositions found in ordinary experience and extends these by making them more definite and consistent. There is already in the language of ordinary life an organization of experience, and it is from this pattern that scientific thinking takes its departure. From this point of view science consists merely of correcting, extending, and verifying familiar concepts of life.

The appeal to syllogistic reasoning from apparently self-evident propositions.[7] A great advance was made when man began to think about his own thinking. The product of these early intellectual efforts was deductive logic, founded by Aris-

5 Thomas Fowler, *The Elements of Inductive Logic.* (Third edition, corrected and revised.) Oxford: Clarendon Press, 1876. Pp. xxvii + 360.

6 James Harvey Robinson, *The Mind in the Making:* The Relation of Intelligence to Social Reform. New York: Harper and Bros., 1912.

7 J. Welton, *The Logical Bases of Education,* pp. 105-6. London: Macmillan and Co., Ltd., 1919.

totle and perfected by the medieval scholastics. The chief instrument of deduction was the syllogism, composed of a major premise, a minor premise, and a conclusion, as, for example, (1) all sinners deserve punishment; (2) A B is a sinner; (3) therefore, A B deserves punishment. The essence of such syllogistic reasoning consists of showing that a given particular case falls under a general rule. As applied by the medieval scholastics, it consisted chiefly of proving or disproving, by the use of appropriate logical techniques, selected statements from Aristotle and the Church Fathers.[8] Although the scholastic method purported to furnish good mental training, it tended to degenerate into mere argumentation for its own sake, and considering the amount of attention devoted to it, contributed relatively little as a means of discovering truth. Defended and opposed by long strings of syllogisms, such hair-splitting distinctions as whether a pig driven to market is held by the man or the rope, or whether a shield white on one side and black on the other may be called black or white, brought this system of logic into disrepute.[9] The primary weakness of the syllogism, however, is in its premises. These were accepted by medieval scholastics as authoritative or as apparently self-evident from experience. Granting the premises, mistakes were not usually made in the actual chain of reasoning. A secondary weakness of syllogistic reasoning arises from the indefinite, ambiguous, and elusive verbal symbolism of logical terms and propositions. Words have many interpretations, meaning different things to different people at different times. These and other factors have caused the syllogistic method to lose favor.

Although this approach to problem solving is not generally in good repute to-day, the fact remains that it has done splendid service in the past and contains much of value for present and future problem solving. The chief difficulties with it, already noted, are its acceptance of premises as self-evident

8 Roscoe Lewis Ashley, *Early European Civilization*, pp. 516-9. New York: The Macmillan Co., 1917.

9 Daniel S. Robinson, *The Principles of Reasoning:* An Introduction to Logic and Scientific Method, p. 336. (Second edition.) New York: D. Appleton and Co., 1930.

and the elusiveness of verbal symbols. Aside from these difficulties, it should be said that the conventions of deductive logic are just as true to-day as ever, and if one accepts the fact that scientific inquiry is an inductive-deductive process, principles of logic are tremendously important. The student of the methodology of educational research may find much that is archaic in deductive logic; he will also find much that is indispensable to good thinking.

The appeal to scientific inquiry. Difficult as it is to fix an exact date for the beginning of the scientific method (because ideas do not come into being full grown), this event is assigned customarily to the seventeenth century.[10] Galileo (1564-1642) made his famous experiment on the rate of acceleration of falling bodies from the leaning tower of Pisa in 1589; he invented the telescope in 1611; Napier (1550-1617) published his work on logarithms in 1614; Briggs (1561-1631) used decimal notation in 1617; Bacon (1561-1626) published his *Novum Organum* in 1620; Kepler (1571-1630) offered proof in 1609 of the Copernican hypothesis that the earth and other planets move around the sun; Harvey (1578-1657) presented his treatise on the circulation of the blood in 1628; and Newton (1642-1727) furnished the mathematical proof of the hypothesis of universal gravitation in 1679.[11] From these modest but exceedingly important contributions has arisen the magnificent structure of modern science.

Viewed historically, man's first explanations of the natural phenomena about him were expressed in terms of the *supernatural*. This sort of explanation is well represented in the savage's belief in magic, charms, witches, and other supernatural forces. Unable to understand the complexity of the natural environment in which he found himself, savage man

10 Although Aristotle, who was intent upon seeking scientific explanations, emphasized the importance of proceeding from systematically collected facts (induction) to generalizations, these being the indispensable premises for deductive reasoning, in practice he failed because he did not see the real nature of induction and hypothetical thinking, and the necessity for sifting and probing facts.

F. A. Westaway, *Scientific Method*: Its Philosophical Basis and Its Modes of Application, p. 76. (Third edition.) London: Blackie and Son, Ltd., 1924.

11 Samuel Chester Parker, *op. cit.*, pp. 113-9.

appealed to the supernatural. These explanations were recorded in the traditions of the tribe and interpreted by the tribal wise men. Gradually, as man emerged from savagery into civilization, he began to note many real and imagined relationships in nature, such as: wet feet cause colds; a circle around the moon portends bad weather; one fish dropped into each hill of corn makes better corn; certain farm crops planted in a light moon grow better than when planted in a dark moon; fat men are more jovial than lean; individuals who learn rapidly forget rapidly; and physiognomical features are indicative of intelligence and criminal tendencies. All such unexplained uniformities, imagined or real, growing out of the trial-and-error experiences of the race, are called *empirical* knowledge; thus, as a result, there are empirical agriculture, empirical medicine, and empirical education. Much that claims the name of education to-day belongs to the empirical category,[12] based upon the trial-and-error efforts of the profession. Many of the so-called laws of the physical sciences are also empirical, that is, observed uniformities in nature for which no adequate reason or explanation can be assigned.[13] One may know, for example, that certain drugs will produce certain effects, without knowing the physiological processes involved; or that certain chemicals react in a given manner, without understanding why they do so, etc. Although man must frequently content himself with these empirical findings, the ultimate goal of science is complete explanation. The tremendous significance of the theory of evolution is to be found in the explanatory principle that it offers for so great a range of facts. Newton's law of gravity, the nebular theory in astronomy, and the theory of relativity are other examples. We cannot, however, fully explain an observed uniformity in nature until we comprehend its numerous relations, until we discover the deeper nature of the underlying system, and until we understand why it acts as it does.[14] When one is able to understand the uniformities of nature and to

12 W. C. Trow, *op. cit.*, pp. 19-21.
13 J. Welton, *op. cit.*, p. 204.
14 Daniel S. Robinson, *op. cit.*, pp. 289-97.

offer satisfactory principles of explanation, one's knowledge is complete, comprehensive, and *scientific*. This is the ultimate goal of all science.

The nature of scientific thinking. The scientific method in research is an inductive-deductive mode of thinking through which one seeks to discover, establish, and explain the uniformities of nature by appealing to experience.[15] It involves a double movement of thought: first, a movement forward from the partially known and sometimes confused data of experience, secured from all available sources (controlled systematic observation, uncontrolled incidental observation, previous investigation, reading, conversation, and reflective thinking) toward universal relationships expressed as hypotheses, laws, principles, or propositions, that is, from the particular to the general; and second, a backward movement from these general propositions to the particular facts or data of experience, that is, from the general to the particular.[16] Induction moves forward from the particular to the general. The mind begins with facts and moves in the direction of some interpretative principle, hypothesis, or explanatory concept.[17] Deduction is a backward movement from the general to the particular. It aims at the verification and proof of hypotheses by bringing their logical implications into line with the facts of the case. Thus scientific thinking starts with facts and continually returns to facts to test and verify its hypotheses.

15 There is a considerable division of opinion among logicians about the inductive-deductive character of the scientific method. Deductive logic is usually associated with syllogistic reasoning and inductive logic with scientific reasoning. Even the more formal logicians, however, appear to recognize a deductive element in the inductive methods of science: Thomas Fowler, *The Elements of Inductive Logic* (Third Edition. Oxford: The Clarendon Press, 1876); James Creighton, *An Introductory Logic* (Fourth Edition, revised. New York: The Macmillan Co., 1920); W. Stanley Jevons, *The Principles of Science:* A Treatise on Logic and Scientific Method (Second Edition. London: Macmillan and Co., Ltd., 1924); Daniel S. Robinson, *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method (Second Edition. New York: D. Appleton and Co., 1930); J. Welton, *The Logical Bases of Education* (London: Macmillan and Co., Ltd., 1919), and *Its Modes of Application* (Third Edition. London: Blackie and Son, Ltd., 1924).

16 John Dewey, *How We Think*, pp. 68-78. Boston: D. C. He[illegible], 1910. Matthew Thompson McClure, *An Introduction to the Logic of P[illegible]*-86. New York: Henry Holt and Co., 1925.

17 *Ibid.*, p. 362 ff.

Dewey supplies the following example of the inductive-deductive character of thinking: A man who has left his rooms in order finds them upon his return in a state of confusion, articles being scattered at random. The notion comes to his mind that burglary would account for the disorder. He has not seen the burglars, but this hypothesis offers a plausible explanation of the facts. It also occurs to him that his children are mischievous; they may have thrown the things about. Thus a competing hypothesis arises, but judgment is suspended until positive proof is had. At this point the deductive movement begins. Further observations, recollections, and reasonings are conducted on the basis of the suggested hypotheses. If burglars were responsible, certain things would have happened; articles of value would be missing. In this thinking process the man goes from the general to the particular, not merely, however, to the original particulars (which would be fruitless or would take him in a circle), but to new facts, the actual discovery or non-discovery of which will test the validity of the supposed explanation. He searches for new evidence. He thus moves back and forth from facts to principles, and from principles to facts until a satisfactory explanation is derived, or the solution of his problem given up as a bad job.[18] The scientific mode of thought involves operations similar to those described above, but more systematically performed.

A second example may be taken from the field of education: from the partial data now available, it appears that the subject-matter of the formally taught, logically organized school subjects may be less well retained than knowledge learned incidentally or functionally in natural life situations. One has observed that the rules of grammar, the facts of history, and the formulae of mathematics are almost always soon forgotten; but when one learns to skate, swim, or drive an automobile, one seldom if ever forgets. Thus, there is first a movement from the concrete facts of experience toward a working hypothesis. It appears that there is an observed difference in

[18] John Dewey, *op. cit.*, pp. 82-3.

the products from these two methods of learning, and this difference is temporarily attributed to the mode of learning. At this point the process is reversed, and the movement from the general to the particular begins. The general proposition may now be compared with new facts systematically collected for the occasion. The general proposition may now take the form of a series of specific questions, such as: (*a*) Is it true that facts functionally learned are longest retained? (*b*) Does this difference obtain for all sorts of materials? (*c*) Is it true for individuals of all levels of training, maturity, and intelligence? (*d*) If it is true that functionally learned subject-matter is longest retained, is the difference attributable to functional learning? (*e*) Can the difference be accounted for on the basis of repetition? (*f*) Can the difference be accounted for on the basis of *drive* or *interest?* (*g*) Can the difference be accounted for on the basis of *meaning?* etc. Each of these special suppositions will need to be carefully and systematically tested in the light of the already available facts and newly collected facts. As the thinking progresses, certain suppositions will need to be discarded, and new ones will take their places, until a defensible explanation is derived. The scientific worker starts with facts and continually returns to facts until his tentatively announced suppositions are fully tested and verified.

Some distinguishing characteristics of the scientific method. Of the many distinguishing features of scientific thinking, reference may be made to six: (1) science is based on facts; (2) science employs the principles of analysis as a fundamental procedure in the comprehension of complex phenomena; (3) science employs hypotheses in the thinking involved; (4) scientific thinking is characterized by freedom from emotional bias; (5) science utilizes accurate measurement; and (6) science employs quantitative methods in the treatment of its data. To secure a better conception of the scientific method of investigation, each of these six distinguishing features will be discussed briefly.

Science is based on facts. The greatest discovery ever made

in human thinking was that the way to determine whether a thing is present is to look and see.[19] Galileo's experiments with falling bodies at the leaning tower of Pisa represented not merely progress in his chosen science but a revolution in thinking. It occurred to Galileo, following many centuries of theorizing about the problem, that the easiest way in which to settle the argument about the rate of acceleration of falling bodies was to look and see. A similar procedure occurred in the field of education when J. M. Rice[20] suggested, not many years ago, that teachers find out whether pupils could spell by giving them achievement tests of spelling. There are innumerable opportunities to-day in the field of education for the application of this principle of evidence. Too much argumentation centers about things that might be settled upon the application of the simple principle of "look and see." As has been said, one of the distinguishing characteristics of the scientific method is its appeal to facts.

Science employs the method of analysis in the comprehension of complex phenomena. The natural phenomena with which man comes into contact are exceedingly complex. This is particularly true of the subject-matter of education. Man's abilities to perceive and comprehend are, moreover, exceedingly limited. If he desires to succeed in his thought processes, he must not attempt wholes beyond his comprehension. The most difficult problems of life can be better comprehended by breaking them up into parts and by attending to each part separately. Instead of attempting to comprehend, for example, the whole of mental discipline at one bold stroke, it would seem better to think first of one of its parts: (1) Do habits of neatness acquired in handwriting transfer to other simple forms of behavior? (2) Does the ability to think logically in geometry transfer to the logical arrangement of the facts in a case of law? (3) Does transfer take place more readily with

19 R. D. Carmichael, *The Logic of Discovery*, pp. 30-1. London: Open Court Publishing Co., 1930.

20 G. M. Ruch, *The Objective or New-type Examination: An Introduction to Educational Measurement*, p. 12. Chicago: Scott, Foresman and Co., 1929.

some forms of instruction than with others, or is it a constant and independent of methods of instruction? Analysis is, therefore, an important step in problem solving. It proceeds by resolving gross total situations into elements in order that the investigator may give each part his separate and undivided attention.[21] By applying the method of analysis and the control of factors according to the law of the single variable, each detail of a complex situation is brought within the focus of attention. It is then possible to encompass situations otherwise incomprehensible.[22]

Science employs hypotheses in guiding the thinking process. When our experience tells us that a given phenomenon follows regularly upon the appearance of certain other phenomena, we conclude that the former is connected with the latter by some sort of relationship and we form an hypothesis concerning this relationship.[23] It is this hypothetical anticipation of nature's laws that constitutes one of the most distinguishing features of the scientific method of inquiry. The mind does not wait for a complete enumeration of all of the facts, but jumps sooner or later to some sort of tentative supposition or provisional guess which seems to explain the situation under observation, that is, in terms of such evidence as is at hand.[24] Once entertained, such a hypothesis becomes the starting point for further investigation. It serves as a sort of guiding light in a world of darkness. It gives point to the search, making it an intelligent one, directing it toward likely sources of truth.[25] It appears that unless we go to nature with something in mind, we are not likely to learn much. We see, as a rule, only what we look for. As the research progresses, we frequently find it necessary to discard one hypothesis in favor of another. It is as if one were

21 M. T. McClure, *op. cit.*, pp. 118-22.

22 Analysis offers an economical mode of thought, but it presents a possible limitation. The parts of a total situation need to be studied not merely in relation to each other but to the complex phenomena of which they are a part. Precaution needs to be exercised lest the parts themselves be changed in the process of analysis.

23 R. D. Carmichael, *op. cit.*, p. 84.

24 James E. Creighton, *An Introductory Logic*, pp. 278-97. (Fourth edition, revised.) New York: The Macmillan Co., 1920.

25 W. Stanley Jevons, *The Principles of Science:* A Treatise on Logic and Scientific Method, p. 576. (Second edition.) London: Macmillan and Co., Ltd., 1924.

swimming from shore to shore across a wide river. One may swim first to a small island and then use this island as a base for the recuperation of one's energies for the continued swim. Hypotheses are islands in the stream of thought.[26]

Science is characterized by freedom from emotional bias. One of the distinguishing characteristics of scientific thinking, and the first prerequisite for success in scientific investigation, is an alert, flexible, and open mind, a mind free from emotional bias. No one word sums up this attitude. One must be alert and continually on the watch for new ideas; he must be flexible and ready to modify old ideas in the light of new evidence; and he must never allow his own personal likes and dislikes to color the facts. Scientific knowledge, at least ideally, is *de-personalized* and *de-emotionalized*, and free from the emotional "halo" which characterizes so many of the burning convictions of lay workers untrained in scientific thinking. Nothing is more irritating to a true scientist than obscure and opinionated thinking. The real motive which spurs the true scientist is a consuming curiosity to find the truth.[27]

Science employs objective measurement. A further distinguishing characteristic of the scientific method is its use of objective measurement. The lay and untrained worker is prone to rely upon guesses, estimates, and subjective evaluations; the scientist measures, weighs, tests, and accurately determines amounts of phenomena under investigation. The progress of the sciences has always been closely related to the development and refinement of instruments of measurement. As the sciences advance, they become more and more accurately quantitative. As Jevons says:[28] "Forces hardly suspected to exist by one generation, are clearly recognized by the next, and precisely measured by the third generation." Nothing tends to promote the advancement of knowledge in a given field of research as

26 M. T. McClure, *op. cit.*, pp. 268-75.

27 Daniel S. Robinson, *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method, p. 220. (Second edition.) New York: D. Appleton and Co., 1930. M. T. McClure, *op. cit.*, pp. 289-92.

28 W. Stanley Jevons, *op. cit.*, pp. 270-334.

readily as the application of a new instrument of measurement. The science of heat may be said to have begun with the construction of the thermometer; chemistry has been created chiefly by the careful use of the balance; and astronomy by the invention of the telescope. Progress in the scientific study of education has been closely associated with the development of accurate instruments of measurement.

The use of quantitative methods in the treatment of data. A final distinguishing characteristic of the scientific method is its application of quantitative methods to the treatment of data. It has already been said that instead of relying upon estimates, guesses, and general impressions, the scientist measures the phenomena under consideration as accurately as possible. The results of his measurements are, therefore, recorded in comparable units that may be counted, added, subtracted, multiplied, and divided. Instead of relying upon the treacherous verbalism of ordinary language, the scientist employs the new and more exact language of mathematics to make the analysis, classification, and summarization of data more reliable. Beginning with the careful study of one aspect of phenomena at a time, he assembles the pertinent data into meaningful categories and summarizes the facts into mathematical values, such as, means, medians, modes, probable errors, quartile deviations, standard deviations, and coefficients of correlation, which are less ambiguous than the terms of ordinary language. The careful measurement of phenomena and the mathematical treatment of the data thus collected are indispensable features of the scientific method.

Steps in the process of scientific thinking. A further characterization of the general methodology of scientific research can best result from a discussion of the logical steps involved in scientific thinking. Briefly they may be stated as follows:[29]

1. A preliminary observation of facts
2. The formulation of a hypothesis

[29] J. Welton, *The Logical Bases of Education*, p. 137. London: Macmillan and Co., Ltd., 1919.

§ 3. The testing of the hypothesis by comparison of its consequences with the results of a careful analysis of the phenomena under consideration

A more detailed enumeration of the steps involved in scientific thinking may be stated as follows:

1. The location and definition of a problem
2. Survey of past experiences with the problem, previous investigations, and the already available data to get ideas about past and possible future solutions and methods of investigation
3. The formulation of a hypothesis (or hypotheses) representing a tentative solution of the problem under investigation, to be employed as a guide in the collection of additional data (by step 2 or step 5) which may lead to an accepted solution of the problem or to the formulation of a new hypothesis (or hypotheses) that may be employed in the collection of more data, etc.
4. The mental elaboration of the hypothesis (or hypotheses), checking for agreement with fact, verifiability, and logical consistency (The mental elaborations here referred to may end in a belief that the solution is correct or in the formulation of new hypotheses to guide in the collection of new data, etc.)
5. The collection of additional data (if necessary) through a new appeal to experience by means of measurement, observation, and experimentation (The already available data may be incomplete, or collected under conditions that throw doubt upon their trustworthiness, or recorded in terms that are ambiguous and subject to many interpretations or mis-interpretations, thus making it necessary to collect new data.)
6. The analysis, classification, and summarization of the data collected
7. The formulation of new generalizations representing observed uniformities, explanatory principles, or scientific law

The last step, that is, the formulation of explanatory principles or scientific laws, usually follows only upon the projection and systematic testing of many hypotheses. A single investigation is seldom sufficient. If one is desirous of understanding the underlying system of complex phenomena such as are observed in professional education, he should expect to spend many hours in the investigation of these phenomena; in collecting, analyzing, and systematizing data; and in reflecting upon the results. It is only by the persistent, continuous, and

systematic investigation of a limited field of research that one may expect to attain scientific insight into the more complex problems of education.

It may appear from the list of steps given above that scientific thinking follows some invariable sequence. Such, however, is not the case. For example, many problems, new and unforeseen, will arise in the process of investigation. It has sometimes been said that the best way to develop a problem consciousness is to experiment. New hypotheses or altered hypotheses may arise at almost any point in the process of investigation. These lead to the collection of new data, new reasoning, and new research. Reference has already been made in this chapter to the backward and forward movement of scientific thinking. One may go from step two to step three and the reverse many times before going to step four, and if the data are reasonably complete and accurate, one may never proceed beyond step four, feeling that the solution has without doubt been reached or that it is reasonably satisfactory. Such is the case in many of the simpler instances of thinking about everyday problems of life and in philosophical research, as will be discussed later. One proceeds to step five only when new and more accurate data are needed.[30]

The succeeding sections of this chapter will be devoted to a brief discussion of the seven rather detailed steps in scientific thinking enumerated above.

The location and definition of a problem. The first step in problem solving is the location of a problem, a felt need, or a recognized difficulty. Dewey cites three sorts of situations leading to difficulties.[31] The first arises out of *the lack of adaptation of means to end.* One desires to keep an engagement at a certain time, and the existing hour taken in connection

30 The terms "already available data" and "new data," because of the different interpretations placed upon them, have led to much confusion. The data may be new to the investigator, but if they have been experienced and recorded by others, whatever their form or source, they are "already available data." If the data involve new observations, measurements, and records, even though similar observations may have been made by previous investigators, we refer to them as "new data."

31 John Dewey, *op. cit.*, pp. 72-3.

with the location, which may be some distance away, is incongruous. The given conditions cannot themselves be altered; the problem is "the discovery of intervening terms which when inserted between the remoter end and the given means will harmonize them with each other." In this case the difficulty resides in the conflict between conditions at hand and a desired result. Much of the search for better means to an end, in education, falls within this category. The second situation leading to difficulties arises in *identifying the character of an object.* In this case some temporarily entertained belief is incompatible with certain observed facts. Dewey uses the example of the identification of what appeared to be a flagpole on a ferry boat. He says, suppose we symbolize the qualities that suggest flagpole by the letters *a, b, c,* and those that oppose this suggestion by the letters *p, q, r.* Let us further assume that the qualities themselves are really not inconsistent, but in the absence of other data they appear to conflict and thus lead the mind to different and incongruous conclusions—hence the problem. Just as in our first case, the object here is to discover some intervening term or terms, symbolized by *d, g, l,* and *o,* which, when combined with the existing terms, will form a single whole. The method again is that of discovering the necessary intervening term or terms. The third situation leading to difficulties arises in explaining *an unexpected event.* In this case, an observer trained to observe natural laws or uniformities finds something odd or exceptional in the behavior of some natural phenomenon. The problem is to reduce an apparent irregularity to rule, law, or type. Here the method of solution is also to seek for an intermediary term or terms which will connect, by regular linkage, the seemingly odd or exceptional behavior with conditions known to follow from processes supposed to be operative. This feeling of need, discrepancy, or difficulty is defined as a problem.

Having experienced a difficulty, the next step in scientific thinking is to define the difficulty. In complex situations the exact nature of a difficulty is not always immediately under-

stood. The situation demands careful observation, deliberation, and analysis. To accept the first suggestion that presents itself is to be *unscientific* in one's thinking. It is into just this error that untrained workers are likely to fall. In the case of a physician this careful analysis of a complicated situation before passing judgment is called diagnosis. The essence of this process is that one attempts to determine the nature of a problem before proceeding into its solution. It is this, more than anything else, that distinguishes uncritical and uncontrolled thinking from verified knowledge.[32] The selection and definition of a problem are discussed at greater length in Chapter II.

The survey of already available data. One seldom begins research upon an absolutely new problem. As a rule, one has had prior contact with the problem and a certain amount of experience with it. This earlier experience furnishes a certain background of information useful in defining the problem and in formulating hypotheses. Not only has the individual probably had prior contact with the problem himself, but other persons have probably come upon the same difficulty; they may have studied the problem systematically; and they may have reported the results of their thinking in published articles, monographs, or books. As a matter of fact, the student of educational problems finds the whole of man's past published experiences (and such unpublished experiences as he can learn) with such phenomena available for use in defining his problems, in the formulation of hypotheses, and in deciding whether additional data are necessary.

It has been said that the original mind is the well-informed mind. One secures ideas about what is worthy of investigation, of methods of investigation, and of the probable solutions to problems by being well informed about such things. There is a large amount of useless repetition of investigations in the field of education as a result of ignorance on the part of research workers concerning previous studies. Although frequently the results of previous investigations need to be

32 John Dewey, *op. cit.*, pp. 73-4.

verified by further research, this should be intelligent research in which the worker is thoroughly informed about what has preceded him. The collection of new data according to the conventions of science is a time-consuming activity and should be undertaken only after the research worker has assured himself that the problem is worthy of the special effort to be expended upon it and has not already been solved. This problem is discussed in considerable detail in Chapter III.

Before leaving this subject of the available data, emphasis should be placed on two facts. In the first place, the use of past experiences with phenomena is an appeal to history, and historians have developed a system of working with documentary evidence with which research workers should be familiar. It is true that one can "muddle through" a survey of past thinking upon some subject without knowing much about the methods of historical research, but training in this field is essential to productive scholarship. So important is the use of the historical method in educational research that a separate chapter of this book has been devoted to it (Chapter VI). In the second place, the writers wish to emphasize the importance of historical analyses of past experiences with educational phenomena by stating that one may devote a lifetime of research to this field alone. One may concern himself, for example, with the history of selected aspects of the school's program of instruction, such as school support, the nature of the curriculum, or changing concepts of method; with selected problems and issues, such as the school-subject organization versus the activity organization of subject-matter, the whole versus the part methods of instruction, or formal discipline; or with general surveys of elementary education, secondary education, or higher education. The same point might be made with reference to concentration on or specialization in other steps in a complete act of thinking. When a worker chooses to make the careful collection and systematization of past experiences with educational phenomena his special province of research, he becomes an educational historian.

The formulation of hypotheses. Earlier in this chapter the use of hypotheses in thinking was discussed as a distinguishing feature of the scientific method. Having come upon some difficulty or some problem, one normally begins to cast about for a solution. If the difficulty is one frequently experienced before, one may recall the solution or probable solutions, and the process may be greatly shortened. This is the case with a fountain pen. At certain fairly definite intervals the pen ceases to write. It is a real economy in thinking to remember that the pen is out of ink again and to eliminate the necessity of rediscovering each time the reason for the pen's failure to write. In educational research, however, we are generally not so much interested in this sort of hypothetical thinking as we are in the discovery of new relationships. With this thought in mind, the question naturally arises: "How does one get ideas about the probable solution to difficulties?" It has already been said that the original mind is the well-informed mind. One purpose of the survey of one's own experiences and of those of others with given problems is to secure ideas concerning probable solutions. One might ask further: "Are there not methods for facilitating the formulation of hypotheses?" "Are there not some habits of thinking which are more conducive than others to the discovery of hypotheses?" etc. These and similar questions will be discussed in Chapter IV on the formulation and logical development of hypotheses.

The logical development of hypotheses. One of the characteristics of a good hypothesis is its amenability to deductive reasoning. In this connection there are two very significant applications of the deductive technique. In the first place, hypotheses may be checked for logical consistency as informally or as formally as one chooses. If the checking is done formally and systematically, one will doubtless employ a large share of what has been learned in the study of syllogistic reasoning and deductive logic. A second process that one may use, and ordinarily does, at this point in the testing of hypotheses is to study the agreement of their deduced consequences with the

already known or readily discoverable facts in the case. One might say, for example, "If this tentative supposition is true, then such and such things should follow;" or "If this hypothesis is not true, then such and such other things should follow;" etc. Thus, when the professor mentioned by Dewey returned to his room to find it in utter confusion, he formed some kind of a tentative conjecture as to the probable cause. The idea of burglary may have suggested itself. From previous experience he has already formed some concept of burglary. With this concept in mind, he tests the burglary hypothesis by applying his knowledge of burglary to the facts in this particular situation. It is a process of checking back and forth from the facts in a case to a hypothesis and from the hypothesis to the facts in the case.[33] Dewey [34] refers to this step as the rational elaboration of an idea, as the process of developing its bearing and implications. Creighton [35] emphasizes the fact that a hypothesis from which nothing can be deduced is of no value. Conjectures that seem plausible at first sight are often found unjustified or even absurd when their full consequences are traced. Even when reasoning the bearings of a false supposition does not lead to its rejection, such a procedure develops the main idea and makes it more amenable to actual verification.

The collection of new data. Let us repeat that science proceeds from particular facts to hypotheses, and from hypotheses to facts. If the data already available in the documents and the memories of man are adequate for the solution of a problem, no new appeal to experience will be necessary. In such cases the completion of the first four of the seven steps in the complete act of thinking furnish, at least temporarily, the terminal point of the search for truth. In many instances, however, the record of past experiences may be incomplete or may have been made under conditions that cast doubt upon

33 M. T. McClure, *An Introduction to the Logic of Reflection*, pp. 349-54. New York: Henry Holt and Co., 1925.
34 John Dewey, *op. cit.*, pp. 75-6.
35 James E. Creighton, *op. cit.*, pp. 278-97.

their trustworthiness. For example, when the data have been collected by biased or unseeing observers, when the means of collecting the data have not been satisfactorily validated, when the observations have not been systematic and controlled, and when the records are made in the ambiguous terms which characterize the ordinary verbal record, it may be necessary to make a new appeal to experience.

The new appeal to experience may involve a simple noting of the presence or absence of simple units of a phenomenon, such as, the number of births, deaths, marriages, divorces, etc., or it may involve the application of more refined instruments of measurement such as standardized tests, rating scales, and mechanical instruments of measurement, according to the conventions of science. Further, the collection of data may be carried on by either controlled or uncontrolled observation. It is sometimes advantageous to study phenomena under the artificially controlled conditions of experimentation.[36] *To experiment* is to place phenomena, by means of artificial controls, in a favorable location for observation. Thus, the collection of data may involve simple counting, or simple counting plus measurement, under controlled or uncontrolled conditions of observation. A series of subsequent chapters will deal with this topic.

The analysis, classification, and summarization. The fact that analysis is one of the distinguishing characteristics of the scientific method has already been emphasized. From one point of view the topic of analysis belongs more appropriately under the heading of collection of data than with classification or summarization of data. Some analysis of a phenomenon, and the circumstances surrounding it, into elements, constituents, or factors must precede any attempt to control the given factors for experimental purposes. Though this is true, analysis is also an important phase of the classification and summarization of data. In the classification of data one assembles data

[36] Thomas Fowler, *op. cit.*, pp. 38-50.
F. A. Westaway, *op. cit.*, pp. 194-9.

of like characteristics.[37] A chair, a table, a couch, and a rug may all be thought of as household furniture and assigned to this category. They are also manufactured articles and may be classified as such. The types of categories constructed in the classification of data will depend, of course, upon the phenomena under investigation, and the purposes of the research in progress. The contribution made by the summarization of data to scientific thinking is the economy of thinking brought about by the assemblage of a multitude of facts into a single whole. If one collects a large number of data about some phenomenon, it becomes correspondingly difficult to retain them in mind as the number of facts increases. For example, instead of attempting to retain the individual I.Q.'s of 300 elementary-school children, it ordinarily serves one's purpose better to calculate the *mean I.Q.* Likewise, one might calculate through the use of appropriate statistical methods the spread of talent, the relationship of one trait to another, etc. The special economies arising out of such treatments of the data have given rise to the subject of educational statistics. Before one progresses very far in the scientific study of the problems of education, one must have mastered at least the rudiments of statistics. It is a major function of statistics to furnish research workers with economical and effective means of analyzing, classifying, and summarizing data. This problem is discussed in greater detail in Chapter XI.

Generalization. The ultimate goal of science is the formulation of valid generalizations in the form of verified suppositions, explanatory principles, or scientific laws.[38] If the data are complete, convincing, and important, the generalization may take the form of a complete scientific explanation. Most investigations will fall short, however, of this ultimate goal of science, contributing merely to the formulation of new hypotheses to be employed in the search for new insight. We have already shown that the problems of education are com-

37 Thomas Fowler, *op. cit.*, pp. 50-87.
F. A. Westaway, *op. cit.*, pp. 215-24.
38 W. Stanley Jevons, *op. cit.*, pp. 526-50.

plex; it is only through the careful, painstaking, and systematic investigation of such problems that one may hope to obtain valid solutions possible of statement in the form of generalizations. Chapter XII discusses at greater length the problem of formulating conclusions and generalizations.

Science, history, and philosophy in research. Before bringing this discussion of the nature of scientific thinking to a close, it is essential to comment briefly on the supplementary character of history, science, and philosophy in educational research. One may, if he chooses, follow through, with reference to some particular problem, the entire sequence of steps of a complete act of thinking, as set forth in the foregoing discussion, or may specialize in a single phase of the research process. If one specializes, for example, in systematizing the records of past experiences with educational phenomena, we call him an educational historian. If one specializes in the critical examination of educational theories, hypotheses, and generalizations in the light of data which are already available, we call him an educational philosopher. If one specializes in the solving of educational problems by making new appeals to experience through systematic, controlled and uncontrolled observation, in field or laboratory, we call him an educational scientist in the classical sense of the term. These several approaches to research are merely phases of the complete act of thinking, and there can be no fundamental conflict between them.

Concluding statement. The authors have presented in this chapter a discussion of the nature of scientific thinking: first, the sources of evidence, namely, personal experience, custom and tradition, authority, syllogistic reasoning, and scientific inquiry; and second, the three levels of knowledge: supernatural beliefs, empirical findings, and scientific explanations. The scientific method was defined as an inductive-deductive mode of thinking in which one seeks to explain the uniformities of nature by appealing to experience. It possesses six distinguishing features: (1) its appeal to facts,

(2) its application of the method of analysis, (3) its use of hypotheses, (4) its freedom from emotional bias, (5) its use of objective measurement, and (6) its use of quantitative methods in the treatment of data. Seven steps were recognized and defined as constituting scientific procedure: (1) the location and definition of a problem, (2) a survey of the already available data, (3) the formulation of a hypothesis, (4) the development of the hypothesis, (5) the collection of new or additional data, (6) the analysis, classification, and summarization of data, and (7) generalization. Finally, a brief comment was offered concerning the supplementary character of science, philosophy, and history. The remaining chapters of this volume are organized roughly about these seven steps in scientific thinking.

Problems and Exercises *

1. What are the sources of evidence (personal experience, custom and tradition, authority, syllogistic reasoning, or scientific inquiry) commonly used to-day by the majority of people in dealing with problems touching such fields as agriculture, politics, government, economics, sociology, psychology, and education?

2. Select a research study of recent date in the field of education, and analyze it in terms of the six distinguishing features of scientific method and the seven steps in scientific procedure discussed in this chapter.

* The problems at the end of the chapters are optional, and may be assigned at the discretion of the instructor. No attempt is made to prescribe instructional methods in dealing with the materials of this book, although teaching and learning procedures in applying principles of research are suggested or at least implied by the nature of the problems themselves. Of course, the student who is working on a thesis or some other type of investigation, from a functional point of view, has a very desirable type of problem to which the principles of research may be applied. There are various possible ways of using these exercises, as suggested below:

1. A single problem selected: (*a*) for the entire class, (*b*) for each small group of three or four students, or (*c*) for each individual, carried through all or most of the chapters and exercises with appropriate applications in connection with each chapter, procedure, or step in research.

2. A different problem selected in connection with each chapter, procedure, or step in research: (*a*) for the entire class, (*b*) for each small group of three or four students, or (*c*) for each individual.

SELECTED REFERENCES †

ALLEN, E. W. "The Nature and Function of Research," *Publications of the American Sociological Society*, XXI (1927-28), 236-47. Discusses the nature and method of science, essentials in research, preparation for research, the conduct of research, the research project, and outlining the project.

* ALMACK, John C. *Research and Thesis Writing*. Boston: Houghton Mifflin Co., 1930. Pp. xviii + 310.

BALL, Carlton R. "Personnel, Personalities and Research," *Scientific Monthly*, XXIII (July, 1926), 33-45. Stresses the importance of the research personnel, and the characteristics essential to a successful research organization.

BACON, Francis. *Novum Organum:* or, A True Guide to the Interpretation of Nature. (A new translation by the Reverend G. W. Kitchin.) Oxford: The University Press, 1885. Pp. xxix + 338.

BAIN, Alexander, *Logic:* Deductive and Inductive. New York: D. Appleton and Co., 1880. Pp. viii + 731.

BERNARD, L. L., and Others. *The Fields and Methods of Sociology*. New York: Long and Smith, 1934. Pp. xvi + 529.

BIXLER, H. H. *Check Lists for Educational Research*. New York: Bureau of Publications, Teachers College, Columbia University, 1928. Pp. xii + 118.

BOAS, Frederick S. "Some Aspects of Research," *School and Society*, XVIII (July 28, 1923), 98-102. An article on the dignity and value of research and the scientific method. Points out, also, some requirements for effective research.

BOGARDUS, Emory S. *The New Social Research*. Los Angeles: Jesse Ray Miller, 1926. Pp. 287.

BOSANQUET, Bernard. *Logic,* or the Morphology of Knowledge. Two Volumes. Oxford: The Clarendon Press, 1911. Pp. xvii + 398, viii + 240.

BROAD, C. D. *Scientific Thought*. New York: Harcourt, Brace and Co., Inc., 1923. Pp. 555.

BROOKS, Benjamin T. "The Interpretation of Research," *Scientific Monthly*, XXVII (November, 1928), 410-5. A discussion of the importance of sound research and its accurate interpretation. Warns against carelessness and exaggeration in interpreting research.

BUCKINGHAM, B. R. *Research for Teachers*. New York: Silver, Burdett and Co., 1926. Pp. v + 386.

BURTT, Edwin Arthur. *Principles and Problems of Right Thinking*. New York: Harper and Bros., 1928. Pp. xii + 590.

CAJORI, Florian. "Baconian Method of Scientific Research," *Scientific Monthly*, XX (January, 1925), 85-91. Points out the essentials of the scientific method of research; the contributions Bacon has made to the development of this method; and wherein his method was inadequate.

† Also see the bibliographies at the end of Chapter V, and at the ends of other chapters dealing with specific methods of research. For the guidance of the reader, a limited number of references have been marked by an asterisk.

CARMICHAEL, R. D. *The Logic of Discovery*. Chicago, London: Open Court Publishing Co., 1930. Pp. ix + 280.

CHAPIN, F. Stuart. *Field Work and Social Research*. Century Social Service Series. New York: The Century Co., 1920. Pp. xiii + 224.

* Columbia Associates in Philosophy. *An Introduction to Reflective Thinking*, Boston: Houghton Mifflin Co., 1923. Pp. vii + 351.

CRAWFORD, C. C. *The Technique of Research in Education*. Los Angeles: University of Southern California, 1928. Pp. 320.

CREIGHTON, James Edwin. *An Introductory Logic*. New York: The Macmillan Co., 1920. Pp. xvi + 502. Fifth edition, 1932 (with H. R. Smart).

DESCARTES, RENE. *Discourse on the Method of Rightly Conducting the Reason and Seeking Truth in the Sciences*. (Fifth edition.) Edinburgh: William Blackwood and Sons, 1873. Pp. xli + 212.

DEWEY, John. *How We Think*. Boston: D. C. Heath and Co., 1910. Pp. vi + 224. New edition, 1933. Pp. x + 301.

——— *The Sources of a Science of Education*. New York: Horace Liveright, 1929. Pp. 77.

DODGE, Raymond, "Problems of Human Variability," *Science*, LIX (March 21, 1924), 263-70. Discusses the universal importance of variability, and the different ways with which it has been regarded at various times. Says the present need is to rescue human variations from oblivion in mass statistics.

DOWNING, Elliot R. "The Elements and Safeguards of Scientific Thinking," *Scientific Monthly*, XXVI (March, 1928), 231-43. Analyzes historical instances of scientific thinking, and discusses types of reasoning in science, and some safeguards of the elements of scientific thinking.

ELMER, M. C. *Technique of Social Surveys*. Los Angeles, Calif.: Jesse Ray Miller, 1927. Pp. 260.

ENRIQUES, Federigo. *Problems of Science*. Chicago: Open Court Publishing Co., 1914. Pp. xvi + 392.

* FOWLER, Thomas. *The Elements of Inductive Logic*. Oxford: The Clarendon Press, 1876. Pp. xxvii + 360.

GIDDINGS, Franklin Henry. *The Scientific Study of Human Society*. Chapel Hill, North Carolina: The University of North Carolina Press, 1924. Pp. vii + 247.

* GOOD, Carter V. *How to Do Research in Education*. Baltimore: Warwick and York, 1928. Pp. 298.

HASLETT, A. W. *Unsolved Problems of Science*. New York: The Macmillan Co., 1935. Pp. xi + 317.

HENMON, V. A. C. "Measurement and Experimentation in Educational Methods," *Journal of Educational Research*, XVIII (October, 1928), 185-94. Points out the inconclusive, sporadic, and apparently contradictory nature of much of the experimental work now done in education; and the need of greater refinement in measurements to reveal complex educational processes.

HERSHEL, John Frederick William. *Discourse on the Study of Natural Philosophy*. Philadelphia: Carey and Lea, 1831. Pp. vii + 279.

HUME, David. *Inquiries Concerning the Human Understanding, and Concerning the Principles of Morals.* Oxford: The Clarendon Press, 1902. Pp. xl + 371.

HUXLEY, Thomas H. *Science and Education:* Essays. New York: D. Appleton and Co., 1898. Pp. ix + 451.

* JEVONS, W. Stanley. *The Principles of Science.* London: Macmillan and Co., Ltd., 1924. Pp. xliv + 786.

* KELLEY, Truman Lee. *Scientific Method:* Its Function in Research and in Education. Columbus, Ohio: The Ohio State University Press, 1929. Pp. viii + 195. New York: The Macmillan Co., 1932. Pp. x + 234.

LOCKE, John. *An Essay Concerning Human Understanding.* (Abridged and edited by A. S. Pringle-Pattison.) Oxford: The Clarendon Press, 1924. Pp. xlviii + 380.

LUNDBERG, George A. *Social Research:* A Study in Methods of Gathering Data. New York: Longmans, Green and Co., 1929. Pp. xii + 380.

* MCCALL, William A. *How to Experiment in Education.* New York: The Macmillan Co., 1923. Pp. xiv + 281.

MCCLURE, Matthew Thompson. *An Introduction to the Logic of Reflection.* New York: Henry Holt and Co., 1925. Pp. xviii + 473.

* MAYER, Joseph R. *Seven Seals of Science:* An Account of the Unfoldment of Orderly Knowledge and Its Influence on Human Affairs. New York: The Century Co., 1927. Pp. xiv + 444.

MERRITT, E. B. "How Scientific Discoveries Are Made," *Scientific Monthly,* XX (June, 1925), 594-97. Discusses open-mindedness and alertness as the chief qualifications of the explorer, and cites instances to show the part played by accident in many discoveries.

MILL, John Stuart. *A System of Logic, Ratiocinative and Inductive:* Being a Connected View of the Principles of Evidence and Methods of Scientific Investigation. New York, London: Longmans, Green and Co., 1884. Pp. xvi + 622.

MINTO, William. *Logic, Inductive and Deductive.* New York: Charles Scribner's Sons, 1915. Pp. xii + 373.

MONROE, Walter S., and ENGLEHART, Max D. *The Techniques of Educational Research.* University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928. Pp. 84.

MOULTON, H. G. "Scientific Method in the Investigation of Economic Problems," *Scientific Monthly,* XLII (March, 1936), 214-21.

NUNN, T. Percy. *The Aim and Achievements of Scientific Method.* London: Macmillan and Co., Ltd., 1907. Pp. x + 144.

ODUM, Howard W. "The 'Scientific-Human' in Social Research," *Social Forces,* VII (March, 1929), 350-62. Characterizes the scientific-human approach as synonymous with attainable standards in social research.

———, and JOCHER, Katherine. *An Introduction to Social Research.* New York: Henry Holt and Co., 1929. Pp. xiv + 488.

OGDEN, C. K., and RICHARDS, I. A. *The Meaning of Meaning:* A Study of the Influence of Language upon Thought, and of the Science of Symbolism. (Second edition revised.) New York: Harcourt, Brace

and Co., Inc. London: Kegan Paul, Trench, Trubner and Co., Ltd., 1927. Pp. xxii + 363.

OGG, Frederic Austin. *Research in the Humanistic and Social Sciences:* Report of a Survey Conducted for the American Council of Learned Societies. New York: The Century Co., 1928. Pp. viii + 454.

PALMER, Vivien M. *Field Studies in Sociology:* a Student's Manual. Chicago: The University of Chicago Press, 1928. Pp. xix + 281.

* PEARSON, Karl. *The Grammar of Science.* (Third edition revised and enlarged.) London: Adam and Charles Black, 1911. Pp. xx + 394. Nature of scientific method and concepts of science.

PEARSON, G. A. "Some Conditions for Effective Research," *Science,* LX (July 25, 1924), 71-3. Discusses the make-up of the research worker; the need for equipment, technical assistants, and clerical help; the need for organized institutions for research; and the objects of research.

POINCARE, Jules Henri. *Science and Method.* New York: Charles Scribner's Sons, 1914. Pp. 288.

PUPIN, M. I. "Meaning of Scientific Research," *Science,* LXI (January 9, 1925), 26-30. A discussion of the mental attitude which characterizes scientific research, with examples of the method and accomplishments of men who possessed this attitude.

REID, E. Emmet. *Introduction to Organic Research.* New York: D. VanNostrand Co., 1924. Pp. viii + 343.

* REISER, O. L. *Philosophy and the Concepts of Modern Science.* New York: The Macmillan Co., 1935. Pp. xvii + 323.

RICHMOND, Mary E. *Social Diagnosis.* New York: Russell Sage Foundation, 1917. Pp. 511

RITCHIE, A. D. *Scientific Method:* An Inquiry into the Character and Validity of Natural Laws. New York: Harcourt, Brace and Co., Inc. London: Kegan Paul, Trench, Trubner and Co., Ltd., 1923. Pp. viii + 204.

ROBINSON, Daniel S. *Illustrations of the Methods of Reasoning:* A Source Book in Logic and Scientific Method. New York: D. Appleton and Co., 1927. Pp. xiii + 346.

* ——— *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method. New York: D. Appleton and Co., 1924. Pp. xviii + 390. Second edition, 1930. Pp. xviii + 393.

ROBINSON, James Harvey. *The Mind in the Making:* The Relation of Intelligence to Social Reform. New York: Harper and Brothers, 1921. Pp. vii + 235.

RUSK, Robert R. *Experimental Education.* London: Longmans, Green and Co., 1919. Pp. viii + 346.

SCHLUTER, W. C. *How to Do Research Work.* New York: Prentice-Hall, 1927. Pp. vii + 137.

* SEARS, J. B., and Others. *The Place of Research in Educational Reconstruction.* Washington: American Educational Research Association, 1936. Pp. 46.

STEBBINS, Joel. "Observation versus Experimentation," *Science,* LV (January, 1922), 29-34. Points out differences between the observer and

the experimenter in attitude toward work, data, equipment, time spent, use of the method of least squares, computations, etc.

THOMSON, John Arthur. *An Introduction to Science.* New York: Henry Holt and Co., 1911. Pp. 256.

* TROW, William Clark. *Scientific Method in Education.* Boston: Houghton Mifflin Co., 1925. Pp. xi + 159.

VENN, John. *The Principles of Empirical or Inductive Logic.* London: Macmillan and Co., Ltd., 1889. Pp. xx + 594.

WELTON, J. *The Logical Bases of Education.* London: Macmillan and Co., Ltd., 1919. Pp. xvi + 288.

——— *A Manual of Logic.* Two Volumes. (Second edition.) London: W. B. Clive, 1912. Pp. xxii + 411 + 23, viii + 292 + 23.

* WESTAWAY, F. W. *Scientific Method:* Its Philosophy and Its Practice. (Fourth edition.) London: Blackie and Son, Ltd., 1931. Pp. xviii + 522.

WHEWELL, William. *History of the Inductive Sciences.* Three Volumes. (Third edition with additions.) London: John W. Parker and Son, 1857. Pp. xxxii + 394, xii + 488, xiv + 565.

WHITEHEAD, A. N. *An Introduction to Mathematics.* New York: Henry Holt and Co., 1911. Pp. 256.

* WOLF. A. *The Essentials of the Scientific Method.* New York: The Macmillan Co., 1925. Pp. 160.

CHAPTER II

THE SELECTION OF A PROBLEM: NEEDED RESEARCH IN EDUCATION

Introduction. The purpose of this chapter is to aid educational workers in identifying problems through an analysis of both their own areas of service and the various types of literature concerned with completed research, trends, critiques, prophecies, investigations in progress, and needed research. Criteria for use in selecting a problem and suggestions for formulating, stating, defining, and delimiting the problem will be presented.

THE DISCOVERY OF PROBLEMS

Many unsolved problems in education. A too common belief of educational workers, whether in field service or the graduate school, is that most of the problems of education have been solved. They express amazement at the relatively large number (in excess of 3200 at this writing) of Masters' and Doctors' theses in education completed each year; from seven to eight hundred books, monographs, and bulletins published annually; and thousands of studies published in research periodicals as evidence that education must have few additional difficulties with which to cope. That this conception is utterly fallacious will be demonstrated in the present chapter.

As long as the major task of the school is to educate youth, with a host of variable factors in terms of pupil, teacher, curriculum, administrative organization, community, etc., there always will be problems to solve. Human nature reduces itself to quantitative terms and to generalizations with much greater difficulty than do inanimate objects in such fields as physics and astronomy. As a matter of fact, it has been pointed out

that of our two parents, one has, let us say, 17,000 germ cells and the other 300,000,000,000 germ cells.[1] The probability of the unique combination that produces a given child is one in 5,000 million million. Although some biologists are more conservative in their estimates, it is perfectly clear that every child is unique and has no duplicate in the past, present, or future. Even 2,000 "standard white rats" which grew along a normal growth curve of weight and size in Wistar Institute at Philadelphia were considered to possess individuality, although not so variable as human beings.

Granted that the research worker in education is confronted by difficulties in the variables mentioned, he may well be stimulated to find more nearly exact answers to his problems by noting the accomplishments of measurement in certain other fields. Hubbard states these achievements in a striking way.[2]

> Through measurements we learn of the proton, smallest component of the atom, of which 10,000 million million in a line would measure one inch. Through measurements we study island universes a hundred million light years away, a million light years across, receding from us with speeds as high as 10,000 miles a second.
>
> Men now measure the change in the rotation rate of the earth, a rhythmic increase and decrease over a range of 40 seconds in 80 years. They can measure changes in the orbit of the moon caused by the shift of masses within the earth. They measure the movement of the north pole of the earth, 40 feet a year. Then, too, they can measure the brightness of the planet Saturn as affected by the change in sunlight. They even measure the change in the size of the sun as its pent-up energy increases in advance of the new cycle of sunspots.
>
> I have often held in my hand the extraordinary device by which we can measure the heat that the North Star may radiate on the finger-tip, a quantity so small that a million years of shining would just heat the finger-tip one degree if no heat were lost. The sensitivity of the modern electron tube may be represented by comparing it to the detection measurably of two drops of water in the annual overflow of Niagara. Another delicate device perfected in Wisconsin records the footsteps of a man or those of a child walking on the ground a quarter of a mile away.

1 H. D. Hubbard, "Unmeasured Goals," *Baltimore Bulletin of Education*, X (March-April, 1932), 161-7.
2 *Ibid.*

Although the appendix will list in some detail unsolved problems in the various subdivisions of education, this introductory statement may well enumerate pressing issues which confront the school after several years of economic depression.[3]

It should not be assumed from a review of such advances in science that most of the problems have been solved. As a matter of fact, with increased knowledge in a given field come many new problems pressing for solution. If a ball of light is likened to truth, and darkness to ignorance or unsolved problems, to increase the size of the sphere of light or to expand the limits of knowledge really serves to increase the area of darkness or unsolved problems on the fringe of illumination or truth. This statement may be substantiated by comparing analyses of needed research in education, prepared a quarter of a century ago when the field was very limited, with the extensive current lists of needed investigations referred to in this chapter. In one of the early discussions [4] of needed research, Cubberley mentions finance, county reorganization, and units of cost; Dearborn and Thorndike stress experimentation and quantitative measurement; while Monroe urges cooperation in research and shows the opportunity and need for research in educational history.[5]

When so much is said and written about "fads and frills" and a return to the "fundamentals" of the "good old days," school people must know educational history in order to evaluate accurately the new and the old. For adequate analysis the problems of class size, individualized instruction, and progressive education require the contribution of the educational historian. When legislatures are passing drastic school laws, which inevitably must be changed when the members are saner, wiser, and less panicky, the efforts of the relatively small

3 Carter V. Good, "Educational Research and the Times," *Journal of Educational Research*, XXVII (October, 1933), 139-41.

4 E. P. Cubberley, W. F. Dearborn, Paul Monroe, and E. L. Thorndike, "Research within the Field of Education, Its Organization and Encouragement," pp. 1-54. *The School Review Monograph*, Vol. I. Chicago: Department of Education, University of Chicago, 1911.

5 Paul Monroe, "Opportunity and Need for Research Work in the History of Education," *Pedagogical Seminary*, XVII (March, 1910), 54-62.

group of research workers in the field of school legislation should be extended more than ever before. Suggestions or commands for changes in curriculum, organization, or method, dictated by the voice of legislative or executive authority, born of necessity or panic, must be tested experimentally in actual school situations for any worth-while evaluation. There is more urgent need for surveying current school conditions in a time of economic depression than during a period of prosperity. In fact, the past few years have been remarkable in the number of great national surveys conducted (modern foreign languages, land-grant colleges, secondary education, teacher education, school finance, social studies, and the White House Conference on Child Health and Protection), although it is true that appropriations were made for some of these studies prior to 1929. Tests are needed that will measure the products of the "new education," which are said to involve values other than factual information. It is desirable to know what effect present economic, social, and home conditions have on the accomplishment of the child, as well as on his attitudes, personality, character, and emotional life. This type of investigation involves detailed case study of the children represented, as well as adequate instruments for measurement.

Inability to recognize problems. The difficulty of many educational workers, especially beginners in the field and in the graduate school, is in recognizing the numerous problems which are obvious to those with the insight to sense such issues. The experienced research worker may be compared with the Indian or woodsman who grasps the significance of a faint haze on the distant horizon and of a broken twig or disturbed fallen leaf. The eye of the novice or city dweller may be physically just as keen as that of the trapper, but he fails because of limited experience to recognize the meanings involved. This characteristic inability of immature workers to see problems has been aptly described by Trow:[6]

[6] W. C. Trow, *Scientific Method in Education*, p. 40. Boston: Houghton Mifflin Co., 1925.

Oftentimes students finish college and go on to graduate school before they discover that they need to do some original research before they will be awarded a graduate degree. So they confer with some member of the graduate faculty and ask him for a problem to work on; they can't seem to think of any. Can't think of any, and the world fairly bursting with them!

A more detailed account of the "problem blindness" of the graduate student was given by Buckingham when he was serving in the dual capacity of college professor and editorial writer. A student has entered the professor's office, and after a preliminary remark or two, the following conversation ensues:[7]

"I've got to write a Master's thesis," says he, "and I'd like to talk to you about a topic." The statement ends with a slight upward inflection as if, in spite of its grammatical form, a sort of question were implied. After an awkward pause Mr. Blank (the student) repeats that he would like to talk about a thesis topic. Whereupon the editor (and professor) suggests that he go ahead and do so.

It transpires, however, that the editor-professor has misconceived Mr. Blank's meaning. He has no topic to talk about. In fact, instead of coming with a topic, he has come to get one. He looks so expectant, too; purely, as one might say, in a receptive mood.

No, he has no problems to suggest. He gives one the impression of having just learned about this thesis business, and of being entirely open-minded on the subject. At least, one gathers that he has no bias toward any particular topic and certainly no preconceived notions. [Graduate professors will recognize this as a familiar situation.]

A conversation ensues. The editor—playing for the nonce his professorial rôle—asks in what department Mr. Blank is majoring, what courses he has taken, what positions he has held, and for what type of educational service he is fitting himself. At one stage of the resulting exchange of ideas Mr. Blank brightens. With some modesty, yet with the undeniable air of a discoverer, he suggests that he might correlate intelligence and achievement in the high school. He could give some tests in the school with which he is connected; and his friend, the principal of the X school, would probably let him give some tests there; and maybe he could get one or two more schools if he stopped to think about the matter. And, O yes! how many schools does the professor think would be needed to get results that you could depend on? On being told that intelligence and achievement

[7] "The Editor Turns Professor," *Educational Research Bulletin*, VI (September 14, 1927), 252-3.

following the given author's own organization, whether in terms of school subjects, levels of instruction, or more specific and limited educational problems.

PROBLEMS EMPHASIZED IN EDUCATIONAL LITERATURE

1. Frequency of investigation of various problems of education. Some indication of problems investigated frequently in the past is provided by analyses of the studies which have been published over a given period of years. In Tables I and II are the results of Franke and Davis' study of the amount of research produced in the various fields and at the several levels of education respectively, as reported in magazines. Only data for 1920-1929 are reproduced.[11]

TABLE I

DISTRIBUTION OF THE AMOUNT OF RESEARCH PRODUCED IN THE VARIOUS FIELDS OF EDUCATION DURING 1920-1929

Field	Articles		Pages	
	Number	Per Cent	Number	Per Cent
Administration	233	11.65	1991	10.32
Curriculum and course of study	161	8.05	1642	8.50
Methods	189	9.45	1728	8.95
Child psychology	102	5.10	1321	6.84
Educational psychology	140	7.00	1572	8.14
Educational measurement and statistics	844	42.20	8120	42.03
Guidance	119	5.95	907	4.70
Character	72	3.60	735	3.81
Physical education	15	.75	83	.43
Teacher training	125	6.25	1212	6.28
Totals	2000	100	19311	100

In commenting on the fields of investigation represented in Table I the authors show that since 1890: (1) a relatively

11 Paul R. Franke and Robert A. Davis, "Changing Tendencies in Educational Research," *Journal of Educational Research*, XXIII (February, 1931), 133-45.

large amount of emphasis has been given to administration, child psychology, and educational measurements and statistics; (2) child psychology has held its most prominent position from 1890 to 1899, educational administration from 1900 to 1909, and educational measurements and statistics from 1910 to the present time, showing an increase from 1920 to 1929.

TABLE II

DISTRIBUTION OF THE AMOUNT OF RESEARCH PRODUCED AT THE VARIOUS LEVELS OF EDUCATION DURING 1920-1929

Level	Articles		Pages	
	Number	Per Cent	Number	Per Cent
Elementary	597	29.85	6294	32.59
Elementary-secondary	124	6.2	817	4.23
Secondary	520	26.0	4935	25.56
Secondary—higher	44	2.2	415	2.15
Higher	715	35.75	6850	35.47
Totals	2000	100	19311	100

With respect to levels investigated they state that: (1) research in elementary education has held a conspicuous position from 1890 to the present time; (2) there is a comparatively small amount of research on the elementary-secondary level irrespective of year-periods, the greater amount of emphasis having been placed on the secondary level rather than on the combination, elementary and secondary; (3) there is a negligible amount of research on the secondary-higher level; and (4) there is a relatively great amount of research devoted to higher education throughout the four periods.

A classification of fields represented in the entire group of Doctors' theses in education from 1918-1931 is reported in Table III.[12]

The data of Table III may be interpreted briefly. In view of the fact that many graduate students have been, and are,

12 Carter V. Good, "Fields and Types of Research in Education, 1918-31," *Journal of Educational Research*, XXIV (June, 1931), 33-43.

TABLE III

CLASSIFICATION OF 1359 DOCTORS' THESES IN EDUCATION COMPLETED, 1918-1929, AND OF 587 DOCTORS' THESES UNDER WAY, 1930-1931

Field	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1918-29 Total	Under Way '30-'31	Grand Total
Administration and supervision	20	13	13	17	19	29	27	42	62	62	60	46	410	165	575
Psychology and measurement (General)	9	14	19	11	30	29	31	39	41	51	52	54	380	108	488
General method and theory	3	8	8	6	4	8	13	13	17	17	11	11	119	40	159
History of education and foreign education	14	10	10	5	10	18	15	18	23	23	25	16	187	92	279
Preschool and elementary education	3	4	5	5	5	3	7	8	5	14	25	24	108	52	160
Secondary education	8	10	5	8	3	16	18	22	27	30	35	29	211	86	297
Higher education and adult education	3	3	6	2	11	10	14	26	37	49	43	40	244	181	425
School subjects	9	11	16	12	14	25	30	29	50	43	66	78	383	222	605
Total theses	53	50	61	43	68	94	110	137	181	189	194*	179*	1359**	587**	1946**

* Titles probably are not completely listed for 1928 and 1929 in the Office of Education Bulletins.

** This, the total number of theses, is less than the total times the various fields are represented, since a given thesis may be classified under more than one subdivision of education.

school administrators and supervisors, it is not surprising that a large number of theses completed, and under way in 1930-31, were in the field of administration and supervision. A comparison of the total number of completed theses in psychology and measurement with those under way in 1930-31 indicates a relative decrease in this field; this may be a natural reaction to the overemphasis on tests and measurements during the decade following the war period.

It is to be expected that an investigator in the field of method will conduct his study in a given school subject, which explains the large number of theses under the heading, *"School subjects,"* as compared with the smaller number under *"General method and theory."* Although Table III does not present such information in detail, the investigator was impressed by the total absence of Doctors' theses under way in art education in 1930-31 and by the small numbers in certain other school subjects: commercial education, three; foreign languages, three; home economics, seven; manual, industrial, and agricultural arts, eleven; and music, four. The number of theses under way in other school-subject fields in 1930-31 was as follows: English, reading, and language, thirty-nine; mathematics and arithmetic, thirty-four; moral, religious, and character education, forty-eight; physical and health education, twenty-one; science, thirty; and social studies, twenty-two. The recent interest in problems of moral, religious, and character education is evidenced by the comparatively large number of studies under way in this field. The number is large, however, partly because certain schools of education classify theses in religious education under the heading of education.

There is a decrease in the number of theses dealing with philosophical or subjective aspects of educational theory, probably caused by wider use of the objective methods and tools of research discussed in later chapters. In the history of education and foreign education, during the earlier years, a large proportion of the theses dealt with educational history in the United States; during the past few years, with the influx of

an increasing number of foreign students, systems of education in other countries are being studied. The International Institute of Teachers College, Columbia University, has been especially active in this field.

As a field for research preschool and elementary education has not received adequate attention in Doctors' dissertations, although a marked increase in the number of theses in this field is noted in 1927, 1928, and 1929. Possibly the fact that many elementary-school workers have not felt the urge to secure a Doctor's degree explains the relatively small number of studies in this field. Secondary education receives a fair proportion of attention. Since 1924, a decided increase in the number of dissertations in higher education is noted. Nearly one third of the theses under way in 1930-31 dealt with problems of higher or adult education.

The annual bibliography of research, issued by the United States Office of Education, includes an interesting tabulation of the number of studies in the various subdivisions of education made during the school year covered. The results for 1929-1934 are found in Table IV.[13]

Three hundred and sixty-eight institutions and organizations are represented in the 1929-30 data of Table IV. Of 4,651 studies listed, about 55 per cent represent Masters' and Doctors' theses, over 15 per cent periodical references, and the remaining entries are for studies of city, state, and various independent organizations. For purposes of comparison, the 122 subjects included in the bibliography were combined and reduced in the table to twenty-five main topics in order that some idea may be had of the fields which were receiving most attention. In later years the number of major headings has been reduced to fewer than twenty-five. Table IV shows in percentages the relationship between each subdivision and the total for the year. Although these percentages indicate to a certain extent the subjects in which there is most interest,

13 Edith A. Wright, *Bibliography of Research Studies in Education*, 1929-30, p. xi. Office of Education Bulletin No. 12, 1931. Washington: Office of Education. Also see later annual bibliographies.

TABLE IV

PERCENTAGE OF RESEARCH STUDIES FOR 1929-34 IN VARIOUS FIELDS OF EDUCATION

Subject	Approximate Per Cent				
	1929-30	1930-31	1931-32	1932-33	1933-34
Educational sociology					1.58
Educational history and biography	1.50	2.38	2.78	3.44	2.51
Current educational conditions—United States	1.50	1.98	1.68	1.14	1.27
Current educational conditions—foreign countries, international aspects	1.25	2.18	1.60	1.33	1.89
Educational theory and practice, special methods, individual differences	3.50	2.36	2.27	4.50	4.11
Educational psychology, child study, etc.	3.50	2.61	1.68	2.00	1.52
Testing and research	4.50	5.13	4.57	4.00	5.01
Special subjects of curriculum	23.00	24.20	25.53	38.79*	38.00*
Elementary education, including preschool, kindergarten, and primary	1.25	1.22	2.26	1.86	1.36
Secondary education	4.00	4.06	5.03	5.08	4.70
Teacher training and status	8.50	8.09	5.85	4.72	5.84
Higher education	2.75	2.91	4.75	4.00	3.31
School administration	6.25	8.09	7.36	19.56**	20.14**
School management	8.25	6.46	5.89		
School buildings	1.75	1.47	1.21	1.06	1.42
School health and physical education	4.25	4.84	5.31	*	*
Play, social aspects, and child welfare	2.00	1.86	2.56	.89*	*
Rural education	1.75	**	**	**	**
Moral and religious education	3.50	2.70	2.62	*	*
Guidance	2.00	2.73	1.44	**	**
Vocational, agricultural, home economics, commercial, professional education	7.00	7.40	8.57	*	*
Civic and military education	.50				
Education of women	.75		.45		
Education of racial groups	1.50	1.51	1.60	1.94	1.83
Exceptional children	2.50	2.54	2.36	2.78	3.06
Educational extension and libraries, adult education	2.75	3.03	2.62	2.86	2.60
Total	100.	100.	100.	100.	100.

* The percentage for the curriculum heading is larger than for earlier years because of the apparent inclusion of certain former subdivisions under this heading, for example, health and physical education, play, moral and religious education, agricultural education, home economics, and commercial education.

** Administration and management include the former headings of rural education and guidance.

they do not show the real situation in every instance. For example, the number of studies listed under elementary education is very small. However, there are many studies classified elsewhere which deal with education at the elementary level. Such sections as rural education, special subjects of the curriculum, school management, and testing will be found to contain many references to studies at the different levels. This fact should be kept in mind when examining the table. With due consideration to the overlapping which occurs in a list of this kind, an examination of the percentages reveals that the greatest emphasis during the period covered has been on the special subjects of the curriculum. Twenty-three per cent of the total number of studies in 1929-30 are credited to that topic, and this does not include a number of investigations in curriculum making which are listed under school management. Of the various subjects of the curriculum, English leads in interest, with reading and arithmetic following. Of special note is the amount of educational research which has been done in the field of training and status of teachers. It is second in interest to the topic, "Special Subjects of the Curriculum," and it also ranks second in the number of Doctors' theses completed in the field. Although Table IV has its limitations, it will show not only the special phases of education which recently have commanded attention, but also the subjects which graduate students have been investigating.[14]

The distributions of research for 1929-34 are quite similar,[15] as noted in the last five columns of Table IV, especially when account is taken of the fact that only graduate theses and faculty research are included for 1931-32 and only theses for 1932-1934. In 1931-32 the most popular fields were those of: (1)

14 Edith A. Wright, *op. cit.*, pp. x-xi.

15 Ruth A. Gray, *Bibliography of Research Studies in Education, 1931-32.* Office of Education Bulletin No. 6, 1933. Washington: Office of Education, 1933. Pp. xiv + 282.
———, *Bibliography of Research Studies in Education, 1932-33.* Office of Education Bulletin No. 7, 1934. Washington: Office of Education, 1934. Pp. xiv + 350.
———, *Bibliography of Research Studies in Education, 1933-34.* Office of Education Bulletin No. 5, 1935. Washington: Office of Education, 1935. Pp. xiv + 328.
Edith A. Wright and Ruth A. Gray, *Bibliography of Research Studies in Education, 1930-31.* Office of Education Bulletin No. 16, 1932. Washington: Office of Education, 1932. Pp. xviii + 460.

special subjects of the curriculum; (2) vocational training including such related subjects as agricultural education and home economics; (3) school administration; (4) teacher training; (5) school management; (6) school health and physical education; (7) secondary education and junior colleges; (8) higher education; (9) testing and research. Of the special subjects of the curriculum, those receiving the most attention were English grammar and composition, with a total of eighty-two entries; music, seventy-seven; psychology, forty-seven; art, forty-six; modern languages, forty-four; social studies, forty-four; history, forty-one; and English literature, thirty-eight. In 1932-34 the fields of greatest interest were the curriculum and school administration and management.

Other workers in such special fields as the psychology of learning, abnormal psychology, psychology in general, sociology, personnel research, and higher education have provided helpful guidance with respect to the extent various subdivisions of these areas have been investigated.

On the basis of an analysis of material on learning found in sixty-five periodicals over a period of forty years, Davis and Ballard have ranked the topics according to the percentage of the studies devoted to each problem. The ranking for 1920-1929 is as follows: [16]

Permanence of learning	1
Attitudes, incentives, and motivation	2
Relation of physical and mental ability	3
Mental and ideational learning	4
Continuous work, fatigue, narcotics, and drugs	5
Nature and principles of learning	6
Transference and interference in learning	7
Drives and confidence	8
Motor learning	9
Attention, interest, and effort	10
Reception of stimuli and method of presentation	11
Reasoning, problem solving, reflective thinking	12
Observation, perception, and report	13
Guidance in learning	14

[16] R. A. Davis and C. R. Ballard, "The Development of Research in Learning," *Journal of Educational Psychology*, XXIII (March, 1932), 226-35.

Goodenough's analysis of trends in modern psychology is based on the *Psychological Index* since 1894 and on *Psychological Abstracts* from 1927 to 1932. She reports in detail the relative emphasis given the topics of:[17] sensation and perception, educational psychology, industrial and personnel problems, the nervous system, plant and animal behavior, childhood and adolescence, mental tests, statistical methods, attention, memory and thought, work and fatigue, sleep and dreams, feeling and emotion, maldevelopment and mental deficiencies, social psychology, and abnormal psychology. Other analyses of psychological trends are listed in footnote 17.

Becker's tabulation of the space apportioned forty-eight topics in sociology covers a thirty-five year period and involves the large divisions of:[18] personality, family, peoples and cultural groups, conflict and accommodation groups, communities and territorial groups, social institutions, social science and the social process, social pathology (personal and

17 Florence L. Goodenough, "Trends in Modern Psychology," *Psychological Bulletin*, XXXI (February, 1934), 81-97.

Also see R. A. Davis and S. E. Gould, "Changing Tendencies in General Psychology," *Psychological Review*, XXXVI (July, 1929), 320-31. An analysis of 110 textbooks in general psychology published over a thirty-nine year period.

W. A. Hunt and Carney Landis, "The Present Status of Abnormal Psychology," *Psychological Review*, XLII (January, 1935), 78-90. An analysis of fifteen textbooks in the field, seven psychiatric tests, of the number of teachers and research workers in abnormal and experimental psychology, and of experimental literature from 1929 to 1933 inclusive.

V. A. Jones, "Fields of Instruction and Research in Psychology as Represented by Members of the American Psychological Association," *Journal of General Psychology*, X (January, 1934), 211-4.

C. M. Louttit, "Psychological Journals: A Minor Contribution to the History of Psychology," *Psychological Review*, XXXVIII (September, 1931), 455-60. An analysis of the subject-, country-, and time-distribution represented in psychological journals.

J. B. Maller, "Forty Years of Psychology," *Psychological Bulletin*, XXXI (October, 1934), 533-39. An analysis of American and European publications in psychology, 1894-1933.

K. L. Smoke, "The Present Status of Social Psychology in America," *Psychological Review*, XLII (November, 1935), 537-43. An analysis of topics treated in the literature of this field.

Helen F. Weeks and Others, "A Comparative Study of Recent Texts in Psychology, Educational Psychology, and Principles of Teaching," *Journal of Educational Psychology*, XXI (May, 1930), 327-40.

18 Howard Becker, "Space Apportioned Forty-eight Topics in the American Journal of Sociology, 1895-1930," *American Journal of Sociology*, XXXVIII (July, 1932), 71-8.

H. G. Duncan and Winnie L. Duncan, "Research Interests in Sociology," *Sociology and Social Research*, XIX (May-June, 1935), 442-6. Explores the interests of sociologists as recorded in the census of research projects published annually in the *American Journal of Sociology*. The data consist of 1,973 projects between the years 1928-1934, and afford an opportunity for determining the general trends in sociological research.

social disorganization), methods of investigation, and general sociology and methodology of the social sciences.

An analysis of 571 articles on educational personnel, over the period 1920-30, indicates the following topical emphasis in terms of percentages:[19] educational guidance, 26; counseling, 13; selective admissions, 12; personality traits, 11; social life and extracurricular activities, 9; vocational guidance, 7; student government, discipline, and good citizenship, 3; and rating scales, 3.

As reported in Strang's study, the relative emphases on methods of collecting data, in percentages, are: intelligence tests, 48; teachers' marks, 42; questionnaires, 24; questionnaires to students, 14; questionnaires to others, 10; rating scales, 14; office records, 12; achievement tests, 10; special records, 8; tabulation of printed material, 6; character and interest tests, 4; tests of emotion, 4; daily schedules, 4; interviews, 4; physical and physiological measures, 4; observation, 4; and tests of motor ability, 2.

Although Martin's canvass of periodical literature on higher education involves only 132 articles, it is suggestive of centers of interest in this area.[20] The number of articles devoted to each topic is as follows: student personnel, 30; curricula, 18; instruction, 17; training of college teachers, 14; administrative and supervisory policies, 13; standards and standardizing agencies, 13; measurement and recognition of good teaching, 10; and general and miscellaneous, 17.

2. Authoritative statements of accomplishment and knowledge of completed research. Valuable orientation with respect to the status of research in many fields of education is provided by stimulating discussions in current periodicals. Such evaluative treatments reveal to the worker the foundation on which he builds in carrying forward his own activities in the same field. Illustrative analyses may be mentioned briefly.

19 Ruth Strang, "Trends in Educational Personnel Research," *Personnel Journal*, X (October, 1931), 179-88.

20 C. W. Martin, "Problems of Higher Education as Found in Periodical Literature," *Peabody Journal of Education*, IX (May, 1931), 372-6.

The biennial survey of education, issued by the United States Office of Education, provides the best available information concerning the present status of education of the various types and at the several levels of instruction: administration and finance; elementary, secondary, industrial, commercial, home-making, agricultural, art, music, hygiene, and physical education; exceptional children; adult, college, and university problems; indigenous peoples, radio, research, libraries, boards and foundations, museums, and legislation.

In 1931 the *American School Board Journal* devoted an entire issue to a summary of forty years of progress in the various phases of educational and business administration:[21] city school administration, state education departments, state superintendency, state policies of financing public schools, Department of Superintendence, United States Office of Education, public-school business administration, school administration, textbooks and textbook making, school architecture, school-room ventilation, public recreation, and school seating.

Strayer reports twenty-five years of progress in city school administration in terms of: application of scientific method, professional training of school executives, organization of the administrative and supervisory staff, organization of the school system, recognition of individual differences, curriculum, personnel, technique of supervision, visiting teacher, business administration, building program techniques, and record systems.[22] However, he maintains that further study is needed on: local-Federal relationships, local finance, public relations, individual adjustment, elimination of propaganda, failure and retardation, and more scientific training of the staff.

Updegraff's statement of a decade of progress in public

21 For example, G. F. Womrath, "Public-School Business Administration in the Past Forty Years," *American School Board Journal*, LXXXII (March, 1931), 43-4, 118.

Also see F. R. Noffsinger, "A Century of Progress in Schoolhouse Construction," *American School Board Journal*, LXXXIX (December, 1934), 39-40; XC (January, 1935), 21-2; XC (March, 1935), 37-8; XC (April, 1935), 36; XCII (January, 1936), 52.

F. R. Noffsinger, "A Century's Progress in School Heating and Ventilation," *American School Board Journal*, XCI (July, September, November, 1935), 38-9, 37-8, 36.

22 G. D. Strayer, "Progress in City School Administration During the Past Twenty-five Years," *School and Society*, XXXII (September 20, 1930), 375-8.

schools includes improvement in: enrolment, attendance, school term, consolidation, transportation, rural high schools, reorganized high schools, special schools and classes, night schools, buildings, salaries, instructional procedures, curriculum, and Federal relations to education.[23]

Workers in educational psychology have provided overviews of accomplishments in several subdivisions. Gates discusses advances under the following captions: educational objectives, teaching and learning, results of present educational systems, educational diagnosis and measurement, educational guidance and prognosis, educational diagnosis and remedial work, trends in methods of research, trends in systematic accounts of educational psychology, and use of the school as a laboratory.[24] He also shows the contribution of psychology to education in the introduction of scientific method, in providing a view of human nature fundamental to modern philosophy in the development and application of a body of scientific principles to educational theory and practice, and in providing useful professional techniques and instruments.[25]

In naming the contributions of science to education, Freeman includes increased knowledge of: learning procedures with special reference to the school subjects, nature and development of the child, mental tests and individual differences, determination of curriculum content, measurement by objective achievement tests, and the school personnel. However, he suggests that too many studies have been trivial, negative in their conclusions, and intended for appraisal rather than discovery.[26]

23 Harlan Updegraff, "Progress in American Public Schools, 1920-30," *Nation's Schools*, XIV (August, 1934), 17-20.

24 A. I. Gates, "Recent Advances in Educational Psychology," *School and Society*, XXIX (January 5, 1929), 1-8.

25 A. I. Gates, "Contributions of Psychological Research to Education," *School and Society*, XXXI (April 12, 1930), 485-93.

26 F. N. Freeman, "The Contribution of Science to Education," *School and Society*, XXX (July 27, 1929), 107-12.

Also see F. N. Freeman, "The Contribution of Science to the Principles and Methods of Teaching," *Childhood Education*, VI (April, 1930), 348-54.

Harold Rugg, "After Three Decades of Scientific Method in Education," *Teachers College Record*, XXXVI (November, 1934), 111-22.

A statement of the contribution of research to curriculum construction in the secondary school recognizes the value of the reports of committees and survey commissions, but specifies difficulties or problems yet to be solved: the ultimate good by which to measure all procedures, the gap between curriculum and conduct, specific causal factors affecting results in a given field of instruction, and restraining influences of college-entrance and other formal requirements.[27]

Research in mental hygiene has contributed to: techniques for measuring individual adjustment, adjustment of the school organization and program to the individual, organized guidance programs, clinical methods of studying and aiding the problem child, and home contacts through the visiting teacher.[28]

Probably the foregoing selected statements of the achievements of research in given areas will show the type of orientation provided in the selection of a problem for investigation. However, for the sake of completeness and to provide a variety of such statements of progress, other similar references may be found in the supplementary bibliography at the end of this chapter. These analyses include:

A century of teacher training	French
A century of progress in education	Judd
A century of progress in psychology	Flugel
A century of progress in social science	Bernard
Junior college	Eells. Noffsinger
Organization of secondary schools	Wiley
Secondary curriculum	Loomis
Method in secondary schools	Douglass
Education for girls	Wilson
Study	Woodring and Fleming
Principles of teaching	Freeman
Educational sociology	Smith
Science teaching	Caldwell, Curtis
English	Jewett

27 H. R. Douglass, "The Contribution of Research to Secondary School Curriculum Construction," *School and Society*, XXXII (September 27, 1930), 411-6.

28 P. M. Symonds, "The Contribution of Research to the Mental Hygiene Program for Schools," *School and Society*, XXXIV (July 11, 1931), 39-49.

Student personnel	Strang
Measurement of character	Shuttleworth
Mental hygiene	Ruggles, White
Parent education	Bridgman

Additional assistance in canvassing completed research may be found in Chapter III which is a detailed treatment of the sources of information available in making an exhaustive bibliographical survey of investigational activity in a given field. Obviously, the educational worker does not wish to attack a problem which has been satisfactorily solved. On more than one occasion a research worker has spent much time in the investigation of a problem only to find that some other person has previously arrived at the same conclusion. In some cases the results were even available in print, but the investigator in question had failed to make a thorough bibliographical survey. Probably graduate students are more likely to duplicate the work of some student in another institution, due to the difficulty involved in ascertaining the problems being investigated by students in graduate schools. Examples of such duplication are given in Chapter III. Familiarity with completed research reveals gaps in the available knowledge of a given field, and suggests studies which need further investigation or repetition for purposes of verification.

3. **Analyses of educational trends.** Critical insight with respect to current problems and familiarity with changes in education are promoted through examination of articles dealing with trends in given fields. For the benefit of their readers, who are classroom teachers in many instances, most educational journals feel obligated to prepare occasional analyses of such changes in the areas represented. A method employed rather frequently in discovering shifts of emphasis is to analyze journals over a period of years, as described earlier in this chapter.[29] Twenty-three addresses delivered at the

29 Howard Becker, "Distribution of Space in the *American Journal of Sociology*, 1895-1927," *American Journal of Sociology*, XXXVI (November, 1930), 461-6.

Mark Fawcett, "A Comparison of the Educational Problems of 1910 and 1926, as Revealed by Educational Magazines." Unpublished Master's thesis, University of Chicago, 1928.

twenty-fifth anniversary of the College of Education, University of Minnesota, picture changes occurring during the twentieth century.[30] Other illustrative analyses of educational trends may be found in the chapter bibliography and deal with:

Teaching of mathematics	Year-book
Character education	Wiley
Personnel research	Strang
Education in the United States	Judd
Recent social changes in relation to educational research	Willey
Educational sociology	Payne
Junior-college curriculum	Barton
Curriculum	Zirbes
Measurement	Segel
Physical education	Cassidy
Business English	Aurner
Modern foreign languages	Henmon
Guidance	Proctor
Mental hygiene	Ruggles
Secondary schools	Hotz

4. **Illustrative critiques of given fields.** Occasional discussions of investigational results secured, techniques employed, or shortcomings in certain areas of activity reveal gaps in the available information which should be closed up by the results of further study. Such critiques are represented by a diversified group of references in the chapter bibliography on:

Educational research	Barr, Coxe, Davis, Lyon, Rugg
Examinations	McConn
Effects of measurement of instruction	Woody
Measurement in the secondary school	Odell, Stephens
Personality measurement	Hendrickson
Secondary education	Douglass, Edmonson, Everett, Reavis
Research in higher education	Henmon
Teacher preparation	Barr and Douglass, Myers
Progressive education or the activity movement	Dickson, Freeman, Hissong, Tyler

[30] *The Changing Educational World, 1905-30.* Edited by Alvin Eurich. Minneapolis, Minn.: University of Minnesota Press. 1930. Pp. 312.

Guidance	Boynton, Kefauver
Philosophy of education	Hullfish
Ability grouping	Otis
Science teaching	Curtis, Riedel
Curriculum	Judd, Everett
Courses of study	Harap
Supervision	Gambrill, Goodykoontz, Rankin
Methods of teaching	Thorndike
Arithmetic and reading	Brownell
Objectives	Wheeler
Educational reconstruction	Wheeler

5. Educational prophecies. Current literature contains interesting predictions of future developments in education. Examination of such prophecies offers suggestions concerning research which must be accomplished before the predictions made can be realized.

In 1931 members of the Department of Education, University of Chicago, placed in the corner stone of their new building prophecies of the status of education in 2031. A summary statement of the prediction follows: [31]

Careful comparative reading of the prophecies discloses considerable recurrence of similar elements. One of the predictions most frequently emerging pertains to the status of the science of education. One writer goes so far as to anticipate that in a hundred years scientific knowledge regarding education will supplant entirely appeal to personal authority. This type of prediction is often associated with one relating to concurrent development of a science of society or of human nature. Other elements of frequent recurrence refer to the extension of opportunities of universal education, adult education, the curriculum, individualization, and school organization. Popularization of education will be carried to higher age levels, and the recent movement for continuous education through adulthood will have moved toward universalization. The curriculum will have been modified in a number of ways, including more attention to cultural and non-vocational phases on levels below the professions. The organization of schools promises to include three levels: an elementary period (certain prophecies also mentioning nursery-school developments), a secondary period that will extend to the end of general education and displace

[31] Members of the Department of Education, "Education in the Year 2031," *School Review*, XXXIX (May, 1931), 337-49.

the four-year college, and the university proper. Among elements recurrently but less frequently mentioned than those listed are improved procedures in teaching (refined through experimentation), programs of guidance, and improved articulation of the system of schools. A number of predictions are mentioned once or twice only, among them several of a non-educational character, such as progress toward a universal language, the disappearance of common labor, and the displacement of the state as a governmental unit.

Briggs first enumerates facts, both favorable and unfavorable, out of which prophecy might grow and vision blossom, and later makes predictions concerning the secondary school of the future. The facts of the present are:[82]

1. Lack of fundamental thinking that has materially affected secondary education
2. A stifling satisfaction with tradition
3. The transcendent faith of the American people in education, which can be used to support a sound educational program
4. A machinery of education unparalleled elsewhere in the world, which should be put to better use
5. A too thoroughly standardized system of secondary schools
6. Need for further improvement in some respects in materials of instruction
7. The challenge to, and opportunity of, democracy by reason of the vast numbers of pupils in secondary schools
8. Individual differences not adequately provided for by a sufficiently diversified program
9. New psychology and new philosophy not yet consistently a part of educational practice
10. Lack of sufficient confidence on the part of teachers in the subjects taught
11. The small accomplishment of the majority of pupils
12. Need to recruit and train a more competent body of teachers

His vision of secondary education in the future includes the following concepts: general recognition by the public that secondary schools are vitally important; realization that effective education cannot be divorced from large social aims; a much more comprehensive school; no contest between the materially utilitarian and the cultural education; an extensive

[82] T. H. Briggs, "A Vision of Secondary Education," *Teachers College Record*, XXXIV (October, 1932), 1-17.

program of comprehensive planning; education for intelligent participation in a democracy; equal opportunity for each to advance his talents for the good of society; teachers guaranteed permanent tenure; and a more consistent demand by society for the product of the schools.

Long predicts that the major emphases of secondary education during the next decade will be: (1) attack on the problem of economic life, (2) increased capacity for consumption of the real values of life, (3) suitable instruction for all pupils of secondary-school age, (4) training to meet the needs of a rapidly shifting vocational world, and (5) a better understanding of peace and of the futility of war. Other adjustments of the future predicted by Long are: breakdown of the time-to-be-served theory, independent study, realignment of departmental barriers, removal of the tyranny of college domination, better use of radio and films for educational purposes, apprenticeship training of teachers selected on the basis of personality and creative ability, extension of the high-school library service especially during vacation periods, gradual reduction of the social distance between teacher and pupil, and incorporation of the junior college as a part of the public school system.[33]

Another forecast of changes in the secondary school follows:[34]

1. The college preparatory-academic domination of the curriculum will be discontinued, and the curriculum will be determined on the basis of life values.
2. The conventional departmentalization of the curriculum and the organization of courses according to academic patterns will be displaced by a departmentalization based on broad fields of experience.
3. Curricular experiences of students will be sequential; specialized semester and yearly courses will be displaced by a continuous program.
4. Students will participate in the planning of the school program.
5. Individual differences will be given increasing attention not

[33] F. E. Long, "Secondary Education During the Next Decade," *Junior-Senior High School Clearing House*, VII (September, 1932), 11-7.

[34] W. L. Wrinkle, "American Secondary Education and the Future," *Junior-Senior High School Clearing House*, X (December, 1935), 239-46.

by the multiplication of specialized courses but by the recognition of differences in interests, needs, and abilities within general fields of experience.

6. The conventional grade classification and annual promotion of students will be discarded.

7. The use of the Carnegie unit and similar quantitative measures will be abandoned.

8. Competitive marking systems and school marks will be eliminated; failure will become impossible.

Frederick discerns thirty-six trends in the secondary school of the future: [85]

1. In the high school of the future will be found 90 per cent of children of high-school age unless the C.C.C. idea or the militarists beat us to the youth of the land.

2. The six-year secondary school will become more frequent in smaller communities.

3. The senior high school will become more like the present-day junior high school, at least in form. (Guidance and extracurricular activities are now listed as constants for the senior as well as the junior high school by the State of New York authorities.)

4. The period of secondary education will be extended by some form of post-graduate organization or junior college.

5. The high school of the future will tend more and more to become a community high school in the sense that it will take a more definitive part in, and draw more extensively on, the life of the community by which it is supported.

6. Support for the system of secondary education will more and more be drawn from the state treasury.

7. Small high schools of fewer than one hundred pupils will disappear as transportation facilities improve and the population moves from marginal lands.

8. Cities will continue to build cosmopolitan high schools with only occasional abortive attempts to segregate pupils into particular trade schools.

9. In cities the typical secondary-school organization will show a three-year junior high school, a three-year high school, and a two-year junior college. In some instances, of course, a 3-5 or an 8 or a 6-2 plan will be set up, but the 3-3-2 plan will prevail.

10. Pupils of the secondary school of the future will have a larger say in the conduct of the school. They will help select their books for

[85] R. W. Frederick, "Future Trends of the High School," *Curriculum Journal*, VI (May 22, 1935), 16-9.

general reading, topics for social studies, and of course their social and extraclass activities.

11. The high-school principalship will follow the present trend and become eventually an office of high professional status requiring thorough and specific training. I look for the principal to become one of the four most important persons in all communities except the very largest cities.

12. The training of the high-school teacher of the future will be dominantly social and psychological rather than academic. Professional training will take precedence over conventional majors and minors. [This is a sharp break from past practice.]

13. The teacher for the high school of the future will be trained for and hired because of ability to carry on general child guidance or advisory functions, rather than for academic mastery of major and minor subjects. High-school teachers will eventually become teachers of boys and girls rather than of subjects.

14. Extracurricular or "related activities" will continue to grow in respectability. This does not mean that definite credit will be given, for our notion of credits will be very much modified.

15. Individualization will be broadened to insure attention to differences in social-economic status, emotional stability, and nervous differences. Ability grouping on the basis of intelligence will be abandoned as an unnecessary and monstrous violation of the dignity of youth.

16. Marks, report cards, failure, and retardation will be eliminated in the future high school. Every child who wants one, will be able to get a diploma in the same number of years.

17. High-school diplomas of the future will be more specific in their presentation of the accomplishment of pupils. All pupils will get the same size diploma with the same size bow of ribbon. The account on the inside will tell the story to all who may be interested.

18. The business in educational tests for science, history, Latin, etc., will collapse, for secondary-school teachers of the future will see their lack of validity for the social objectives of education.

19. Vocational guidance will become only a minor phase of guidance activities. The field of guidance will in the future concentrate on the more important factors of personality, character, happiness.

20. Vocational education as a terminal program will be gradually shifted to the years beyond the twelfth grade. The free public high school will stop preparing stenographers, printers, and milliners.

21. There is a trend toward the elimination of textbooks to be learned. Instructional materials of the future will be more flexible, more in the form of guides to classroom activity, and they will be more and more often prepared by the local staff.

22. The high school of the future will capitalize all learning situa-

tions in the life of the school including corridors, cafeteria, playground, and discipline.

23. More and more of the secondary-school curriculum will move into the required, constant variety. There will be less time for free elections. The program will be of the constants-variable type, with few variables.

24. The content of the curriculum of the future high school should be drawn from the general areas of human interest and need as health, leisure, religion, philosophy, rather than from the traditional hierarchy of subject disciplines as mathematics, sciences, history.

25. Secondary education of the future will see the gradual elimination of dividing lines between subjects. Science and mathematics will come together, and history, economics, geography, and civics will combine into a general course in citizenship. In fact the day may come when pupils will study for a whole year one topic, in which all fields are combined.

26. The high school of the future will, let us hope, give much more time for all students to the fine arts and music.

27. The history sequence will disappear. In its place will be offered a study of contemporary civilization in which students will incidentally dip into the past experiences of the race.

28. Group prescriptions as for college entrance or commerce groups will be very much less frequent and distinctive in the future. Common integrating knowledges and skills will be the point of emphasis.

29. The forward reference will be minimized in the secondary school of the future. Each year's work will be planned and conducted for its own sake. Pupils do not go through the ninth year so they can do the tenth year's work.

30. The secondary school of the future will attempt to arouse in each child an interest in the welfare of mankind on a planetary scale.

31. The secondary school of the future will avoid deliberate indoctrination and strive to eliminate unconscious imposition of patterns of thinking.

32. The high school will continue to prepare for college, but the present trend will continue until finally detailed specifications of particular subjects will give way to general character and personality development and mastery of study-learning skill.

33. Secondary education will eventually cease to be an institution devoted primarily to the imparting of academic information. The school will gradually come to emphasize the immediately practical habits and skills necessary for the daily job of living.

34. The secondary school of the future will give far more attention than at present to the subtler phases of child development including interests, special talents, and personality.

35. Primary attention in the future will be directed to the task of

making pupils adjustable to a changing society rather than to the problem of adjustment to any one social and economic system. In this direction lies the hope of preserving democracy.

36. Secondary education of the future will be bolder in that teachers and pupils will be trusted to consider all sides of controversial issues without the imposition of any viewpoint by the teacher except that facts must be respected.

Snedden [36] speaks in the tense of 1960 and describes American high schools and vocational schools as existing then in a society no less complex than that of 1931 but with larger social controls to utilize scientific techniques, govern production, diffuse prosperity, and to attain the elements of human welfare for all. With home and community life made richer and therefore more soundly educative for the young, very few Americans will send their children under nine years of age to school. Attendance on full-time schools of general (interpreted as strictly non-vocational) education will be compulsory throughout the United States from the tenth to the eighteenth birthday for all. From eighteen to twenty-five full-time attendance on some type of vocational school will be required of all during a specified number of weeks, and a comprehensive scheme of such schools is outlined by Snedden. There is complete elimination of the vocational aim and the college-preparatory function from high-school education. To the realization of "really functional *cultural* and *civistic* attainments" the program of the high school is directed.

Certain anticipations of the development of American colleges and universities by 1980, expressed by the same author, include the following concepts: a greatly increased number of distinctively professional colleges within the larger universities, evolution of graduate studies into distinctly professionalized curricula, culmination of interdependency of liberal and professional colleges, and the freeing of the liberal college to offer courses only of proved functional significance

[36] David Snedden, *American High Schools and Vocational Schools in 1960*. New York: Bureau of Publications, Teachers College, Columbia University, 1931. Pp. vi + 122. See review by P. W. Hutson, *School Review*, XXXIX (November, 1931), 707-8.

for civic competence, personal culture, and other non-vocational achievement.[37]

Hughes believes that research in public education by 1950 may be characterized by the following statements:[38]

1. Shift from minor to major problems, from the narrow field of tests and measurements to every important phase of educational activity
2. Having determined coöperatively educational objectives, procedures, and facilities, research with the continuous purpose of evaluating them in terms of consistency and effectiveness
3. Revelation of the incompatibility of older school standards and of life standards in general
4. Facts and principles of efficient personnel administration determined, finding much in common with personnel management in business and industry
5. Evaluation of many new departures in education
6. Revelation of discrepancies between real and supposed educational practice
7. Evaluation of actual school procedures
8. Determination of causes of inarticulation between the school and the home
9. Discovery and analysis of the qualities of personality essential for success in the various occupations and professions
10. Evaluation of the 6—4—4 plan, of secondary school organization

A prediction of the status of education in 1940 ends with the following conclusion:[39]

It is predicted above that the enrolments in all levels of Education in 1940 will be as follows: Kindergarten and Elementary, 26,000,000; Secondary, 7,000,000; Normal Schools and Teachers' Colleges, 175,000; Colleges, Universities, and Professional Schools, 1,250,000; and Special Schools, 700,000. It is estimated that the teaching of the 36,000,000 students of 1940 will be carried on by 1,200,000 teachers. Soon after 1940, all elementary teachers will have four years of college training, while secondary teachers will have five years, and junior college teachers will have six years of college training. Moreover pro-

37 David Snedden, "Some Anticipations: American Colleges and Universities in 1980," *Journal of Higher Education*, IV (October, 1933), 347-52.

38 W. H. Hughes, "Research and Public Education in 1950," *Nation's Schools*, VI (July, 1930), 21-4.

39 F. C. Touton, "Education in 1940," *Education*, LIII (March, 1933), 428-35.

gressive college teachers will have had training in educational methods. Teaching in 1940 will consist in directing student experiences toward clearly defined objectives with appropriate content. Classrooms will be built and equipped with special reference to subjects taught within their walls. Methods of learning will consist of a conscious well-directed attempt to develop abilities of individual students; films will be used to present scenes in literature and history, and processes in physical and biological sciences. Students will be trained in organizing materials and making judgments in classroom activities. A clearer vision of the need for education in our democracy will lead in the direction of state-supported education and equalized educational opportunities through the secondary-school period.

In the chapter bibliography are represented other interesting attempts to look into the future of a variety of educational areas:

A survey of a century of British education and a forecast	Robertson
Twenty-five years of prophetic achievement	Morgan
Development of public education	Norton
The outlook in secondary education	Sadler
The outlook for school research	Osburn, Theisen
The future of school administration	Chambers, Osburn
Next steps in curriculum making	Bode, Briscol, Davidson, Harap
Future progress in supervision	Burton
Prospects in home-economics education	Harap, Hopkins
The program of studies	Loomis
Mental hygiene	Hincks
Mathematics training	Jablonower, Marsh
Teacher education	Cooper

6. Research under way. The type of information found in Chapter III provides assistance in determining studies in progress Reference also should be made to another helpful guide for accomplishing the same purpose.[40] Of course, it is undesirable in most cases to duplicate an investigation either completed satisfactorily or well under way. The material of Chapter III may be anticipated at this time by certain rather specific suggestions for canvassing research in progress.

[40] Carter Alexander, *How to Locate Educational Information and Data*, pp. 223-9. New York: Bureau of Publications, Teachers College, Columbia University, 1935.

Through their administrative offices, certain graduate schools make available a list of current investigations on which students and staff are engaged. Certain journals are attempting to make information available concerning graduate or staff studies in progress in the fields of education [41] and sociology,[42] for example. News items in periodicals provide valuable information concerning future year-book topics, school surveys, projects of research agencies, and other important investigations under way. The *Journal of Educational Research* through its Department of Research News and the *School Review* and *Elementary School Journal* through their editorial columns have been active in providing such information. Advance notices of publications issued by teacher-training institutions, research bureaus, and educational publishers are worth reading to maintain contact with studies well under way or near completion. From time to time news-letters of chapters of Phi Delta Kappa (national educational fraternity) have printed lists of the projects on which members were engaged. Usually the year-books of professional organizations and learned societies include a list of the topics for projected year-books on which work is going forward. The Office of Education at Washington has also provided assistance. As early as February, 1926, and in March, 1927, the National Committee on Research in Secondary Education published through the United States Office of Education a *Bibliography of Current Research Undertakings in Secondary Education.* In March, 1928, the Office published a *Bibliography of Current Research Studies in Education.* This series of reports has been continued in one form or another.[43] The annual report of the

41 Carter V. Good, "Doctors' Theses Under Way in Education, 1934-35," *Journal of Educational Research,* XXVIII (January, 1935), 376-99. This annual service began in 1931.

———, "Doctors' Theses Under Way in Education, 1935-36," *Journal of Educational Research,* XXIX (January, 1936), 384-406.

42 "Students' Dissertations in Sociology," *American Journal of Sociology,* XL (July, 1934), 74-103; XLI (July, 1935), 67-100.

G. A. Lundberg, "Current Research Projects (Sociology)," *American Journal of Sociology,* XL (September, 1934), 221-39; XLI (September, 1935), 218-35.

43 Edith A. Wright, *List of Educational Research Studies of State Departments of Education and State Education Associations, 1931-32.* Office of Education Circular No. 63, October, 1932. Washington: Office of Education. Pp. 44.

Commissioner includes a list of the projects under way at the Office of Education. The annual reports of foundations and research organizations usually enumerate lists of studies in progress.

In this connection, a discussion of sources of information covering research in progress in the humanistic and social sciences is of interest.[44] Certain other specific instances may be cited to illustrate the way in which state, city, and university organizations make known to the public the studies which are being carried forward by the agency or its members: a university research bureau (Ohio State),[45] California studies in secondary schools,[46] Sacramento projects,[47] public-school research in Michigan,[48] collegiate research at Minnesota,[49] research in New York,[50] North Carolina studies in progress,[51] and a description of investigations promoted by research organizations in Ohio.[52]

It is recognized that when these paragraphs reach the reader, the projects listed as under way at this writing will no longer be of contemporary interest. However, many of the sources of information mentioned are more or less continuous, and the interested worker has only to secure later numbers of a given bulletin, report, or periodical to become acquainted with cur-

44 Lawrence Heyl, "Sources of Information Covering Research in Progress and University Dissertations," *School and Society*, XXIX (June 22, 1929), 808-10.

45 "The Bureau of Educational Research in 1932-33 (Ohio State University)," *Educational Research Bulletin*, XII (November 15, 1933), 227-38.

46 F. C. Touton, "Research Projects of the Secondary School Level Carried on in California Cities During 1932-33," *California Quarterly of Secondary Education*, IX (January, 1934), 167-94.

47 J. F. Bursch, "Research Projects in the Sacramento City Schools," *California Quarterly of Secondary Education*, V (January, 1931), 186-8.

48 Clifford Woody, *Summaries of Investigation Reported by Michigan Directors of Educational Research*. Bureau of Educational Reference and Research Bulletin, No. 130. Ann Arbor, Mich.: University of Michigan, 1930. Pp. 48.

49 M. E. Haggerty, "Institutional Resources Available for Collegiate Educational Research," *School and Society*, XXIX (May 25, 1929), 653-64.

50 "The Study of Secondary-School Problems in New York State," *School Review*, XXXVIII (June, 1930), 40-4.

"Research Projects of the Bureau of Reference and Research of the New York City School System," *Elementary School Journal*, XXX (October, 1929), 94-5.

51 M. C. S. Noble, *Current Reports on Activity Programs, Projects, Research Studies, etc., in North Carolina*. Educational Publication, No. 149. Raleigh, N. C.: State Superintendent of Public Instruction, 1929. Pp. 48.

"Research in Progress, July, 1929, to July, 1930," *University of North Carolina Record*, (October, 1930), 1-107.

52 "Mapping Research Areas," *Ohio Schools*, VIII (June, 1930), 248.

rent investigations of succeeding years. At least, the references cited illustrate the type of information concerning research in progress now being made available. Other illustrations of available information on current research deal with student teaching,[53] contemplated year-books on supervision to be prepared by the Department of Supervisors and Directors of Instruction,[54] kindergarten research,[55] work and projects of the National Council on Education,[56] personnel studies,[57] and investigations in Great Britain.[58]

7. **Needed research in education.** The educational literature of the past ten years contains numerous analyses of problem areas in need of investigation. Although many field workers are conscious of their own problems, there is a tendency to overlook needed research because of too close contact with routine duties and specific details of the given situation; that is, "the woods can't be seen because of the trees." It is said of those who live near the Alps that they rarely cast up their eyes to appreciate the grandeur which thousands journey around the world to see. Therefore, a list of needed studies, compiled by an educational worker with vision and insight, and possibly detachment, frequently proves stimulating to the individual in close contact with the field represented, as well as to the more remote student of the same problems. The foregoing statement is made with full recognition of the fact

53 A. R. Mead, "Report of the Research Committee, the Supervisors of Student-Teaching," *Educational Administration and Supervision*, XV (May, 1929), 385-8.
A. R. Mead, "Studies of Training School Problems," *Educational Administration and Supervision*, XIX (February, 1933), 152.

54 "The Ten-year Program," *Educational Method*, IX (April, 1930), 385-6.

55 "International Kindergarten Union Research Committee: Report of Progress," *Childhood Education*, VI (June, 1930), 461-3.

56 "Reports: Problems and Plans Committee (and of other committees)," *Educational Record*, XV (July, 1934), 340-69.

57 W. V. Bingham, "The Personnel Research Federation in 1930," *Personnel Journal*, IX (October, 1930), 251-9.
O. E. Pence, "Personnel Research in the Y. M. C. A.: Progress on a Five-Year Program," *Personnel Research*, VIII (April, 1930), 375-83.

58 Committee for Research in Education, "Researches in Progress or Planned, December, 1930," *British Journal of Psychology*, XXI (April, 1931), 434-6.
"Report of Researches in Education," *British Journal of Educational Psychology*, II (1932), 221-7.
Committee for Research in Education, "Research in Educational Psychology Planned and in Progress During 1934-35," *British Journal of Psychology, General Section*, XXV (April, 1935), 504-9.

that such field workers as administrators and supervisors have provided penetrating analyses of needed research in their areas of responsibility. It is also recognized that the graduate student with little or no field experience frequently has difficulty in isolating problems because he is too far removed from concrete school situations.

In some instances graduate schools and departments of education, individual professors and directors of research, and occasionally field supervisors have compiled lists of problems for investigation, to be placed in the hands of the graduate student or field worker. This service may possess certain values for the beginner in research, but too frequently such lists of problems are considered as "assignments," with demands made on the person who compiled the list to suggest a plan and technique for the solution. Ordinarily the worker who chooses his own problems for study, of course using, to the extent desired, types of assistance enumerated in this chapter, thereby indicates a degree of intellectual independence and promise not possessed by the individual who asks for a research "assignment." The alert worker should find many stimulating suggestions for problem solving in connection with the pursuit of university courses of instruction and other types of reading and study. In fact, many careful reports of completed research end with a statement of leads for further investigation.

In the appendix are suggested lists of problems requiring investigation in a number of the subdivisions of education. Two factors of significance are the recent publication date of many of the analyses and the wide range of interests represented. The critical, inquiring attitude represented should prove stimulating to teacher, graduate student, and other educational workers. It is recognized that some of the problems enumerated will have been at least partially solved by the time this chapter is in the hands of the reader. However, the bibliographical survey described in the next chapter will reveal to the investigator those issues which are still current. A number

of the digests of research and bibliographies cited in Chapter III suggest problems for investigation. Owing to limitations of space and the varied interests of the readers it does not seem desirable to reproduce in the appendix complete lists of the issues recommended for investigation. In some instances, only major divisions into which the problems fall are given. Having made the selection in terms of his own area of specialization or interest, the educational worker may read profitably the discussion of needed research in its original setting. However, sufficient description will be provided to identify the type of problem discussed by the various authorities cited.

In no sense should the brief analyses in the appendix be considered as specific statements of definitely delimited problems for investigation, but as guides for future study and as raw materials for formulating problems. No attempt has been made by the present authors to determine critically the most urgent research needs, except through selection of the writings summarized. Welcome as a single comprehensive list of needed investigations in the entire field of education, with relative values indicated, might be, it is doubtful whether any one or even any three workers have sufficient insight and expertness to perform such a service. Possibly identification of needed research in any important subdivision of education is a sufficiently large task for a single educational worker. The combined analyses of many such experts in different areas should present a reasonably complete picture of needed investigations in the entire field of education. This, in effect, is what is presented in the appendix, although undoubtedly some areas are analyzed more fully than others, and certain smaller subdivisions have been treated briefly or even omitted.

The plan of classification employed involves a limited number of major subdivisions of education, with an alphabetical arrangement by authors under each large heading. Such a scheme seems more usable for present purposes, particularly in seeking to determine quickly whether or how a given leader has analyzed the needed research in his area of specialization

and competence, than to attempt an elaborate system of subtopics under the major headings used. As a matter of fact, the number of references under a given heading is hardly large enough to make further sub-classification by topics necessary or even desirable.

The fields represented are: (*a*) higher education, (*b*) secondary education, (*c*) elementary education, (*d*) curriculum, (*e*) school subjects, (*f*) educational psychology and measurement, (*g*) supervision, (*h*) administration, (*i*) rural education, and (*j*) general problems. Certain of the analyses could be classified under more than one heading, for example, a discussion of needed research in secondary-school measurement or in college French. Therefore, it will be necessary in the case of certain areas of interest to canvass more than one subdivision. The fact that in some instances the same problem is emphasized by more than one author should not be viewed as useless repetition in these analyses, but as a partial indication of the urgency with which a given area demands study.

In the appendix a few of the statements of needed research are in the form of a connected discussion or exposition rather than a numbered list of problems. The reader who prefers this type of presentation may usually find it in the original source from which a given list of problems was taken.

In addition to the authoritative statements of needed investigations, reported at some length in the appendix, a number of other analyses can be mentioned only by the topic represented and, in most cases, by the name of the author, as listed in the chapter bibliography:

Miscellaneous educational problems	Judd, McCall
Educational reconstruction	Wheeler
The summer camp	McClusky
Prevention of delinquency	Olson
Comparative education	Eckelberry
Supervision	Kyte
Administration	Ashbaugh, Ackerly, Wiley
College entrance	Toops
Teacher training	Hughes

Secondary education	Douglass, OBrien, Sadler
Curriculum	Judd
Progressive education	Freeman
Experimental possibilities in public schools	Meyers
Visual aids	Weber
Religious education	Watson
Art education	Whitford
Industrial education	Smith
Home economics	Kyrk
Foreign languages	Cole, Hutchinson
Geography	Atwood
Physical education	Browne, Griffith
Child study	Goodenough and Anderson
Elementary education	Cole, Goodykoontz, Klapper
Measurement	Melby
Mental and physical growth	Brooks, Meredith and Stoddard
Youth	Hubbard

SELECTING, STATING, AND DEFINING THE PROBLEM

Selecting a problem for investigation. If more than one problem in a given field of interest has been located as an outcome of the type of reading and thinking suggested in preceding sections of the present chapter and in Chapter III, or as a result of direct field contact, obviously the university investigator, field research worker, or teacher must decide which problem is to be attacked first. In most instances the controlling point of view in selecting a problem should be that of overcoming obstacles which prevent education or the school from performing its functions or attaining sound objectives, rather than grasping at any problem which turns up, in which there may be only artificial or transient interest. Unfortunately, many graduate theses fall in the latter category. Mere collection of data should not be an end in itself. However, in isolating and identifying any type of problem, pure or applied, a thorough knowledge of the related literature is essential.

If responsibility for choosing the problem rests primarily on the student or field worker rather than on a member of the

university faculty or supervisor of field research, greater interest and intellectual growth should result. As a matter of fact, in most graduate fields, the ability of the student to select, plan, and complete a study is considered the best single measure of competence in the area represented. It is true that professors are usually willing to weigh with students the merits of suggested problems. This type of insight into educational problems is welcomed by progressive administrators, supervisors, and directors of school research, and such officers frequently play a rôle in encouraging field research similar to the service rendered by university professors in stimulating graduate students to work out their theses.

The subsequent discussion of the selection of a problem for investigation may be based on seven criteria suggested by Reeder:[59] (1) novelty of the problem, (2) the investigator's interest in the problem, (3) practical value of research on the problem to the student or investigator and others, (4) the worker's special qualifications to attack the problem, (5) availability of data on the problem, (6) cost of investigating the problem, and (7) time probably required for the investigation of the problem.

The novelty of the problem may be determined through a bibliographical canvass of available related studies, as outlined in Chapter III. If this survey is neglected in the selection and definition of the problem, the investigator may be attacking a problem on which evidence is already available. Certainly the investigational attitude and library technique of the student who submitted a manuscript to Thorndike with the hope that it would be accepted as a Doctor's thesis are not to be recommended. This candidate for a graduate degree said, in effect, "I know this thesis is original because I have read nothing on the subject."[60]

The survey of related studies not only aids in preventing

59 Ward G. Reeder, *How to Write a Thesis*, pp. 23-6. Bloomington, Ill.: Public School Publishing Co., 1930 (revised).

60 W. A. McCall, *How to Experiment in Education*, p. 8. New York: The Macmillan Co., 1923.

duplication of investigations previously conducted by other workers, but may uncover additional problems for solution, assist in the choice of research procedures, and provide a summary of related investigations, which is usually considered an essential part of a research report. A more detailed discussion of the problem of duplication may be found in Chapter III, but it seems desirable to give instances of mistaken concepts of the meaning of duplication here. Community and environmental differences vary to such an extent that the solution of a problem for one area will not hold for another. School buildings in Florida or California differ in some respects from those in Maine, Minnesota, or Canada. The problem of the all-year school in a mountainous coal-mining region is not the same as in the select residential section of a large city. The secondary-school curriculum of agricultural Iowa varies in some respects from that of industrial Detroit. Sometimes earlier studies need to be repeated for verification or to survey current conditions at stated intervals.

The question of novelty or newness has an angle other than that of duplication of earlier work. The study should employ as nearly as possible the most recent data. Too frequently students who pursue their graduate training during summer sessions collect data for a thesis, then allow the material to lie fallow for two, three, or even more years. Fallacious conclusions result from such data when they are applied to the present. This is especially true when the material has been collected for several years prior to the present writing, in the early stages of an economic depression which had not then touched the schools directly. For example, data collected in 1930 and presented in 1934 or 1935, concerning summer sessions in public schools, high-school annuals, salaries of athletic directors and teachers of physical education, and an occupational analysis of young high-school graduates, are far from accurate in the light of the great social and economic changes of the intervening years.

In terms of the criterion of interest, it should not be difficult

in education, an applied science, for student or teacher, for university or field investigator, to find in his own area of work a number of practical problems of real concern. In fact, the story of "The Great Stone Face" has a direct application in the case of field workers or students who look everywhere except in their own "back yards" for pressing problems of immediate interest. A major reason for encouraging workers to select their own research problems is that the results should prove better in terms of the growth of the investigator and the quality of work done.

Of course, in terms of the criterion of practical value, the solution of the difficulties suggested in the preceding paragraph is of greater present worth to the worker and to education than to attack "pure" research, which may have little or no immediate application to school procedure. However, the foregoing statement should not be interpreted to mean that so-called "pure" research is to be neglected, since in many cases the pure research of to-day provides the basis for the applied research of to-morrow. For example, Franklin's work with electricity was not applied extensively until more than a century later when Edison did his great work; nevertheless it was essential to progress in this field. Possibly the adoption of this point of view would promote more widespread tolerance toward investigations of animal learning, ball-tossing, target shooting, maze learning, memorization of nonsense syllables, etc.

To obtain the special training needed by the investigator to attack a given problem, ordinarily he may become better acquainted with his area of interest through courses pursued, actual field experiences, or careful study of the available literature, preferably through the three avenues combined. Many problems involve the use of special techniques—historical, experimental, statistical, or testing procedures—which require special training on the part of the investigator. These techniques of investigation are discussed in subsequent chapters. Though it is preferable to secure the appropriate training

before selecting a problem for investigation, field workers and students often find it necessary to pursue correlated reading, study, or even courses after the exact nature of the problem and its difficulties have been determined. Examples of the failure to secure needed training and the results of such lapses may be given. With no previous contact in the field of testing, a young candidate for the Master's degree administered and scored mental tests in such a manner as to report children with I.Q.'s below 20 in the fifth grade. Examination of test scores secured by experienced workers revealed the extent of the error, although even an elementary knowledge of mental tests is sufficient to show the fallacy of the original results. In studying the educational development of a higher institution, another worker with inadequate training in history and the historical method had great difficulty in making his report anything more than an encyclopedia of events chronologically arranged and neglected problems of interpretation, cause and effect, and the influence of a variety of external forces on the development of the institution in question.

Probably one of the most important abstract personal qualifications is the ability to suspend judgment and to maintain a detached, impersonal, unbiased point of view. Frequently, on the basis of a subjective or emotional reaction, the immature worker makes extreme statements concerning the relationships between nature and nurture, or education and good government, not recognizing the reciprocal play of forces in such situations. When a strongly religious teacher in a denominationally controlled secondary school learned that the majority of such teachers were required by their boards to be church members, and that this was not the case in public high schools, he hastily concluded that the character of the former teachers was correspondingly better, failing to recognize that church affiliation and good character are not necessarily synonymous. Preparing an analysis of a county-seat school population in Ohio, an enthusiastic native son described the integrity of the people, the local industries, and the beauty of the landscape

in terms that would have put all the adjectives of the real estate promoters to shame. Members of certain races, in discussing the educational problems of their people, frequently experience great difficulty in maintaining a detached, scientific point of view, and in many cases frankly admit this limitation when it is pointed out. An ardent advocate of the activity movement, only after strenuous self-discipline, was able to report the transition of his school system to the activity plan in the dispassionate terms of science rather than those customarily used before the local Boosters' Club. A small-town superintendent, with a janitorial force of three in whom he took great pride, sought to generalize concerning janitorial loads on the basis of their performance, failing to keep in mind the fact that the heights of a giant of eight feet, a dwarf of four feet, and a midget of three feet do not mean that the average height of man is five feet.

There are happily many other instances of investigators who maintain a detached point of view, in spite of strong conditioning factors. Of two doctoral candidates with ministerial training, one had studied the learning behavior of a gorilla and of children, but could not be persuaded into making comparisons unwarranted by the data at hand. The other had investigated the effect of nicotine on white rats and had rather strong convictions concerning the use of tobacco, but was totally unwilling, without experimental evidence, to generalize his findings to apply them to human beings.

Other violations of valid procedure, caused partly by gaps in the training of the worker, will be cited in the several chapters dealing with investigational techniques.

Beginners in research, especially graduate students, frequently fail to consider carefully the criteria of availability of data, cost, and time required in working out a proposed study. A doctoral candidate undertook a study of teacher training which he realized later could not be solved without visits to the teachers' colleges of the country. He could not afford the expenditure of money and time required, so it was necessary

to take up another problem, a detailed cost study of a group of near-by high schools, where the factors of availability of data, cost, and time required were in keeping with his resources. Another worker proposed a detailed analysis of the Negro secondary-school population in a large city. He utilized a case-study procedure, without giving due consideration to the fact that a few months later he would be employed hundreds of miles away where the sources of the data would be relatively inaccessible. Over many months two doctoral candidates collected curriculum materials, presumably as the basis for courses or units of work in the social studies, dealing with the traits of a good citizen and the topics treated in the *Literary Digest* respectively, without foreseeing the probable need for testing out such materials in a learning situation and without arranging for either the facilities, time, or funds for such testing.

Too frequently the Master's candidate has a "questionnaire complex" which closes his eyes to other available sources of data. Desirable exceptions are found in the case of workers who go to the records in the appropriate files or use the interview, where feasible. For example, an investigator studying teacher tenure in a limited area of Indiana went to the offices of the school superintendents involved instead of circulating questionnaires among teachers. Another Master's candidate interviewed newspaper editors in a group of states with respect to their policies concerning space devoted to school items, since a questionnaire probably would have accomplished little. Another student proposed a questionnaire canvass of the attitudes and interests of school-board members, when he had immediately available data on the way in which a foundation educational program would work out in his own and adjoining counties.

To comment specifically on the time required for the completion of a graduate thesis, it will be recognized that the variable factors are the student, the problem, and the institution. Few good Doctors' dissertations are completed within less than a

year, and most such studies are in progress over a longer period of time. Sometimes the Master's thesis has been worked out within a period of three or four months, when full time could be devoted to the project, although this is the exception rather than the rule. Such facts suggest the desirability of early selection of the thesis problem by the graduate student and of deliberate, careful procedure on the part of both university and field workers.

Numerous studies of large scope, recently investigated, which stand the test of the foregoing criteria exceptionally well, are described in the Department of Research News of the *Journal of Educational Research*. For example, certain of the newer types of research reviewed there within the two years preceding this writing deal with the relation between the secondary school and the college, development of qualitative standards for secondary schools and colleges, the effect of motion pictures on youth and the development of appropriate standards of appreciation, the effect of the radio on children, relations between the emotions and the educative process, experimentation in character education, child development, educational diagnosis, and the social studies in the schools. In acquiring a better understanding of the criteria previously discussed, it may be of some value to the reader to apply them to such investigations as are outlined briefly in numbers of the *Journal of Educational Research* and of certain other periodicals current at the time this paragraph is read.

The foregoing discussion of criteria for selection of a problem may be supplemented by examination of a similar set of standards originally intended for workers in the social sciences:[61]

1. Does the field appeal to my interest?
   (*a*) Is the interest purely intellectual?
   (*b*) Is the interest present because of reward—pecuniary returns, possibility of advancement in position, increased authority, and so forth?

[61] W. C. Schluter, *How to Do Research Work*, pp. 11-2. New York: Prentice-Hall. 1926.

2. Are the results that may be obtained of practical or utilitarian significance?
   (*a*) May they be of use in business?
   (*b*) May they be of use to society, to government, or to others?
3. Does the field present gaps in verified knowledge which need to be filled?
4. Does the field require reworking?
5. Does the field permit extension of inquiry beyond the present limits of verified knowledge?
6. Is the field pivotal or strategical from the standpoint of the immediate purposes which the possible results of investigation are to serve?

Another writer emphasizes three major procedures as aids in choosing administrative problems: (1) acquire the attitude of questioning every administrative procedure in education, and inquire what evidence there is to support one procedure in preference to another; (2) really know the most important fifty studies in educational administration; and (3) chart the issues which superintendents of schools must meet, list the kinds and amounts of knowledge, and estimate the reliability of the knowledge available. In more specific terms he presents a list of standards to which the thesis problem in educational administration at Teachers College, Columbia University, should conform.[62] Such standards (which follow) are equally applicable in other subdivisions of education, whether the given problem is in the university or field.

1. Must be within the field of educational administration.
2. Must be unsolved, so that its solution will be a "contribution to education."
3. Must be real in the senses that its solution is a felt need and that it is capable of fairly definite solution based on adequate actual data.
4. Must make a worth-while or significant contribution to education.
   (*a*) Discover additional facts or new practices.
   (*b*) Substantiate questioned facts, theories, or practices.
   (*c*) Perfect a previously discovered technique.
5. Must be definite in that its conclusions have real value.

62 Carter Alexander and Others. *Educational Research*, pp. 2-6. New York: Bureau of Publications, Teachers College, Columbia University, 1927. Also see later revisions of this guide.

6. Must be sufficiently limited to permit of exhaustive treatment.
7. Must be of sufficient value to justify the effort and time employed in the research.

An interesting chart [63] has been evolved for making a comparative study of two or more research problems and covers many of the items discussed above. Parallel columns contain the analysis of the two problems compared. A second part of the chart, not here reproduced and not fully worked out, deals with evaluation and considers unusualness, scientific significance, practical significance, and timeliness. Such an outline should be of considerable assistance in determining which of two or more problems is most feasible, although it cannot be applied in a mechanical manner or with a high degree of objectivity. At least it serves the purpose of directing the attention of the student and critic to items of importance in the selection, planning, and evaluation of research studies.

Formulating and stating the problem. After the problem has been selected, it must be definitely formulated and stated. McCall describes three types of investigators in terms of the way in which they formulate their problem.[64] The first type of worker suggests problems so broad in scope and with so many possible variables involved that it is virtually impossible to plan the details of the investigation. For example, a would-be experimenter proposed the problem, or rather, field of investigation: "What is the effect of various factors upon learning?" Apparently, no recognition was taken of the fact that psychology reveals many factors affecting learning, and that there are various types of learning. Later the statement of the problem became: "What are the effects of distribution of time upon learning?" Obviously, there are hundreds of ways in which to distribute time. Finally the problem became: "Will a typical fourth-grade class in silent reading, spending three thirty-minute periods per week, accomplish more or less than an equivalent class spending five periods of eighteen minutes

63 C. W. Hall, "Comparing Research Problems," *Educational Research Bulletin*, IX (September 10, 1930), 339-42.
64 W. A. McCall, *op. cit.*, pp. 9-11.

CHART FOR COMPARATIVE STUDY OF TWO OR MORE RESEARCH PROBLEMS

Title or Field	Problem No. 1—Social Intelligence	Problem No. 2—Extra-curricular Activities
	Part I. Availability	
Statement of Problem...	The construction and trial of a test to measure social intelligence.	What is the correlation between extracurricular activity in high school and extracurricular activity in college?
Delimitation	A. By social intelligence is meant the ability to get along with other people. B. Test will be designed for Freshmen entering college.	A. Would study only that group which reach the senior year in college. B. Would consider only those activities which are recorded.
Principal Assumptions to Be Made	A. That there is a general ability which conditions the ability to get along with people. B. That participation in extra-curricular activities is a criterion of this ability.	A. That extracurricular activities are essentially the same in high school and college. B. That conditions which determine the extent of this activity are similar in high school and college.
Survey of Literature: 1. Extent	A. It is necessary to be at least slightly familiar with the entire literature of personality. Roback's Bibliography (1927) lists about 1,500 titles. Many articles have appeared since.	A. The general literature is fairly voluminous and quite recent. It is mostly on a secondary-school level.
2. Possible Delimitation	B. For intensive reading only the experimen-	B. If attention is limited to the experimental

Title or Field	Problem No. 1—Social Intelligence	Problem No. 2—Extra-curricular Activities
	tal studies need be included. This reduces the number of titles to about 300.	work on the college level, the number of titles does not exceed twenty-five.
Job Analysis	A. Analysis of literature B. Collection of test items 1. By sampling the literature 2. By interviewing individuals (*a*) College faculty (*b*) High-school teachers (*c*) Student body C. Construction of test with large number of items D. Setting up criterion and giving test E. Selection of items by partialing out intelligence and scholarship F. Final trial and standardization	A. Analysis of the literature and correspondence with others working in this field B. Preparation of a questionnaire to be given to all college Seniors which will secure record of both high-school and college participation C. Devising a weighting scheme for scoring activities D. Correlation of high-school and college scores
Analysis of Techniques to Be Used		
1. Philosophical		
2. Historical		
3. Descriptive		
4. Analytic	Analytic — in determining the factors that should enter into the test	
5. Deductive		
6. Experimental	Experimental — in formulating test items and in trying them out on criteria	
7. Statistical	Statistical — in evaluating items and complete test. Use partial correlation technique	Statistical techniques would be used in weighting, in scoring, and in running correlations

Title or Field	Problem No. 1—Social Intelligence	Problem No. 2—Extra-Curricular Activities
8. Questionnaire		The questionnaire would be used to gather data.
Availability of Data....	A. Data for test items present no great difficulty. B. Securing of adequate criteria will be most difficult.	Some difficulty might be met in obtaining total populations unless administrative interest is obtained.
Degree of Objectivity Possible	A. Can be objective within assumptions. B. Considerable difficulty as to criterion. May be able to quantify.	Questionnaire data can be tested as to reliability and handled statistically. Much more rigidly objective than No. 1.
Risk	A. There may be no such separate ability. B. All test material may correlate highly with intelligence.	Should get some kinds of usable results.
Time	A. Three months to read literature B. Three months to secure test items C. Six months to evaluate items D. Six months for trial and write-up	A. Three months to read literature and prepare questionnaire B. Three months to give and collect questionnaire C. Three months to handle data
Cost	$200 to $300 (More will be required if Hollerith cards are used.)	$100 for questionnaire $100 for traveling expenses if other colleges are included (More will be required if Hollerith cards are used.)
Special Financing	Probably unnecessary	Probably unnecessary
Summary Estimate of Availability		

each per week?" It hardly requires further comment to show that the factors which affect learning, the various types of learning, the available educational levels, and possible variations in length of practice periods are numerous, making it necessary to formulate the problem in more specific terms.

To use the illustration which is employed in a variety of ways in other chapters, students sometimes say they wish to investigate "individual differences" as a thesis problem. It requires no comment to demonstrate that this is a field or area of almost countless problems, many large enough for a Master's or Doctor's study. However, to survey the ways in which a selected group of junior high schools adapts its program of instruction to the individual differences and varying needs of the pupils involved can be delimited within reasonable bounds. Likewise graduate students sometimes state that they wish to attack the problem of "school administration" or of "science teaching" in working out a thesis, when in reality a field of many problems has been named. Their difficulty is the same as that of the student described by McCall.

The discussion in the preceding paragraph may be amplified somewhat by presenting a list of problems which are formulated and stated within reasonable limits; some of these have been worked out as graduate theses.

In a second list are examples of actual instances in which rather broad titles of Doctors' dissertations have been narrowed with the passage of time, and with a realization of the complexity of the large original topic selected. The original title is given in parentheses.

On the other hand, rather narrow or localized problems are sometimes broadened as the result of experience with, and increased insight into, the given area of investigation. The third list provides illustrations of actual changes of this type in Doctors' dissertations. The original title is given in parentheses.

In a fourth list are topics which, as stated, hardly lend themselves to scientific attack. In some cases, only a large area is named; in others, a subjective, emotional, or oratorical reac-

tion is implied; and in still other instances, only a mass of raw data or of personal experiences is suggested.

I. Illustrative Problems Capable of Formulation and Statement Within Reasonable Limits

1. Inductive versus deductive methods of teaching fifth-grade arithmetic
2. Effectiveness of the "dualistic" versus the "coördinate" form of supervision in cities of 100,000 and over
3. Liability of school boards for injuries to children while on school property
4. The grammar-translation versus the direct conversational method of teaching first-year French
5. Relation between mental and physical maturation between the ages 12-15
6. The development of the Latin Grammar School in Massachusetts from 1635-1750
7. Practices of the forty-eight states with respect to statewide adoptions of textbooks
8. Determination of the mental ability, as measured by intelligence tests, necessary for successful work in a teacher-training institution
9. Relation between school marks and character ratings of pupils, made by teachers
10. A survey of population trends and selection of future building sites in a city of 400,000
11. Historical development of the Arizona public-school system
12. The reliability of reaction time tests
13. Punctuation usages in the written work of certain rural school children
14. A study of errors in beginning Latin
15. History of Catholic education in Kansas, 1836-1932
16. Personality traits as measured by the Association reaction-time test
17. Secondary education in Georgia, 1732-1858
18. Changes in Thorndike intelligence-test scores at the end of the college course
19. Objective determination of the content of sixth-grade arithmetic
20. An analysis of the vocabulary load of twelve general-science texts

II. Illustrations of the Manner in Which Broad Problems or Fields Have Been More Narrowly Delimited

1. "Visual Defects as Factors Influencing Achievement in Reading" (The Effect of Poor Vision on School Adjustment)

2. "The Scholastic Achievement of Sixth-Grade Children in Relation to Behavior Problems" (Achievement of Elementary-School Children in Relation to Behavior Problems)
3. "A Decade of Controversy in American Institutions of Higher Learning" (A Decade of Controversy)
4. "The Functions of Prairie View State College in the Development of Public Education for Negroes in Texas" (A Study of Negro Land-Grant Colleges)
5. "An Experimental Investigation to Determine Whether Homogeneous Grouping or Heterogeneous Grouping Insures Greater Growth in Academic Achievement" (A Study of the Relative Effectiveness of a Specified Plan of Homogeneous Grouping Compared with Heterogeneous Grouping)
6. "The Effect of Marginal Headings on Comprehension" (The Effect of Captions, Marginal Headings, etc., on Comprehension in Reading)
7. "The Measurement of Achievement in Music Education in Grades 4 to 6 and 7 to 9 Inclusive" (Diagnostic Tests in the Field of Music Based Upon an Analysis of the Content of the Subject)
8. "School Adjustment as Revealed by Teachers' Marks and Objective Tests" (Factors Other Than Intelligence Which Influence School Achievement)
9. "An Evaluation of the New York City Junior High School Physical Fitness Tests" (Physical Accomplishment of Negro Junior High School Boys in Harlem)

III. Illustrations of the Manner in Which Rather Narrow or Localized Problems Have Been Expanded

"A History of Higher Educational Work of the Church of God" (A History of Findlay College)

"Colonial Schoolmasters, 1635-1775" (The Colonial Schoolmasters of Maryland, Virginia, and North Carolina)

"Standards Reflected in Fifty Sets of Primary Readers Published in the United States Since 1850" (Content and Methods in Primary Readers Used in Texas Since the Civil War)

IV. Illustrative Topics Involving too Large an Area, an Unscientific Procedure, or Merely an Unassimilated Mass of Data or Experience

1. School boards
2. Teaching of Latin
3. Adolescent and child psychology
4. The learning of school children
5. The supervision of schools

6. Historical and comparative education in Ancient, Medieval, and Modern times
7. School textbooks, a plea for free books in a time of depression
8. Election of the county superintendent, an argument that in a democracy the voice of the people should rule
9. Experiences of teachers in rural schools, a running stenographic account of personal difficulties encountered by 100 teachers
10. Teachers are born and not made, reasons and arguments for and against
11. "Back bone," or the development of character, a series of inspirational assembly talks to junior high-school boys
12. The need for more school buildings in Cincinnati, an ardent plea for a building program over the next fifteen years, as advocated by the local school survey
13. The school of the future, the hopes, ambitions, and aspirations of the teachers of to-morrow
14. Creative youth, as described and recorded verbatim by running stenographic account and dictaphones
15. Teaching, the great adventure, an inspirational, stimulating essay on the great service to mankind of the teaching profession
16. Equalization of opportunity in education, let the wealth of the state educate the children and future citizens of the state
17. Preparation of effective assembly talks to be given by a dean of girls to adolescent girls in a junior high school
18. School buildings, apparatus, equipment, and supplies
19. School textbooks, the curriculum, and course of study
20. Code of ethics for the teaching profession, written as the result of, and based on, thirty years' personal experience as a teacher
21. How to discipline pupils, a handbook of the methods used by the three most successful teachers in a large school system

A second investigator is described by McCall as the "pot-hole" type who selects such narrowly delimited problems as to appear an experimental drudge and as failing to see any relation between his isolated studies and the general pattern or major problems of education. Certain of the ball-tossing, target-shooting, and maze-learning experiments may seem, in the judgment of some educational workers, to belong to this class.

The third type is represented by the investigator who formulates the major issue or general problem, then subdivides it into smaller problems or specific working units. According to

McCall, the solutions of these smaller or more specific problems, when assembled in an integrated pattern, are contributions to the solution of the major issue, which alone may have real meaning and value.

Monroe and Engelhart emphasize that the problem should be stated as a question or in such form that the question to be answered is clearly indicated. It has been stressed that a topic, such as the title of a thesis, merely names the particular field in which the problem lies and does not provide a satisfactory statement of the problem itself. According to Monroe and Engelhart, the various forms available for use in the general statement of the problem are as given below.[65] Occasionally students mistakenly assume that they must use each of these forms in the statement of a single problem, which of course is ridiculous. The type of statement to be employed depends on the preference of the worker and the nature of the problem.

1. A question or questions
   (*a*) A single question
   (*b*) Several questions
   (*c*) A single question followed by several sub-questions
2. Declarative statement
   (*a*) A single statement
   (*b*) A single statement containing several phases
   (*c*) A series of complete statements
   (*d*) A general statement followed by subordinate statements
3. Statement followed by restatement in the form of a question
4. A statement followed by a series of theses

Defining and delimiting the problem. Obviously, it is not enough to formulate the problem briefly in the form of a question or declarative statement such as those listed above. More detailed definition and delimitation are necessary. Of course, the worker is at liberty to use as many procedures in defining and delimiting his study as make for clarification. The formulation and testing of hypotheses, as related to problem solving in education, are discussed in Chapter IV. Monroe and Engel-

[65] Walter S. Monroe and Max D. Engelhart, *The Techniques of Educational Research*, p. 14. University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928.

hart have provided an excellent discussion of the considerations which enter into the definition of the problem.[66]

To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be specified. The limits of the investigation must be determined. Frequently, it is necessary to review previous studies in order to determine just what is to be done. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they must be explicitly noted.

The definition of the problem affords a basis for the subsequent phases of educational research. It is the guide for the collecting of data. The data are to be analyzed, organized, and summarized so as to be most useful for answering the questions specified in the definition of the problem, and the conclusion is merely a statement of the answers resulting from the investigation.

The basic importance of the problem and its definition indicates that they should appear early in a report of educational research. However, it is not unusual to find reports in which a large amount of introductory material precedes the statement of the problem. Occasionally this may be desirable, but frequently a critical reader wonders if the formulation of this introductory material did not precede the formulation of the problem.

Various ways of defining the problem are given by the same authors as follows:

1. Analysis of the major problem or problems in terms of subordinate problems
2. Statement of the limits or scope of study
3. Orientation of the problem
   (*a*) A historical account, remote or recent
   (*b*) A survey of previous studies or related studies
   (*c*) An analysis of previous studies or related subjects
   (*d*) Preliminary survey
4. Description of the general nature of the problem
   (*a*) Type
   (*b*) Source
   (*c*) Procedure
5. Statement of limitations of technique employed
6. Recognition of assumptions and implications
7. Importance, value, or significance of study to education
8. Definition of terms

[66] *Ibid.*, Chapter II.

Concluding statement. The content of this chapter, along with the information presented in Chapters III and IV, should provide the student or field worker with a reasonably adequate background in the selection, statement, and delimitation of a problem. Acquaintance with current educational literature and field contacts with teaching, supervisory, or administrative problems reveal many issues which require additional investigation. The types of available analyses considered most helpful in locating problems or in determining whether the solution of a given difficulty is already in print include: (1) frequency distributions and topical analyses of the research completed in various fields, (2) authoritative statements of accomplishment and research completed, (3) analyses of educational trends, (4) critiques, (5) educational prophecies, (6) surveys of research under way, and (7) statements of needed research. In addition, something may be said for McCall's suggestion that one start an investigation and watch problems "bud" out of it.[67] This is, however, a practice somewhat more appropriate for the laboratory than the classroom where the regular work of the school day or year must be done, without too much distraction for teacher and pupils. In other words, it seems more practical and economical in the classroom to start with a definitely planned study, intended to solve a specific problem, than to experiment at random because of an intellectual curiosity to see what related issues will become apparent in the course of the investigation.

It has been stressed that in choosing a problem the investigator should consider the factors of novelty, interest, practical value, personal qualifications and expertness, availability of data, cost, and time. Without question, the problem must be delimited within reasonable bounds, if it is to be attacked scientifically.

Certainly the investigator need not hesitate to select and delimit a practical field problem for study because it may seem to him small and insignificant as compared with the

[67] W. A. McCall, *op. cit.*, pp. 7-8.

multitude of unsolved educational problems illustrated and listed in this chapter. Rarely is a major discovery made which brings about sweeping changes in the complex processes of learning and teaching. Frequently, it is by a combination of results from large numbers of smaller studies that generalizations are reached and investigational findings applied to educational practice.[68]

We are familiar in mathematics with the doctrine of the summation of infinitesimals. The result is a finite magnitude whose size may indeed be very great. Each method, which through patient investigation is proved to be a little superior to the methods hitherto in operation, is one of the small quantities entering into this summation. Let us not suppose that any one of these procedures must produce a large effect in the complex learning process. Let us be prepared to accept small gains and to combine them for the purpose of producing large gains. Let us work bit by bit toward the master method. Let us play the educational game as the chess masters are now playing their game. Let us be content with an accumulation of small advantages.

Problems and Exercises

1. Select a subdivision of education of major interest to you, and list at least six problems requiring investigation which have been emphasized in the literature within twelve months preceding the undertaking of this assignment.
2. Choose one of the problems named in working out the preceding assignment, and:
   (*a*) State, delimit, and define it in accordance with principles developed in this chapter.
   (*b*) Analyze it in terms of criteria for choosing a problem.

Selected References †

ABELSON, H. H. *The Art of Educational Research: Its Problems and Procedures,* Chapter II. Yonkers-on-Hudson, N. Y.: World Book Co., 1933. The genesis and selection of a research problem.

[68] B. R. Buckingham, "The Accumulation of Minute Advantages," *Journal of Educational Research,* XVI (September, 1927), 136-8.

† Also see Appendix I. The plan of alphabetizing employed is to place at the end of the bibliography all references without designated authors. A limited number of references have been marked with an asterisk for the guidance of the typical reader who probably will have the equivalent of four years of college training. These references are annotated more fully than subsequent bibliographies, in order to be of maximum assistance in choosing reading materials helpful in identifying educational problems which require investigation.

AKERLY, H. E. "Needed Improvement in School Business Administration," *American School Board Journal*, XCI (November, 1935), 15-16, 81. Covers budgeting and accounting practice, purchasing and housing, general business economies, instruction and teaching staff, larger school units, fuel and heating problems, and maintenance and fixed charges.

* ALMACK, J. C. *Research and Thesis Writing*, Chapter II. Boston: Houghton Mifflin Co., 1930. Discusses the nature and sources of problems, and criteria for selecting problems.

ASHBAUGH, E. J. "Research in School Administration," *Journal of Educational Research*, XXVIII (September, 1934), 48-9. A thoroughly coördinated series of studies is advocated which will attempt to articulate the present situation in school administration and the future development of a fundamental philosophy, so as to make for consistency both in the training of administrators and in the performance of their duties.

ATWOOD, W. W. "Research and Educational Work in Geography," *Journal of Geography*, XXVII (October, 1928), 263-70. Points out where geographical research is necessary, and describes the type of person needed. Believes geography has the possibility of contributing more to the establishing of good will among the people of the world than any other subject. Urges the founding of one or more institutions for geographical research in the different countries.

AURNER, R. R. "The Status of Research in the Field of Business English," *Balance Sheet*, XV (November, 1933), 111-6, 144.

BARR, A. S. "On the Timeliness of Research," *Journal of Educational Research*, XXVIII (September, 1934), 49-52. The difficulty with respect to the timeliness of research arises out of a difference of opinion between university workers and field workers as to the problems worth studying.

———, and DOUGLASS, Lois. "The Pre-training Selection of Teachers," *Journal of Educational Research*, XXVIII (October, 1934), 92-117. Summarizes recent theories, practices, and investigations; suggestions for further study and extensive bibliography.

BARTON, J. W. "Trends in the Junior College Curriculum," *Junior College Journal*, V (May, 1935), 405-18. Despite ample warning, the junior college remains predominantly a school preparing for continuation work, although there has been a decided emphasis on vocational and pre-professional education, which may be preparatory. Semi-professional courses are on the increase in most junior colleges, and in scattered areas adult education and orientation, survey, or guidance courses are being introduced.

BERNARD, L. L., and BERNARD, J. S. "A Century of Progress in the Social Sciences," *Social Forces*, XI (May, 1933), 488-505. The development of the science of history and historical method, historical research, political science, political economy, professional economics and commerce, sociology, social-science organizations and publications, graduate social sciences, and the expansion of research.

* BIXLER, H. H. *Check-Lists for Educational Research*, Chapter II. New York: Teachers College, Columbia University, 1928. Selection of the problem, preparation of the bibliography and survey of the literature.

formulation of the problem and outline of the procedure, and examination of the proposed sources of data.

BODE, B. H. "The Most Outstanding Next Steps for Curriculum Makers in the United States," *Teachers College Record,* XXX (December, 1928), 179-91. The most important next step in curriculum construction is the application of such a conception to the selection and organization of subject-matter, as to make the curriculum contribute to the disposition and power to "see life steadily and see it whole," in terms of the circumstances and opportunities of the modern age.

——— "The Next Step in Elementary Education," *Education,* LV (May, 1935), 513-7. Emphasizes the next step as a more adequate recognition of the doctrine that education means the continuous reconstruction of experience, and of the need for interpretation in the intellectual and spiritual life of individual pupils. Acceptance of this responsibility will have a direct bearing on selection of subject-matter, on the progressive differentiation of the curriculum into subjects, and on the transformation of our entire educational system into an instrumentality for social progress.

BOYNTON, P. L. "Guidance—A Science or a Philosophy?" *Junior-Senior High School Clearing House,* VIII (May, 1934), 517-20. One who uses either science or philosophy to the exclusion of the other is seeing only one arc in the guidance program instead of the whole circle of related aspects.

BRADBURY, Dorothy E., and SKEELS, Esther L. "An Analysis of the Literature Dealing with Nursery Education," *Child Development,* VI (September, 1935), 227-30.

BRIDGMAN, R. P. "Ten Years' Progress in Parent Education," *Childhood Education,* VII (January, 1931), 249-56. Describes the work of national organizations, official state programs, child development research centers, college and university extension courses, local voluntary organizations, and of the National Council of Parent Education.

BRISCOL, W. S. "Next Steps in Curriculum Organization—What and Why?" *California Journal of Secondary Education,* XI (February, 1936), 107-9.

BROOKS, F. D. "Mental Development in Adolescence," Chapter V in "Mental and Physical Development," *Review of Educational Research,* VI (February, 1936), 1-152.

BROWNE, A. D. "Suggested Subjects for Physical Education Theses and Dissertations," *Research Quarterly of the American Physical Education Association,* II (May, 1931), 128-36.

BROWNELL, W. A. "The Growth and Nature of Research Interest in Arithmetic and Reading," *Journal of Educational Research,* XXVI (February, 1933), 429-41. Educational science must concern itself with "depth" rather than "extent" and "spread"; tabulation of studies in reading and arithmetic shows many to be by one-study authors who fail to publish the results of, or to carry on, further investigations, in the areas represented.

BURTON, W. H. "Probable Next Steps in the Progress of Supervision," *Educational Method,* IX (April, 1930), 402-6. Scientific attack upon such problems as:

1. The nature of the administrative organization of the school system, with especial reference to the provision for supervision
2. The determination of more objective evidences of teacher efficiency
3. The progressive development of a new point of view in teacher training and particularly the recognition on the part of supervisors and principals of their share in teacher training.

CALDWELL, O. W. "Research and Elementary Science Teaching," *Science Education*, XVIII (April, 1934), 65-7.

CARTWRIGHT, M. A. *Ten Years of Adult Education:* A Report on a Decade of Progress in the American Movement. New York: The Macmillan Co., 1935. Pp. 220.

CASSIDY, Rosalind, and Others. "Physical Education Trends and Progress," *Journal of Health and Physical Education*, VI (February, 1935), 14-21, 62.

CHAMBERS, M. M. "A Glimpse into the Future of School Administration," *Nation's Schools*, XIII (January, 1934), 13-4. Suggests as fields of research personnel administration in the schools and external educational administration.

CHAMBERS, M. M. "Two Major Issues in State Administration," *Nation's Schools*, XVII (April, 1936), 25-6.

* COLE, Luella. *Psychology of the Elementary School Subjects*, Chapter X. New York: Farrar and Rinehart, 1934. Discusses possible studies of objectives, textbooks, teaching method, difficulty, children's interests and abilities, and test construction.

COLE, R. D. "A Plea for More Experimental Work by College Departments of Modern Foreign Languages," *School and Society*, XXXV (April 9, 1932), 501-3. Urges that the 123 problems listed in the Coleman report of the Modern Foreign Language Study be given consideration in the selection of theses and dissertations for graduate study, as well as made subjects for investigation within college departments.

COOPER, Hermann. "A Forward Look in Teacher Education," *Education*, LVI (December, 1935), 195-200.

COXE, W. W. "Frontier Issues of Educational Research," *Journal of Educational Research*, XXVII (April, 1934), 561-3. Educational theory has advanced unevenly in the various fields of endeavor, with the result that practice is a peculiar blend of scientific findings and conventionalism. In many cases studies show a critical investigation of one phase and a naïve acceptance of very closely related problems. Workers should extend the educational research frontier in two directions, first, to investigate the unquestioned assumptions which underlie much of the current practice, and second, to work on those problems which lie in the borderland between education and allied fields.

* CRAWFORD, C. C. *The Technique of Research in Education*, Chapter I. Los Angeles: University of Southern California, 1928. Discovery of problems that need solving, and judging the relative values of those discovered.

CURTIS, F. D. "Some Reactions Regarding the Published Investigations in the Teaching of Science," *School Science and Mathematics*, XXVII (June and October, 1927), 634-41, 710-20. Impressions gained from

an analysis of learning and curricular studies on the teaching of science; mentions some of their more striking values and defects, and discusses briefly the present status of investigation in relation to future research in this field.

DAVIDSON, P. E. "Curriculum Study, Present and Future," *California Journal of Secondary Education,* XI (January, 1936), 27-32.

DAVIS, R. A. "Research and the Schools," *Journal of Educational Research,* XXVI (April, 1933), 561-8. Notes some of the most obvious defects of research and the influence on education; indicates improvement which may be effected, the contribution of qualitative methods in philosophical, integrative, and historical research, and needed training in problem solving.

DICKSON, V. E. "Scientific Research in the New Education," *Educational Method,* XIII (April, 1934), 337-48.

DOUGLASS, A. A. "On the Problems of Secondary Education in California," *California Journal of Secondary Education,* X (October, 1935), 415-20.

1. The aims or "platform" of secondary education
2. The development of a series of principles for constructing and judging units of instruction
3. The production of new teaching materials
4. The articulation of the revised curriculum with the higher institutions of the state

DOUGLASS, H. R. "Does the Future of Secondary Education Depend Upon Statistical Research in Foundational Thinking?" *Education,* LIII (January, 1933), 284-9. Urges that there need be no conflict between philosophy and science; since both are needed to organize thinking and to point the way out.

——— "Three Hundred Years of Method in the Secondary School," *Educational Administration and Supervision,* XXI (May, 1935), 321-33. Discusses development of the field of individual psychology, use of visual and auditory aids, character education, the testing movement, controlled experimentation, pupil-initiative and responsibility, a coöperative and sympathetic pupil-teacher relationship, and psychology and method as essential in the training of secondary-school teachers.

DURRELL, D. D. "Research Problems in Reading in the Elementary School," *Elementary English Review,* XIII (March, 1936), 101-6, 111.

ECKELBERRY, R. H. "The Need for a Study of Comparative Education," *School and Society,* XXXII (October 4, 1930), 455-6. To study foreign education and practice would enlarge our horizon, throw new light on our problems, and break down prejudices.

EDMONSON, J. B. "Some Needed Changes in Secondary Education," *University of Michigan School of Education Bulletin,* VII (January, 1936), 52-4.

ELLS, W. C. "Status of the Junior College in the United States, 1935-36," *School and Society,* XLIII (February, 1936), 160-2.

* EVERETT, Samuel, and Others. *A Challenge to Secondary Education:* Plans for the Reconstruction of the American High School. New York: D. Appleton-Century Co., 1935. Pp. viii + 354.

* FLUGEL, J. C. *A Hundred Years of Psychology.* New York: The Macmillan Co., 1934. Pp. 384. A historical discussion of psychology since

1833, with the last chapter considering the present position of psychology, which is characterized as infantile and uncoördinated; suggests that the next thirty or forty years may be occupied with efforts toward consolidating the positions already won and further systematic advance on a unified front.

FREEMAN, F. N. "Needed Research in the New Education," *Progressive Education,* X (April, 1933), 220-4.

——— "Proposed Educational Reforms—Some of the Major Issues," *Nation's Schools,* XII (July, 1933), 30-3. Since debates concerning proposed reforms in education are often unproductive, an attempt is made to analyze issues and to weigh considerations impartially, discussing freedom, self-expression, interest, overt activity, drill, morale, discipline, social responsibility, and purpose, with emphasis on development of social purposes in the individual translated into socialized behavior.

——— "The Contribution of Science to the Principles and Methods of Teaching," *Childhood Education,* VI (April, 1930), 348-54. Describes briefly the various types of scientific investigation which have yielded fruitful results, and presents a few recent typical studies bearing upon the various methods and principles of instruction.

FRENCH, W. M. "A Century of Teacher Training in New York," *Education,* LVI (December, 1935), 215-23.

GAMBRILL, Bessie L. "A Critical Review of Researches in Supervision," *Educational Administration and Supervision,* XV (April, 1929), 279-89. Suggests problems for investigation.

* GOOD, Carter V. *How to Do Research in Education,* Chapter V. Baltimore: Warwick and York, 1929.

* GOODENOUGH, Florence L., and ANDERSON, J. E. *Experimental Child Study.* New York: The Century Co., 1931. Pp. 546. Contains many outlines of experiments to be made on groups of children.

GOODYKOONTZ, Bess. "New Problems in Elementary Education," *Nation's Schools,* XVI (September, 1935), 23-26. Deals with: (1) need for reorganization, (2) effectiveness of coöperation, (3) need for restatement of functions, and (4) curriculum expansion.

——— "The Scientific Method and Creative Supervision," *Educational Method,* XIII (May-June, 1934), 385-90.

GRIFFITH, C. R. "A Laboratory for Research in Athletics," *Research Quarterly of the American Physical Education Association,* I (October, 1930), 34-40. States that the field of athletic competition with its many problems has virtually remained untouched; describes the laboratory for research in athletics at the University of Illinois in terms of its history and the problems studied.

HARAP, Henry. "A Critique of Public-School Courses of Study, 1928-29," *Journal of Educational Research,* XXI (February, 1930), 109-19. In 242 courses of study the following elements were studied: typography; inclusion of procedure, objectives, and tests; form of the unit of work; provision for adapting instruction to individual differences; and other tendencies.

——— "Next Steps in Curriculum Making," *Elementary School Journal,* XXXI (September, 1930), 16-24.

——"Next Steps in Curriculum Making for Home Economics," *Journal of Home Economics*, XXI (August, 1929), 570-6. The steps are: preparing an introductory statement of guiding principles, determining objectives, composing the units of school work, introducing reviews, and formulating tests.

HENDRICKSON, Gordon. "Some Assumptions Involved in Personality Measurement," *Journal of Experimental Education*, II (March, 1934), 243-9. Three basic problems are discussed: (1) What is the nature of personality? (2) How stable is personality? (3) What social factors are involved in personality measurement?

HENMON, V. A. C. "Recent Developments in the Study of Modern Foreign Language Problems," *Modern Language Journal*, XIX (December, 1934), 187-201.

——"The Function, Value, and Future of Educational Research in Colleges and Universities," *Journal of Educational Research*, XXVII (March, 1934), 493-502.

HINCKS, C. M. "The Next Quarter Century," *Mental Hygiene*, XIX (January, 1935), 69-77. Deals with the work and future of the National Commission for Mental Hygiene, which is to direct its efforts of the next twenty-five years to promoting the happiness and efficiency of man through a new understanding of him as an organism, in which the physical and mental are parts of a whole, and to a new view of the individual as part of a social organization.

HISSONG, Mary C., and HISSONG, Clyde. "The Scientific Movement and Progressive Education," *Education*, LI (September, 1930), 1-9. A comparison of the new school and the traditional school, together with suggestions for development of the child who can think for himself and investigate a problem thoroughly, stressing critical attitude and "systematic, orderly, and exact thinking."

HOPKINS, L. T. "Prospects for Progress in Home Economics Education," *Journal of Home Economics*, XXIII (February, 1931), 117-23. Deals with three main questions: What changes are coming about in the family as a social institution? What are the fundamental bases for family life? What are the opportunities of home-economics education in meeting present needs?

HOTZ, H. G. "Trends in the Development of Secondary Schools," *North Central Association Quarterly*, X (January, 1936), 287-97.

HUBBARD, F. W. "Today's Youth Problems," *Journal of the National Education Association*, XXV (January, 1936), 13-28.

HUGHES, J. M. "Suggested Study on the Relation of Training of Teachers in Content Subject-Matter to the Effectiveness of Instruction," *Journal of Educational Research*, XIX (March, 1929), 228-32. A suggested procedure to determine to what extent college training in mathematics functions in the work of high-school teachers of mathematics.

HULLFISH, H. G. "A Critical Problem for Philosophy of Education," *Educational Administration and Supervision*, XVI (April, 1930), 241-8. Are we to continue to exist in the midst of change, taking our buffetings as they come, and be no little disturbed because the things once held dear seem denied us, or are we to orient ourselves to the

characteristic features of the times for the purpose of evolving a program which will see in change an opportunity to live a more intelligent life?

HUTCHINSON, M. E. "Some Needed Research in the Teaching of Latin," *Classical Journal*, XXIX (February, 1934), 335-56.

JABLONOWER, Joseph. "Mathematics Teaching in the Next Ten Years," *Progressive Education*, XII (May, 1935), 338-41. The three most important realizable outcomes of mathematics teaching are listed as:

1. The notion of mathematics as a means of describing time and space aspects of the world of phenomena
2. The notion that the concepts of mathematics have a history and are understood the more clearly in terms of their historical development
3. The notion that mathematical work is often the occasion for making explicit the methods of reasoning

In shaping the curriculum, guides may be found in the aims mentioned above, which suggest that:

1. Mathematics will get much of its material from the fields in which it is applied.
2. The mathematical curriculum of the secondary school will in time show little of the rigid division among the various aspects of the field.
3. Mathematics teaching in the secondary school will make the study of methods of reasoning a direct object of study.

JEWETT, Ida A. "A Decade of Research in English in Teachers Colleges," *Teachers College Record*, XXXV (March, 1934), 460-72. The studies are classified under the heads of teacher supply and demand, curriculum, classroom techniques, and measurement.

JUDD, C. H. "A Century of Progress in Education," *Phi Delta Kappan*, XVI (August, 1933), 40-54. Development since 1833 of compulsory professional training for entrance into teaching, history of the instructional program, teaching of health, and methods of teaching.

* ——— *Problems of Education in the United States.* Recent Social Trends Monographs. New York: McGraw-Hill Book Co., 1935. Pp. 214. Reveals important current trends and presents some of the problems which inevitably arise in a social system that is undergoing rapid evolution.

——— "The Scientific Development of the Curriculum," *Elementary School Journal*, XXXIII (April, 1933), 577-91. Defines the school as society's agency for socializing individuals. Shows need for a new and more comprehensive view of the science of education, which must ally itself with the whole family of social sciences. This broad view supplies the formula for curriculum reconstruction.

KEFAUVER, G. N. "Proposals for a Program of Evaluation of Guidance," *School Review*, XLII (September, 1934), 519-26.

KLAPPER, Paul. "The Experimental Study of Education with Special Reference to the Elementary School," *Journal of Educational Research*, XII (September, 1925), 123-35. Points out a large number of problems needing experimental study rather than decision by personal opinion; relates factors which have retarded the development of ex-

perimental education, and offers many reasons why we have not evolved a set of commonly accepted measuring scales.

KYRK, Hazel. "The Selection of Problems for Home Economics Research," *Journal of Home Economics*, XXV (October, 1933), 680-6. A discussion of criticisms that have been raised against advanced work in home economics, together with criteria for choosing problems for research.

*KYTE, G. C. *Problems in School Supervision*. Boston: Houghton Mifflin Co., 1931. Pp. 214.

*LOOMIS, A. K., and Others. *The Program of Studies*, pp. 278-80. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 19. Washington: Office of Education. Certain major features of a new program of studies at the secondary-school level can be inferred from the trends which have been discovered, involving general plans of organization, guidance, emphasis on major fields, integration of work, the constant element of the program, and requirements for college entrance.

LYON, H. W. "An Elementary-School Principal Talks About Research," *Nation's Schools*, XII (August, 1933), 52-4. Says that the modern tendency to make the curriculum fit the individual has brought about a need for intensive studies of ways of recognizing and providing for differences, and discusses trends due to recognizing individual differences.

*MCCALL, W. A. *How to Experiment in Education*, Chapter X. New York: The Macmillan Co., 1923. A number of problems, submitted by graduate students, with a rough plan for solution indicated.

MCCLUSKY, H. Y. "A Neglected Laboratory for the Study of Youth," *University of Michigan School of Education Bulletin*, I (December, 1929), 33-4. The summer camp offers observation of all phases of living, since it permits child observation twenty-four hours a day; presents various types of social situations involving children of the same age; stimulates naïve and spontaneous behavior; and permits simultaneous observations which are extremely difficult under ordinary circumstances. One's view in the commonly used agency, the juvenile court, is fragmentary, pathological, and extreme.

MCCONN, Max. "Examinations, Old and New: Their Uses and Abuses," *Educational Record*, XVI (October, 1936), 375-411.

MARSH, Willa M. "Future Developments in Junior High School Mathematics," *California Journal of Secondary Education*, X (December, 1935), 547-50.

MELBY, E. O. "Some Problems in Measurement," *Education*, LVI (November, 1935), 170-4. Deals with techniques for the study of individuals, techniques for the analysis and appraisal of learning activities, and measures of conduct and living.

MEREDITH, H. V., and STODDARD, G. D. "Physical Growth from Birth to Maturity," Chapter IV in "Mental and Physical Development," *Review of Educational Research*, VI (February, 1936), 1-152.

MEYERS, Edna R. "Experimental Possibilities in the Public Schools," *Progressive Education*, IX (January, 1932), 22-8. Describes the plan of an experimental school in Chicago, together with phases of the

program which can be incorporated in other schools with an enrolment of forty-five to fifty children.

MORGAN, J. E. "Twenty-five years of Prophetic Achievement," *Journal of the National Education Association,* XX (May, 1931), 147-8. Points out the achievement of the National Recreational Association, its leaders, and its connection with the problem of leisure, wise use of which will do as much to determine national character in the next century as the common school has done during the past century.

MYERS, A. F. "An Evaluation of Research on Teacher Preparation," *Journal of Educational Research,* XXVI (November, 1932), 161-74.

NOFFSINGER, F. R. "A Century of Progress in School Water Supply," *American School Board Journal,* XCII (April, 1936), 30.

NOFFSINGER, H. G. "One-third of a Century of Progress," *Junior College Journal,* V (May, 1935), 395-404. Deals with growth in numbers and respectability, progress by experimentation and university leadership, functions of junior colleges, criticisms, and present development.

NORTON, J. K. "The Joint Commission Looks to the Future," *Journal of the National Education Association,* XXIV (September, 1935), 179-82. Counsels teachers that the future development of public education in the United States calls for a more realistic understanding by the teaching profession of the forces and groups which operate to determine educational policy; professional organizations must be better financed and more effective both as to program and methods than they have been in the past.

OBRIEN, F. P. "A Problem for Coöperative Research—The High-School Dropouts," *School and Society,* XXIX (May 18, 1929), 642-3. Suggests this problem, in view of the attention given pupils while they remain in high school, and that records should be available in high-school offices for preliminary information.

ODELL, C. W. "Education Measurement in the Secondary School," *Journal of Educational Research,* XXVI (October, 1932), 81-9.

* ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research,* Chapter XXI. New York: Henry Holt and Co., 1929. Deals with "Exploring the Sources": selection of the problem, defining and delimiting the subject, preparing for the study, obtaining data from primary sources, use of the library, bibliographies, note-taking, interviews, and correspondence, telephone, and telegraph.

OLSON, W. C. "Needed Research in the Prevention of Delinquency," *University of Michigan School of Education Bulletin,* VI (April, 1935), 102-3. An experiment, which should be inaugurated in various centers, is planned to demonstrate the effectiveness of the application of present knowledge in the prevention of delinquency; both constructive and remedial programs should begin at an early age and continue over a protracted period.

OSBURN, W. J. "An Outlook for Educational Research," *Journal of Educational Research,* XXVIII (April, 1935), 623-5. The period of atomistic research is moving toward the organismic point of view.

——— "What Next in School Administration?" *Educational Administration and Supervision,* XXI (February, 1935), 107-14. The needed changes in school administration arising out of present conditions are:

1. Recognition of the multi-ordinal character of our fundamental functional concepts and the need for analyzing them
2. Abandonment of additive and identification practices
3. A new technical vocabulary of single-valued words or symbols as a basis for a new and more genuine science of school administration
4. Definite knowledge objectively arrived at, showing at what levels our schools and colleges of professional education are actually operating at present

OTIS, A. S. "Fallacious Arguments Regarding Ability Grouping," *Childhood Education*, VIII (December, 1931), 171-80. Maintains that the arguments used against homogeneous grouping are either fallacious, irrelevant, or an argument in favor of such grouping; discusses the meaning and fundamental principles of homogeneous grouping.

PAYNE, E. G. "Research Problems and Trends in Educational Sociology," *Journal of Educational Research*, XXV (April-May, 1932), 239-52.

PROCTOR, W. M. "Trends in Pupil Guidance," *California Journal of Secondary Education*, X (January, 1935), 113-7. (1) Final vocational decisions not made in the junior high school, (2) increased emphasis on non-vocational phases of guidance in the junior high school, (3) relegation of vocational courses to the eleventh and twelfth grades and to the junior college, (4) correlation of school program and industry, (5) guidance for increased leisure, (6) emphasis on social engineering.

RANKIN, P. T. "Scientific Method in Supervisory Programs," *Educational Method*, XIII (May-June, 1934), 391-3. Indicates the bases for judging the degree to which a supervisory program is planned and conducted in accordance with the principles of scientific method.

REAVIS, W. C. "Secondary Education as a Field for Research," *Phi Delta Kappan*, XII (June, 1929), 21-4.

* REEDER, W. G. *How to Write a Thesis*, Chapter II. Bloomington, Ill.: Public School Publishing Co., 1930. Discussion of the selection, delimitation and planning of the problem.

RIEDEL, F. A. "What, If Anything, Has Really Been Proved as to the Relative Effectiveness of Demonstration and Laboratory Methods of Science?" *School Science and Mathematics*, XXVII (May and June, 1927), 517-9, 620-31. Presents the status of the controversy, and criticizes and analyzes in some detail the studies in this field.

ROBERTSON, C. G. "Educational Development, 1831-1931: A Centenary Survey and a Forecast," *School and Society*, XXIV (October 3, 1931), 445-58. Reviews the development of English education over a century and forecasts future trends; looks to psychology for aid, especially intelligence tests, in determining degree of educability; sees human activities viewed in terms of degree of trained intelligence and special aptitude required; expects functional differentiation between sexes; stress on the end and purpose of education with a due place for religion.

RUGG, Harold. "After Three Decades of Scientific Method in Education," *Teachers College Record*, XXXVI (November, 1934), 111-22. States that in the initial stage of the movement the quantitative workers

have concentrated on increasing the objectivity of facts, have displayed a meager interest in the validity of facts, and have devoted no effort at all to the questions of value, theory, and philosophy. Scientific inquiry has been assumed to consist essentially of the process of reducing error by buttressing quantitative measures.

RUGGLES, A. H., and Others. "Twenty-fifth Anniversary Celebration of the National Committee for Mental Hygiene," *Mental Hygiene,* XIX (January, 1935), 1-37. The past achievements, present needs, and future hopes of the mental-hygiene movement.

* SADLER, Michael. *The Outlook in Secondary Education.* New York: Teachers College, Columbia University, 1930. Pp. 56.

——— "The Outlook in Secondary Education," *Teachers College Record,* XXXII (June, October, December, 1930), 1-16, 123-39, 256-78. Says that when we find answers to questions concerning the progress and pitfalls of secondary education, youth and tests, and a liberal education, we shall be able to judge what tests of individual attainment are practicable without injury to the process of education itself.

1. Whether education should be all-embracing or selective.
2. To what extent the essentials of education must always come, not through the organized discipline of the school alone, but through agencies more intangible and atmospheric which kindle the zeal, strengthen the will, and color the purpose of those for whom the educational system is designed.
3. What, in the province of national education, are the limits, if any, to the function of government?

* SCHLUTER, W. C. *How to Do Research Work,* Chapters II, V, VI. New York: Prentice-Hall, 1926. Deals with selecting the topic, subject, or field of research; formulating or defining the problem; and differentiating and outlining the elements in the problem.

SEGEL, David. "Recent Developments in Educational Measurement," *Education,* LVI (November, 1935), 161-4. Deals with tests which seek to measure individual development, and discernment of proper relationships between the various elements of life.

SEYFRIED, J. E. *Principles and Mechanics of Research,* pp. 36 ff. Albuquerque, N. M.: University of New Mexico, 1935. Criteria for selecting a worth-while problem.

SHUTTLEWORTH, F. K. "A Decade of Progress in Methods of Measuring Character," *Journal of Educational Sociology,* IV (December, 1930), 233-41. Methods of measuring character are traced for a period of twenty-five years; lists five accomplishments during recent years as: (1) the rescue of measuring devices as useful instruments of evaluation with attendant improvements in the method of collecting data and a clearer recognition of the function of such tests; (2) measurement of moral knowledge; (3) a large number of ingenious suggestions, most of which need further study, for the application of pencil and paper testing to the measurement of special aspects of character; (4) measurement in terms of conduct, especially of honesty, service, self-control, and inhibition; and (5) development and refinement of the method of controlled observation, which promises to be important in the future.

SMITH, D. E. *Challenging Problems in American Schools of Education.* New York: Teachers College, Columbia University, 1935. Pp. 47.

SMITH, Homer J. *One Thousand Problems in Industrial Education.* Minneapolis, Minn.: University of Minnesota Press, 1931. Pp. 90. A list of titles appropriate for term papers and theses by graduate students, and for practical research projects by men active in administration and supervision.

SMITH, W. R. "Recent Progress in Educational Sociology," *Journal of Educational Sociology,* III (April, 1930), 450-5. Special mention is made of publications, authors, and evidences of a growing insight into the values of a socially dominated education.

* SPAHR, W. E. and SWENSON, R. J. *Methods and Status of Scientific Research,* Chapter VII. New York: Harper and Brothers, 1930. Selecting and formulating the problem, bibliography, note-taking, consulting standard reference books, use of special libraries, and gathering data outside of libraries.

STEPHENS, W. B. "'Regimentation' and Comparable Educational Measurement," *Junior-Senior High School Clearing House,* X (October, 1935), 114-7. The uses and abuses of new-type devices.

STRANG, Ruth. "Developments in Student Personnel Research," *Teachers College Record,* XXXV (November, 1933), 120-34. Reviews trends with regard to five areas of personnel work—selection of students, problems of personality and background, educational guidance, vocational guidance and part-time employment, and extracurricular activities.

——— "Trends in Educational Personnel Research," *Personnel Journal,* X (October, 1931), 179-88. Analysis of 582 articles published in ten magazines during ten years shows trends in teachers' marks, methods of treating data, and in statistical measures.

THEISEN, W. W. "The Outlook for School Research," *Nation's Schools,* XIII (February, 1934), 16-8. A much brighter future is seen than policies of retrenchment would indicate. Special stress upon administrative research, supplemented by effective publicity, is urged, with emphasis on the successes rather than the failures of schools when reporting the results of investigations.

THORNDIKE, E. L. "The Need for Fundamental Analysis of Methods of Teaching," *Elementary School Journal,* XXX (November, 1929), 189-91. Contributions from school experience and laboratory study seem to be often adulterated by error or confused by irrelevant factors before they operate in terms of methods of teaching; the remedy suggested is a more fundamental and thorough analysis of methods of teaching rather than in locating blame for past mistakes.

TOOPS, H. A. *Two Hundred Research Problems for a Five-year Research Program into the Collegiate-Entrance Problem.* Ohio College Association Bulletin, No. 61. Columbus, Ohio: Ohio State University, 1929. Pp. 658-713.

TYLER, R. W. "Evaluation: A Challenge to Progressive Education," *Progressive Education,* XII (December, 1935), 552-6. Urges formulation of objectives and determination of the extent to which they are realized.

WATSON, G. B. *Experimentation and Measurement in Religious Education*. New York: Association Press, 1927. Pp. xii + 296. Prepared for students in undergraduate and graduate courses in religious education who are anxious to secure a more adequate understanding of the experimental viewpoint and of the necessary technique; includes a list of 140 problems.

WEBER, J. J. *Visual Aids in Education*. Valparaiso University, Valparaiso, Ind.: Published by author, 1930. Pp. 226 (mimeographed). Includes a large number of suggestions for educational research, grouped under four major headings, related to:

1. Psychology of learning and principles of teaching
2. Practical utilization of visual aids in the modern curriculum
3. Evaluation and improvement of visual aids and mechanical equipment
4. Administrative phases of visual instruction in the whole scheme of formal education

WHEELER, R. H. "Problems of Educational Reconstruction: I, The Issue," *Educational Administration and Supervision*, XXI (January, 1935), 23-44. Criticizes education as promoting cultural lag and as preventing the growing child from understanding the world in which he lives; urges the educator to abandon his atomistic ways of thinking; says that education is back on the main track of pre-relativistic, pre-organismic thought; and that the problem is to guide the new functionalism into sound application and to reconstruct the educational program accordingly.

WHEELER, R. H. "Problems of Educational Reconstruction: II, An Outline of New Objectives," *Educational Administration and Supervision*, XXI (October, 1935), 497-506. Analyzes twelve objectives.

WHITE, W. A. "The Origin, Growth, and Significance of the Mental-Hygiene Movement," *Science*, LXXII (July 25, 1930), 77-81. Indicates some of the outstanding points in the development of the mental-hygiene movement, and how the thought of the physician has been changed by the introduction of the concept of mental health. Predicts that the most significant change which mental hygiene will effect is in the concept of values as applied to human beings.

WHITFORD, W. G. *An Introduction to Art Education*, Chapter XX. New York: D. Appleton and Co., 1929. Deals with research in art education: values of scientific investigation, research and the teacher, the broad field of art education, coöperative effort, and the one hundred problems in art education.

* WHITNEY, F. L. *Methods of Educational Research*, Chapter II. New York: D. Appleton and Co., 1931. Deals with the selection of a problem for research: origin, location, evaluation, definition, and suggested studies.

WILEY, G. M. "The Contribution of Research to the Organization of Secondary Schools," *School and Society*, XXXI (April 19, 1930), 517-22. Educational workers have been busy with the measurement of the educational product, but must now direct thought to the improvement of the product and to the development of policies that will insure an effective organization for this purpose.

WILEY, S. W. "Recent Trends in Character Education," *Religious Education*, XXVI (April, 1931), 346-54. Ten trends are reviewed:

1. The greatly increased concern about character education
2. A more critical study of what constitutes character
3. The tendency to distinguish between instruction in religion and in character training
4. Emphasis upon purposeful activity in contrast to dependence upon ethical codes
5. Emphasis upon the value of small and relatively permanent groups
6. Recognition of the issue between standardized programs and group-determined programs
7. The issue between teaching a set of virtues and dealing with life situations as a whole
8. Interest in parent training
9. Development and use of tests and measurements
10. Application of the method of scientific research to character education

WILLEY, M. M. "Recent Social Changes and Educational Research," *Journal of Educational Research*, XXVII (January, 1934), 321-32.

WILSON, Lucy L. W. "Three Hundred Years of Education for Girls in America," *School and Society*, XLII (July 27, 1935), 105-11. An historical account of the long struggle which has brought equality of educational opportunity to girls and women.

WOODRING, Maxie N., and FLEMING, Cecile W. "Recent Trends in Study," *Teachers College Record*, XXXVII (October, 1935), 27-49. Covers: (1) improvement of the assignment; (2) direction of study in a laboratory procedure; (3) acquisition of library skills and techniques, and the close relationship of the library and classroom; (4) a new evaluation of home study; (5) clearer understanding of the function of a study hall; (6) a diagnostic and remedial approach to reading as a skill, and an appreciation of reading as a recreational activity; (7) development of additional study techniques; and (8) discovery of more effective procedures in specialized subjects.

* WOODY, Clifford, and Others. "A Symposium on the Effects of Measurement on Instruction," *Journal of Educational Research*, XXVIII (March, 1935), 481-529.

1. All authors recognize the positive potential contribution of measurement as a means for the improvement of instruction.
2. All seem to agree that the objections to measurement arise from faulty techniques of test construction, faulty selection of content, and faulty interpretation of results.
3. The authors also seem to agree that the abuses and misuses of measurement present a challenge for improvement in the field rather than abandonment of measurement.
4. Most of the participants in this symposium pointed out the need for development of instruments of measurement for subtle and dynamic qualities such as initiative, coöperation, methods of work, methods of thinking, appreciations, attitudes, or emotional effects.
5. The contributors implied, if they did not implicitly state, that

the various types of measurement must be evaluated in terms of the purposes for which they are designed.

6. The authors seem to imply that values emphasized in the tests must change from time to time and must be consistent with the essential values of the educational process.

* ZIRBES, Laura. *Curriculum Trends:* A Preliminary Report and a Challenge. Washington: Association for Childhood Education, 1935. Pp 40.

* "The Activity Movement," *Progressive Education,* XI (October, 1934), 327-59. A symposium based on the "activity" year-book of the National Society for the Study of Education, dealing with the activity movement in terms of: basic realities, controversial issues relating to the activity curriculum, an adverse point of view, and the essentials of the movement.

* *The Application of Research Findings to Current Educational Practices.* Official Report of 1935 Meeting of the American Educational Research Association. Washington: The Association, 1935. Pp. 273.

"Educational Books of 1935," *School and Society,* XLIII (March 28, 1936), 409-26. Includes a summary by fields of the number of publications, 1927-1935, a total of 5,994 titles for 1926-1935.

* *Evaluating the Public Schools.* Washington: National Education Association, 1934. Pp. viii + 48. Also *Phi Delta Kappan,* XVI (February, 1934), 145-92. Defines educational issues of nation-wide importance and cites pertinent evidence, with problems and selected references listed.

* *Issues in Secondary Education.* Committee on the Orientation of Secondary Education, T. H. Briggs, Chairman. Bulletin of the Department of Secondary-School Principals, January, 1936. Chicago: H. V. Church, University of Chicago. Pp. 372. See also *Journal of the National Education Association,* XXV (April, 1936), 106; and *Nation's Schools,* XVII (March, 1936), 32.

"Problems in Education as Emphasized in Addresses at St. Louis (1936 meeting of the Department of Superintendence and allied organizations)," *Phi Delta Kappan,* XVIII (March, 1936), 210-8; XVIII (April 1936). Reported by W. A. Stumpf.

* "Problems of Educational Sociology as Seen by the Sociologist," *Journal of Educational Sociology,* IX (September, 1935), 4-55. A symposium, each article having a bearing on either educational theory or practice; a unifying element is provided by treating education always as a process of social adjustment.

Significant Changes and Trends in the Teaching of Mathematics throughout the World since 1910. Fourth Yearbook of the National Council of Teachers of Mathematics. New York: Teachers College, Columbia University, 1929. Pp. x + 186.

Suggestions for Studies and Research in Home-Economics Education: Outline of Projects Needing Investigation and Some Basic Considerations in Relation to Them. Home Economics Series, No. 15. Bulletin No. 166. Washington: Federal Board for Vocational Education, 1932. Pp. xii + 78.

CHAPTER III

THE SURVEY OF RELATED INFORMATION

Introduction. Although the preceding chapter has been devoted to a detailed analysis of the selection, statement, and delimitation of the problem, it is not to be assumed that such steps in the process of problem solving are accomplished independently of a survey of related information and experience. As a matter of fact, the suggestions made in Chapter II and in the present chapter are frequently used simultaneously; that is, the investigator may be carrying forward a program of careful reading and study in connection with the actual selection of his problem, as well as in the later development of the plan and procedure formulated. Chapter VI, on the historical method, should also prove helpful in making the survey of related literature, especially where a time span of some length is represented.

The present discussion will outline: (1) the purpose and contribution of the preliminary survey of related information, (2) guides to the various types of educational literature, (3) classified lists of important publications with an interest in educational problems, and (4) studies of the investigators and scientists who produce a factual literature, with special reference to education and psychology.

PURPOSE AND VALUE OF THE PRELIMINARY SURVEY

Purpose of the survey. The preliminary survey of previous studies, discussions, and experience relating to the problem under investigation may accomplish five purposes:[1] (1) show

[1] For a list phrased differently but with similar emphasis, see: Carter Alexander, *How to Locate Educational Information and Data*, pp. 6-8. New York: Bureau of Publications, Teachers College, Columbia University, 1935.

whether the evidence already available solves the problem adequately without further investigation; (2) provide ideas, theories, explanations, or hypotheses valuable in formulating the problem; (3) suggest methods of research appropriate to the solution of the problem; (4) locate comparative data useful in the interpretation of results; and (5) contribute to the general scholarship of the investigator. Since other chapters deal with the formulation and testing of hypotheses, methods of research for collecting data, and interpretation of results, the contribution of the survey of related information to these procedures will not be discussed at this time; it plays an important part in each of these steps.

Avoidance of unnecessary duplication. To prevent pointless repetition, the investigator, whether in the field or the graduate school, who has chosen a definite problem for study must conduct a thorough canvass of the materials already available in the given field. As a matter of fact, in all probability, he has made at least a partial bibliographical survey in the selection of a problem. Only through painstaking analysis of the available educational literature is the research worker able to determine whether his chosen problem or some phase of it has been previously investigated. If this preliminary step is neglected, he may be attacking a problem which has been satisfactorily worked out. A university teacher of Italian, a Ph.D. candidate, had worked for a year on the contribution of a certain Italian author to the literature of his time. Imagine the disappointment and chagrin of this teacher to find accidentally on the library shelves two dust-covered volumes on the same subject, written by a recognized scholar in a much more thorough-going manner than he (the candidate for a degree) could hope to achieve. Undoubtedly, the preliminary canvass of the field had been far from complete. For that matter, when as great a scientist as Pasteur found that the bacillus which manufactures rancid-butter acid worked without air, he announced it as the first example of little animals living without air; the literature would have shown him that it

was in reality the third example and have saved his time and dignity.[2]

Avoidance of duplication in the case of the doctoral dissertation has been especially stressed by Alexander who considers this one of the most serious types of duplication, and believes that the degree cannot be granted if the thesis overlaps to a large extent any previously published work.[3] Unfortunately there are some instances where the candidate has not been intellectually honest and has appropriated large portions of the work of another without acknowledging his indebtedness, although duplication of effort is generally caused by ignorance of the earlier work.

A Doctor's candidate who had spent nearly a year in studying the problem of certification of teachers in a certain state was very much surprised in 1935 at the appearance of a printed dissertation on the same subject (and state) from another university. He could have found the latter thesis reported as under way in the January, 1933, number of the *Journal of Educational Research*, at least a year before he began work on the problem.

The question of duplication is sometimes raised when two students wish to work out a joint graduate thesis, a procedure which is not encouraged as a general rule. There are on record a few instances in which the problem has seemed so large, and at the same time so urgent, that two workers were permitted to submit a joint manuscript, for example, duplication of curriculum content in the various departments and colleges of a large state university. As a rule, a better measure of the initiative and performance of each student is provided by breaking up a large problem into two parts, if such division is possible. For example, a study of curriculum reorganization in the secondary schools of a state proved too comprehensive for a single Master's thesis, and the project was subdivided into two Masters' problems, one concerned with the junior high schools and the other with the senior high schools. The two

2 T. A. Boyd, *Research*, pp. 74-5. New York: D. Appleton-Century Co., 1935.
3 Carter Alexander, *op. cit.*, pp. 227-8.

students were able to coöperate in a number of ways—in traveling, visiting school systems, examination of records, discussion of data, etc.—and the procedure had value in the trend toward coördination in research.

Full-time students and teachers in service registered in university classes sometimes propose as subjects for term papers, and even theses, the preparation of comprehensive summaries of factual studies in such fields as reading and arithmetic, seemingly unaware of the excellent work of Gray [4] and Buswell [5] respectively and of the annual supplements in the *Elementary School Journal* and *Journal of Educational Research*. Of course the height of the ridiculous is represented in the case of the student described in Chapter II who laid before Thorndike a manuscript, basing his hope of acceptance on the originality represented, because he had read nothing whatever on the subject treated.[6] In Chapter II is an account of another student, who proposed that he correlate intelligence and achievement, seemingly unaware that this has been done many hundreds of times.[7]

Mistaken interpretations of meaning of duplication. Young and inexperienced workers sometimes take Crawford's advice to "plan your investigation before reading what others have done" too literally; in reality he simply wishes the worker to make his plans as complete as possible, before canvassing in detail the related studies, in order that originality and initiative may have an opportunity to function without undue influence operating in the form of a minute analysis of previously employed techniques.[8] Of course the original plan of the investigation may be refined materially in the light of an

4 W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementary Educational Monographs, No. 28. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 176.

5 G. T. Buswell and C. H. Judd, *Summary of Educational Investigations Relating to Arithmetic*. Supplementary Educational Monographs, No. 27. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 212.

6 W. A. McCall, *How to Experiment in Education*, p. 8. New York: The Macmillan Co., 1923.

7 "The Editor Turns Professor," *Educational Research Bulletin*, VI (September 14, 1927), 252-53.

8 C. C. Crawford, *Methods of Study*, p. 162. Moscow, Idaho: C. C. Crawford, 1926.

research, the field worker is obligated to examine carefully all the evidence on his problem and to evaluate it critically before deciding which of the conflicting results found in the literature should be adopted and applied to practice.[10] Another chapter (XIV), however, deals at some length with the problem of evaluating educational research.

Extent of information possessed by educational workers. However, the evidence is all too clear that not only students in training and field workers in service but even authors are ignorant of important evidence and literature in the field involved.[11] An editorial writer took to task an officer of the (then) Federal Board for Vocational Education who used antiquated statistics in an address. The speaker had stated that only 34 per cent of fifth-grade pupils entered high school, whereas, according to the editorial writer, 53 per cent of the young people of high-school age were in secondary schools at that time.[12]

Even concerning a comparatively recent survey of national scope and significance, it has been reported that the findings are not known and used to the extent expected and desired.[13]

Some factual evidence concerning the educational information possessed by school workers is available. In a monograph edited by Pressey, D. A. Worcester reveals wide gaps in the background of students in education concerning educational and scientific organizations, honorary professional organizations, educational journals, universities prominent in education, educational leaders, and requirements for graduate degrees.[14] The group investigated consisted of 219 students attending summer session in two well-known colleges of education. Of this group 73 per cent had teaching experience, 47

10 W. A. Brownell, "The Field Worker as a Consumer and Producer of Research," *Journal of Educational Research*, XXIX (October, 1935), 144-8.

11 Carter V. Good, *op. cit.*, Chapter II.

12 "Antiquated Statistics," *Elementary School Journal*, XXX (September, 1929), 4.

13 G. E. Carrothers, "Survey of Secondary Education," *School and Society*, XLI (May 4, 1935), 607-10. A questionnaire canvass of the extent to which the survey has been used in Michigan; indicates the need for wider use of these monographs.

14 S. L. Pressey, L. C. Pressey, and Others, *Research Adventures in University Teaching*, pp. 63-5. Bloomington, Ill.: Public School Publishing Co., 1927.

per cent having taught three years or more; 62 per cent were in or above the third year of their professional course. When asked to list educational and scientific organizations, 20 per cent failed to name any, 8 per cent named only local bodies, and no national organization other than the National Education Association (54 per cent) was mentioned by more than 5 per cent of the students (except the National Geographic Society, listed by 9 per cent). No honorary professional organization was known by more than 12 per cent. It was found that 7 per cent could not name an educational journal; 9 per cent could list only local or state periodicals; and no single journal was mentioned by more than 24 per cent. When asked to name universities prominent in education, more than one-half of the students listed only two institutions. No single leader in education was mentioned by more than 46 per cent, and the field of specialization of the worker named was in most cases unknown.

Ashbaugh tested the information possessed by forty-eight students concerning educational workers through a matching exercise which included the names of thirty well-known (at that time) educators and a list of twenty statements.[15] Each statement was to be matched with the appropriate name.

Although some of the offices represented had only temporary, local, or state-wide significance or prominence, they should have been familiar at the time of the investigation to students in the state involved (Ohio). Correct responses were given on 38 per cent of the items. Only 63 per cent of the total number of items were attempted. Seven different people were designated as the president of the N. E. A., as the dean of Teachers College of Columbia University, and as the president of the University of Chicago; six different persons were named as the editor of the *Educational Review*.

Ashbaugh also reports the information possessed by sixty-six graduate students concerning the positions held by fifty writers

15 E. J. Ashbaugh, "Should School Administrators Know Something About People Prominent in Education?" *Educational Research Bulletin*, VI (October 12, 1927), 291-3

who had contributed three or more articles to educational journals of national scope during the years immediately preceding the investigation. Of the total 3,300 possible responses (fifty names and sixty-six students) only 615 were attempted, and 420 were correct. Only 18.6 per cent of the total items were attempted, and but 68.3 per cent of those tried were answered correctly.

Such facts as those summarized in the preceding paragraphs suggest that the present status of professional information is in many instances at a comparatively low level and that professionalization of the rank and file of field workers, in terms of an adequate working knowledge of educational literature, must be a gradual development. However, it seems reasonable to expect graduate students in education, school administrators, supervisors, department heads, most secondary-school teachers, and the best trained elementary workers to be fairly well acquainted with the service of leaders in the field and with significant contributors to educational literature. Ordinarily such groups of workers have completed an undergraduate program of training with a prescribed number of courses in education, and in many cases they have pursued graduate courses in the area of specialization represented. The assumption is that they have read more or less regularly one or more of the educational periodicals. Therefore, the natural expectancy of the professor of education, the progressive school administrator, and the supervisor is that graduate students and field workers will possess or acquire information as needed, concerning and from the various types of educational literature discussed in succeeding portions of this chapter. Amplifications of the point of view expressed in this and preceding paragraphs may be found in numerous current discussions.[16]

16 Carter Alexander, "Selecting Magazines for Teachers Starved for Professional Vitamins," *School Executives Magazine*, LII (April, 1933), 268-70.

F. E. Bolton, "The Professional Library in the School System," *School and Society*, XXXIX (January 13, 1934), 59-63.

J. H. Newlon, "The Principal's Professional Library," *School Executives Magazine*, LIII (October, 1933), 50-1.

J. R. Shannon, "Directing Professional Reading as a Device in Supervision of Instruction," *Educational Method*, XIII (March, 1934), 308-11.

Need for a knowledge of library procedure. The gaps in professional information revealed in the preceding paragraphs suggest the desirability of systematic reading and study on the part of school workers in service and in training, at least in the major field of interest and specialization represented. The library knowledge and skill needed by professionally alert field workers are listed by Alexander under eighty-three headings, from which five are quoted here to indicate the helpfulness of the entire list and the accompanying discussion. Such a check-list may be used by the educational worker as a self-survey of his knowledge and deficiency.[17]

1. Where can I find the significant facts about a community or an institution in which I would like to work or apply for a position?

4. Do I know when and how to skim in library reading?

7. Is there in existence a guide to the professional literature of my field? If so, where is it and how may I secure a copy? If there is no such guide, what ought to go into one so that I may keep my eyes open and in the course of several years gradually build one up for myself?

9. Which encyclopedia is best for use in my major field?

10. Which are the most useful three reference books for my major field?

The same writer [18] outlines in some detail the necessity for planning intelligently the search for library materials, mastery of the various types of reading skills needed, use of appropriate headings for the search, and knowledge of sound principles of note taking; and reproduces an unusually complete form of bibliography card.[19]

The Voegelein list of subject headings (alphabetically arranged),[20] the *Education Index*, and the card catalogue of the

17 Carter Alexander, *How to Locate Educational Information and Data*, *op. cit.*, pp. 13-8.

18 *Ibid.*, pp. 21-27, 28-30, 65-79, 80-90.

19 Carter Alexander, *Alexander Universal Bibliography Card*. New York: Bureau of Publications, Teachers College, Columbia University, 1934.

For a comprehensive loose-leaf system for the collection and use of references and other data, see the *Visible Index Research System*. Distributed by Crossman and Clayton, 327 Broadway, New York City, or Paul V. West, School of Education, New York University, New York.

20 L. Belle Voegelein, *List of Educational Subject Headings*. Columbus, Ohio: Ohio State University Press, 1928.

library are useful in formulating a list of subject headings for the bibliographical survey. A new list of subject headings (a classified organization with an alphabetical index) which includes definitions of many of the more controversial and less well-known topics in education is now in preparation.

Although the topic mentioned as an example in the subsequent discussion of educational guides is "teacher personnel," other subjects, such as "adaptation of the instructional program to varying needs," would be canvassed in a similar manner, of course first ascertaining appropriate subject headings. In the case of the latter topic such headings as individual differences, individualized instruction, interests, unit organization, curriculum reorganization, directed or supervised study, ability grouping, remedial teaching, and many others would be involved.

Obviously, it is essential that a systematic record be kept of worth-while conclusions derived from such reading and analysis; otherwise, valuable references and data cannot be recalled when desired. Probably many incomplete references and some haziness in papers, reports, and even in published materials are caused by failure to copy complete bibliographical information and to prepare an adequate annotation at the time of the original reading. Cards or slips of paper have been found better than large sheets of paper for filing such information. Detailed examples of bibliographical form may be found in a later chapter (XIII) dealing with the reporting of research, and note-taking is discussed in Chapter VI.

SOURCES OF INFORMATION AND TYPES OF EDUCATIONAL LITERATURE

The major types of educational literature from which assistance and information may be secured are listed in terms of the kind of thinking or research procedure involved: (1) statistical or experimental studies with emphasis on objective methods and results expressed mathematically; (2) theoretical,

speculative, or philosophical discussions with emphasis on the methods of logic and rationalization; and (3) historical investigations. In later chapters each of these types will be given reasonably full consideration. In view of this fact, and especially because library aids and guides are not classified along the foregoing lines, the remainder of the present chapter must be organized to facilitate ready use of the available information. Therefore, the workable classification has been adopted in terms of the form in which the material appears: (1) periodical literature (found in journals); (2) books, monographs, year-books, and bulletins; (3) graduate theses, which usually are unpublished except for a limited number of Doctors' dissertations; and (4) certain miscellaneous sources of information. Before entering upon a detailed discussion of each of these specialized types of educational literature, a brief but systematic plan should be given for making a reasonably complete and rapid initial survey of the entire field of literature dealing with the problem under investigation. This is done under the heading of educational "guides."

Guides to educational literature. Really, in spite of the greatly increased mass of educational literature, it is so much simpler to-day than fifteen or even ten years ago, to find quickly the previous studies germane to a given problem, that further encouragement may well be given to the workers who have prepared such aids as those mentioned below. This fact makes it all the more inexcusable when investigators have been ignorant or careless in analyzing earlier studies in the area represented. It is possible to note the extent to which bibliographical aids and library guides have increased by comparing earlier discussions of this problem with the range of information presented in this chapter.[21] If subsequent para-

[21] E. J. Ashbaugh, "A Bibliography of Research Articles Published in 1924," *Journal of Educational Research*, XI (May, 1925), 368-79.

Arthur Edward Larkin, "The Historical Development of the Current Indexing of Published Educational Information." Unpublished Master's thesis, University of Notre Dame, 1932.

Harold O. Rugg, "How to Keep in Touch with the Quantitative Literature of Education," *Elementary School Journal*, XVIII (December, 1917), 301-10.

graphs seem elementary to the advanced university student of educational problems, it will be conceded that they offer useful suggestions to most field workers and to beginners in educational research who are often literally "swamped" in attempting to canvass a pertinent part of the great volume of literature now available.

General guides. Let us assume that the area of interest is "teacher personnel." For purposes of orientation it is probably best to read the professional textbooks or reference works on this subject discussed later in this chapter. Books on school administration and supervision usually include chapters on the teaching staff which provide additional selected references dealing with the topic under investigation.

The *Education Index,* which began publication in 1929, could well be examined next, since it is the most important educational guide in existence. Its purpose is to index all educational books in the United States, except elementary and high-school textbooks; all articles in a large number of educational periodicals; other educational articles appearing in certain non-educational journals; and a large number of monographs, bulletins, reports, book reviews, courses of study, state documents, etc., of interest to educational workers.[22] A good

———, *Statistical Methods Applied to Education,* Chapter II. Boston: Houghton Mifflin Co., 1917.

W. W. Theisen, "Recent Progress in Educational Research," *Journal of Educational Research,* VIII (November, 1923), 301-14. Summarizes the chief contributions of research to instruction and administration, and suggests other investigations that are needed in these fields.

M. R. Trabue, "Educational Research in 1925," *Journal of Educational Research,* XIII (May, 1926), 336-44. A summary of the literature on educational research, articles in periodicals, books, and booklets, published during 1924 and 1925. Mentions a number of investigations as having special merit.

Clifford Woody, "A Survey of Educational Research in 1923," *Journal of Educational Research,* IX (May, 1924), 357-81. A review of the important researches reported in 1923 in various fields, including administration, instruction, educational and mental tests, statistical methods, experimental studies, and miscellaneous.

22 Because of the fundamental value of the *Education Index* in referencing important educational literature, many educators will undoubtedly desire to subscribe to this service personally. The annual cumulative cloth-bound volume may be secured for approximately the price of an ordinary educational periodical, and the entire indexing service, including paper-bound monthly publications (which make the information in the annual volumes available each month right after the educational periodicals have been published) may be secured for twice this amount. Write the H. W. Wilson Company, 950 University Avenue, New York City, for particulars.

statement of the organization and use of the *Education Index* is available elsewhere.[23]

A logical starting point, in terms of a variety of research references, is to examine the *Review of Educational Research*, which began publication in 1931 and covers some fifteen subdivisions of education within a three-year cycle. Fortunately for our investigator, the June, 1934, number of this digest of research includes 640 references on teacher personnel and reviews of the studies relating to thirteen major problems in this field. The April, 1931, issue includes a bibliography of 458 items relating to teacher personnel. Presumably, in 1937 another number of the *Review of Educational Research* will deal with this same problem. The canvass may be extended by examining the annual bibliographies of research published by the United States Office of Education, the classified and selected lists of references published monthly in the *School Review* and *Elementary School Journal*, Monroe's *Ten Years of Educational Research* (1918-1927),[24] and *Locating Educational Information in Published Sources*,[25] Monroe and Shores' *A Catalogue of Bibliographies and Summaries in Education to June 30, 1935*,[26] Alexander's *Educational Research*,[27] and the *Research Bulletin of the N.E.A.*

The *Psychological Bulletin* publishes frequent bibliographical summaries of research in the various subdivisions of psychology, including educational psychology. The *Educational Research Bulletin* of the Catholic University of America has issued reviews and bibliographies covering a variety of fields—

23 Carter Alexander, *How to Locate Educational Information and Data, op. cit.*, pp. 95-100.

24 W. S. Monroe and Others, *Ten Years of Educational Research*, 1918-1927. University of Illinois Bulletin, Vol. XXV, No. 51. Bureau of Educational Research Bulletin, No. 42. Urbana, Ill.: University of Illinois, 1928. Pp. 368.

25 W. S. Monroe and Others, *Locating Educational Information in Published Sources*. University of Illinois Bulletin, Vol. XXVII, No. 45. Bureau of Educational Research Bulletin, No. 50. Urbana, Ill.: University of Illinois, 1930. Pp. 142.

26 W. S. Monroe and Louis Shores, *A Catalogue of Bibliographies and Summaries in Education to June 30, 1935*. New York: The H. W. Wilson Co., 1936. To be continued in the *Education Index*.

27 Carter Alexander, *Educational Research:* Suggestions and Sources of Data with Specific Reference to Administration. Third Edition, Revised. New York: Bureau of Publications, Teachers College, Columbia University, 1931. Pp. 115.

the constancy of the intelligence quotient, reading tests, spelling, child development, ability grouping, reading interests, etc. A new journal, *Educational Abstracts*, established in January, 1936, will present concise abstracts from books, journals, and monographs in both American and foreign literature five times a year. The major topics covered by the *Review of Educational Research, School Review, Elementary School Journal*,[28] and *Psychological Bulletin* are given in the following lists.

TOPICS COVERED IN THE "REVIEW OF EDUCATIONAL RESEARCH"

"The Curriculum," I (January, 1931), 1-64.
"Teacher Personnel," I (April, 1931), 65-160.
"School Organization," I (June, 1931), 161-244.
"Special Methods in Elementary School," I (October, 1931), 245-324.
"Psychology of School Subjects," I (December, 1931), 325-450.
"Special Methods on High-School Level," II (February, 1932), 1-94.
"Finance and Business Administration," II (April, 1932), 95-182.
"Tests of Personality and Character," II (June, 1932), 183-270.
"Tests of Intelligence and Aptitude," II (October, 1932), 271-342.
"School Buildings, Grounds, Equipment, Apparatus, and Supplies," II (December, 1932), 343-441.
"Educational Tests and Their Uses," III (February, 1933), 1-80.
"Mental and Physical Development," III (April, 1933), 81-182.
"Pupil Personnel, Guidance, and Counseling," III (June, 1933), 183-278.
"Psychology of Learning, General Methods of Teaching, and Supervision," III (October, 1933), 279-368.
"The Legal Basis of Education," III (December, 1933), 369-482.
"Methods and Techniques of Educational Research," IV (February, 1934), 1-119.
"The Curriculum," IV (April, 1934), 121-252.
"Teacher Personnel," IV (June, 1934), 253-352.
"School Organization," IV (October, 1934), 353-444.
"Psychology and Methods in the High School and College," IV (December, 1934), 445-563.
"Special Methods and Psychology of the Elementary-School Subjects," V (February, 1935), 1-120.
"Finance and Business Administration," V (April, 1935), 121-184.
"Psychological Tests," V (June, 1935), 185-331.

28 The monthly selected references in the *School Review* and *Elementary School Journal* cumulate annually and are bound under one cover, for example, *Selected References in Education, 1934*. Supplementary Educational Monographs, No. 42. Chicago: Department of Education, University of Chicago, January, 1935. Pp. x + 190.

"The School Plant," V (October, 1935), 333-434.
"Educational Tests and Their Uses," V (December, 1935), 441-520.
"Mental and Physical Development," VI (February, 1936), 1-152.
"Student Accounting, Personnel, and Guidance," VI (April, 1936).
"Psychology of Learning, General Methods, and Supervision," VI (June, 1936).
"History of Education and Comparative Education," VI (October, 1936).
"Mental Hygiene," VI (December, 1936).
"Educational Sociology," VII (February, 1937).

TOPICS COVERED IN THE MONTHLY SELECTED REFERENCES IN THE "SCHOOL REVIEW"

Guidance	September
Organization of Secondary Education	October
Administration of Secondary Education	November
Higher Education	December
Secondary-School Instruction: I	January
Secondary-School Instruction: II	February
Secondary-School Instruction: III	March
The Extra-Curriculum	April
Educational Psychology	May
Statistics and the Theory of Test Construction	June

TOPICS COVERED IN THE MONTHLY SELECTED REFERENCES IN THE "ELEMENTARY SCHOOL JOURNAL"

Elementary-School Instruction: I, Curriculum, Methods of Teaching and Study, and Supervision	September
Elementary-School Instruction: II, The Subject Fields	October
Elementary-School Instruction: III, The Subject Fields (*Continued*)	November
Teacher Education	December
Public-School Administration: I	January
Public-School Administration: II	February
Preschool and Parental Education	March
Kindergarten-Primary Education	April
Literature of Exceptional Children	May
Foreign Education	June

SELECTED TOPICS REVIEWED IN THE "PSYCHOLOGICAL BULLETIN"

Intelligence Tests
Educational Tests
Character and Personality Tests

Sex Differences
Learning Theories
Learning in Infant and Preschool Children
Imagination
Social Psychology of Everyday Life
Introversion-Extroversion
Personality Adjustments of Only Children
Interferences in Reading
Influence of Disease on Motor Development During Childhood
Experimental Study of Reading
Childhood Play
Learning and Retention of Verbal Material
Law of Effect As a Principle of Learning

Periodical guides. It is possible to make the canvass more detailed and complete by use of certain bibliographical and library aids organized in terms of the type of publication represented. The periodical literature is well covered in certain of the sources mentioned in the preceding paragraph, especially the *Education Index,* as far as a complete classification and listing of titles is concerned. Other periodical indexes and abstracts are: *Readers' Guide to Periodical Literature, International Index to Periodicals, Teachers Journal and Abstract* (suspended publication in 1932), *Educational Abstracts, Education Digest, Loyola Digest, Psychological Abstracts, Psychological Index, Occupational Index,* and *Social Science Abstracts* (suspended publication in 1932). It will be noted from the titles of certain of these guides that they provide an abstract or digest service, while other aids are devoted to the task of indexing periodical literature. In subject-matter fields other than education and psychology may be found similar library guides, as listed in the chapter bibliography.

Helpful tables, showing the years covered by various periodical indexes and the chronological order in which indexes should be consulted for certain types of information, are available.[29]

[29] Carter Alexander, *How to Locate Educational Information and Data, op. cit.,* pp. 110-1.
Eleanor M. Witmer and Margaret C. Miller, "Guides to Educational Literature in Periodicals," *Teachers College Record,* XXXIII (May, 1932), 724-5.

Guides to books and monographs. Special additional assistance is available for canvassing non-periodical literature. For a number of years *School and Society* has published annually a complete classified list of educational books, monographs, year-books, and bulletins of the preceding year with the so-called "sixty most important" books of the year indicated. This same list of sixty books appears annually in a spring number of the *Journal of the National Education Association,* which also publishes an annual list of forty "notable" American books covering the entire range of intellectual endeavor. The complete lists in *School and Society* include 813 titles in 1933, 765 in 1934, and 823 in 1935. The numbers of *School and Society* which should be consulted are:

XXV (January 1, 1927), 18-23; for 1926.
XXVI (December 31, 1927), 823-35; for 1927.
XXVIII (December 29, 1928), 801-15; for 1928.
XXX (December 28, 1929), 857-73; for 1929.
XXXIII (January 24, 1931), 101-21; for 1930.
XXXV (March 19, 1932), 393-410; for 1931.
XXXVII (March 25, 1933), 391-408; for 1932.
XXXIX (March 24, 1934), 374-92; for 1933.
XLI (March 30, 1935), 432-48; for 1934.
XLIII (March 28, 1936), 409-26; for 1935.

Books and monographs may also be located by author, title, or subject in the card indexes of the library, the *United States Catalogue, Supplements to the United States Catalogue,* and the *Cumulative Book Index,* which give complete information concerning publisher, number of pages, price, etc. The *Publishers' Weekly* may be used when it is essential to secure information concerning books which have appeared since the last number of the *Cumulative Book Index.* The service of the *Education Index* in listing books has already been described. Other guides to books and literature are given in the chapter bibliography. The *Book Review Digest* is of value in providing brief quotations from book reviews previously published in periodicals. This service aids in the evaluation of books.

Guides to graduate theses. The discovery and examination of graduate theses involve more difficulty than the materials mentioned above, since most Masters' and many Doctors' studies are unpublished. However, reasonably good aids are available even for canvassing these unpublished materials. Over the period, 1917-1927, the Bureau of Educational Research of the University of Illinois prepared mimeographed annual or biennial lists of graduate theses in education. Monroe's *Ten Years of Educational Research* (1918-1927) [30] includes the titles of Doctors' dissertations in education over the period covered. Since that time the annual bibliographies of educational research issued by the United States Office of Education have been devoted very largely to an annotated listing of thesis titles. The bulletins of the Office of Education which should be consulted for titles of Masters' and Doctors' theses in education are:

Bulletin No. 22, 1928 for 1926-27.
Bulletin No. 36, 1929 for 1927-28.
Bulletin No. 23, 1930 for 1928-29.
Bulletin No. 13, 1931 for 1929-30.
Bulletin No. 16, 1932 for 1930-31.
Bulletin No. 6, 1933 for 1931-32.
Bulletin No. 7, 1934 for 1932-33.
Bulletin No. 5, 1935 for 1933-34.

The Office of Education also has on file a number of these studies for lending purposes, 1900 in 1935. At intervals the Office publishes a list of theses which have become available for loan since the last previously published list.[31] Interlibrary loans of theses may also be made between educational institutions.[32] Within recent years many graduate institutions have published volumes of abstracts of completed theses, and this

30 W. S. Monroe and Others, *Ten Years of Educational Research, 1918-1927, op. cit.*

31 *Recent Theses in Education.* Office of Education Pamphlet No. 26, 1931. Washington: Office of Education. 1932. Pp. 41.
Ruth A. Gray, *Doctors' Theses in Education:* A List of 797 Theses Deposited with the Office of Education and Available for Loan. Pamphlet No. 60. Washington: Office of Education, 1935. Pp. 70.

32 Carter Alexander, *How to Locate Educational Information and Data, op. cit.*, pp. 152-9. A discussion of the procedure involved in interlibrary loans.

information is available in a later section of this chapter, in the chapter bibliography, and elsewhere.[33]

Later in this chapter, reference is made to lists of doctoral dissertations published by the Library of Congress and by the H. W. Wilson Co.

Lists of theses may be located in the *Education Index* under the topics, "dissertations—academic" and "degrees—academic, Doctor's, and Master's."

The *Journal of Educational Research* prints annually each January a list of Doctors' studies under way in education.

Other bibliographical and summary guides. In addition to guides to educational literature previously mentioned, other specialized aids (bibliographies or summaries of research) should be mentioned. The classified monthly lists of references in the *School Review* and *Elementary School Journal,* and the summarizing work of the *Review of Educational Research* have already been described, as has the *Psychological Bulletin* which publishes critical summaries of research dealing with a wide range of psychological problems. Within recent years the literature in the field of psychology has been summarized in an admirable manner in the handbooks of psychology, edited by Carl Murchison and published by Clark University Press. The titles of the bibliographical reviews mentioned above may be found annually in the September number of the *Journal of Educational Research.*[34] Certain journals, such as the *Research Quarterly of the American Physical Education Association, Modern Language Journal, Religious Education,* and *Science Education,* have been publishing annual bibliographies in the fields represented for several years. To illustrate the valuable bibliographical and summary aids now available in education, only a few of the more comprehensive attempts can be enumerated in the chapter bibliography:

33 Clara E. Derring, "Lists and Abstracts of Masters' and Doctors' Dissertations in Education," *Teachers College Record,* XXXIV (March, 1933), 490-502.

34 For example, Carter V. Good, "Selected Bibliography on the Methodology of Educational Research and Related Problems," *Journal of Educational Research,* XXIX (October, 1935), 156-70.

Higher education and teacher training	Good, Betts
Personnel development and guidance	Strang
Junior college	Eells
Buildings, grounds, and equipment	Smith and Noffsinger
School finance	Alexander and Covert
Research methodology	Barr and Rudisill, Good
Behavior development in infants	Dewey
Heredity and environment	Schwesinger
Mental tests and rating scales	Hildreth
Mental tests and heredity	Schieffelin and Schwesinger
Social science	Bye, Ogg, Rugg
English and reading	Lyman, Gray
Arithmetic	Buswell and Judd, Monroe and Engelhart
Science	Curtis
Foreign language	Buchanan and MacPhee, Cole, Coleman and Jacques
Athletics	Ryan
Commercial education	Blackstone
Religious education	Watson
Leadership	Smith and Krueger
Examinations	Champneys
National systems of education	*Bibliographie Pedagogique Internationale*

Miscellaneous guides to educational literature. In the chapter bibliography certain additional guides of assistance in locating information in a variety of educational fields are listed:

Periodical literature	Carlson, Witmer and Miller
Educational research in general	Witmer, Whitney and Rugg
Personnel literature	Cowley
Psychology	Louttit
Teacher training	Lancaster
Secondary education	Manske and Alexander
Curriculum	Dech
Negro education	Cook
Elementary education	McSwain and Alexander
Occupational research	Davis
Physical education	Sefton
School administration and research	Alexander
Commercial education	Gropp
Graduate theses in education	Derring

History	Dutcher
American history	Hockett
School law	Edwards
Speech education	Tauber
Office of Education publications	Witmer and Miller
Comparative education	Abel

A good discussion of how to make such guides and a rather complete list of educational guides are available.[35]

Four other library aids may be mentioned, although strictly speaking, they are not guides to current literature. However, they can be made to serve somewhat the same purpose, in that the topics, terms, and to some extent the problems in the fields of education and psychology are indicated. English has provided a dictionary of more than 2000 psychological terms, while Warren's later effort includes 10,000 terms.[36] Haggerty has listed 2,584 topics in psychology.[37] Voegelein has prepared a comprehensive list of educational subject headings.[38]

At the risk of repetition, it may be stated that these bibliographies, abstracts, summaries, and guides have been made necessary by the rapid increase in educational literature during the past decade. Critical summaries require research ability of high order and are among the most valuable contributions to educational literature. Whether on the university campus or in the field, the student of education may save himself much searching in the library and some mental anguish by becoming familiar with available guides, bibliographies, and summaries. To-day there is no reasonable excuse for ignorance concerning worth-while work (whether books, monographs, bulletins, year-books, periodical articles, or graduate theses) previously done in the field of interest, even though such lapses may have been viewed with more tolerance in the past than

35 Carter Alexander, *How to Locate Educational Information and Data, op. cit.*, pp. 160-7.

36 Horace B. English, *A Student's Dictionary of Psychological Terms*. Yellow Springs, Ohio: Antioch Press, 1929. Pp. 82. H. C. Warren, *Dictionary of Psychology*. Boston: Houghton Mifflin Co., 1934.

37 M. E. Haggerty, *Topics in Psychology*. Minneapolis, Minn.: University of Minnesota Press, 1929.

38 L. Belle Voegelein, *List of Educational Subject Headings*. Columbus, Ohio: Ohio State University Press, 1928. Pp. xiv + 338.

in the present or future. Ten years ago most of the bibliographical and library aids cited above did not exist.

Evidence of the extent to which research workers employ reference materials is found in Louttit's statement that in 144 periodicals in psychology and related fields over the period 1900-1927 there was a total of 2,134 bibliographies.[39]

The preceding section has been concerned with the various educational guides useful in making a reasonably rapid, yet fairly complete bibliographical survey of a problem. The remainder of this chapter is devoted to a more highly detailed and specialized treatment of the various types of educational literature and the sponsoring organizations or agencies.

Periodical literature in education. Investigators have been active in determining the journals most frequently read, the type of authorship represented, and the topics treated. Such information is of value in directing the reading and study of educational workers.

TABLE V*

THE HELPFULNESS OF CERTAIN PROFESSIONAL JOURNALS

Journals	Index of helpfulness	Rank in helpfulness
School Review	45.5	1
Educational Administration and Supervision	32.1	2
American School Board Journal	21.2	3
Teachers College Record	19.8	4.5
Journal of Educational Research	19.8	4.5
Journal of Education	18.8	6
Educational Review	14.5	7
School and Society	13.3	8
State Journals of Education	12.2	9
Education	10.3	10

* Rearranged from author's data.

Extent to which journals are read, and guidance for such reading. A questionnaire study of significance to secondary-

[39] C. M. Louttit, "The Use of Bibliographies in Psychology," *Psychological Review*, XXXVI (July, 1929), 341-7.

school principals sought to discover which of ten designated educational journals were read most by senior high-school principals.[40] The conclusions of the investigation are based on returns from 381 principals located in 375 cities, including all the states and the District of Columbia. The periodicals were rated in terms of helpfulness in the work of the principals. A percentage index of helpfulness was secured by dividing the number of times a journal was mentioned as most helpful by the total number of times it was being read. The second column of Table V gives this index of helpfulness, and the last column indicates the rank in helpfulness.

Kelly and Whitney made a companion study to that reported by LaPoe,[41] and summarized above, in order to determine the educational periodicals read by elementary principals and classroom teachers.[42] This questionnaire investigation involves 250 elementary principals and 250 elementary teachers in 156 cities in forty states and the District of Columbia. In Table VI is found a list of professional journals ranked according to their helpfulness to three different groups of school workers. The figures in the second column of Table VI are taken from LaPoe's study. The data in the third and fourth columns are a part of Kelly and Whitney's findings. A blank space in any column means that the periodical involved did not appear in the list of the ten journals read most frequently by the group in question.

Eells classifies, according to the journals represented, 2,500 articles read by 115 students at Stanford University in the twenty-eight periodicals which are represented by twenty or more articles.[43] Approximately forty other journals are reported with less than twenty articles each. The five journals read with greatest frequency and listed according to rank were *School*

40 James L. LaPoe, "The Senior High School Principals' Professional Magazines," *Educational Research Bulletin*, VI (September 14, 1927), 259-61.

41 *Ibid.*

42 E. L. Kelly and F. L. Whitney, "Educational Magazines Read by Five Hundred Elementary-School Principals and Classroom Teachers," *Elementary School Journal*, XXIX (November, 1928), 176-80.

43 W. C. Eells, "What Professional Magazines Do Prospective Educators Read?" *School and Society*, XXIX (April 6, 1929), 446-8.

and Society, School Review, Sierra Educational News (state journal), *Educational Review* (now combined with *School and Society*), and *Journal of the National Education Association.*

TABLE VI

EDUCATIONAL MAGAZINES RANKED AS TO HELPFULNESS TO HIGH-SCHOOL PRINCIPALS, ELEMENTARY-SCHOOL PRINCIPALS, AND ELEMENTARY-SCHOOL TEACHERS

Magazine	High-School Principals	Elementary-School Principals	Elementary-School Teachers
American Educational Digest	....	3	....
American School Board Journal	3	....	....
Child-Welfare Magazine	....	....	9
Education	10	....	....
Educational Administration and Supervision	2	....	....
Educational Review	7	....	4
Elementary School Journal	....	2	7
Industrial-Arts Magazine	....	....	5
Journal of Education	6	7	3
Journal of Educational Method	....	1	....
Journal of Educational Research	4.5	5	6
Journal of the National Education Association	....	4	1
Normal Instructor and Primary Plans	....	6	2
Primary Education—Popular Educator	....	10	....
School Review	1	....	....
School and Society	8	....	8
State Journals of Education	9	9	10
Teachers College Record	4.5	8	....

Eells also asked the preferences of college juniors and seniors in the course, "Introduction to Education," at Stanford, concerning three journals to be read regularly.[44] More than one-half of the class chose *School and Society,* while the *Journal of the National Education Association* and the *School Review* received the votes of one-third of the students. The journals selected by approximately one-sixth of the class were *School Executives Magazine, Progressive Education, Nation's Schools,*

[44] W. C. Eells, "Are Educational Journals Worth Reading," *Journal of the National Education Association,* XIX (May, 1930), 159-60.

California Quarterly of Secondary Education (now *California Journal of Secondary Education*), *American School Board Journal, Journal of Adult Education,* and *Sierra Educational News.*

Reports from 253 members of the National Society for the Study of Education and the National Society of College Teachers of Education, who were asked in 1917 to name from one to five educational journals desirable for a public library, recommended in the order named: *School and Society, School Review, Educational Review, Elementary School Journal, Educational Administration and Supervision, American School Board Journal, Journal of Education, Journal of Educational Psychology, Education,* and *Teachers College Record.*[45] Of course, since that date the *Educational Review* has combined with *School and Society,* and other important journals have been established.

There is space only to list in the chapter bibliography certain other informative analyses of periodical literature: topics treated or type of authorship represented (Ashbaugh, Barr, Becker, Collins, Cornelinson, Davis and Ballard, Franke and Davis, Goodenough, Louttit, Martin, Shannon, Strang); suggested lists of journals or guidance for such reading (Alexander, Clark, Copeland, Dillman, Lyle, St. John); and the development of educational journalism during the past century (Davis).

Of course, the thoughtful reader will not allow the foregoing analyses of the extent to which certain journals are read to distract his attention unnecessarily from many other useful periodicals named subsequently in this chapter. As a matter of fact, certain of the journals most valuable to research workers in psychology and education have at this writing a subscription list numbered in hundreds rather than thousands or tens of thousands. At the same time it is quite common for important reports of investigations to be held in editorial files for a year or more before appearing in print. This con-

45 *School and Society,* VI (October 13, 1917), 433-4.

dition might be remedied in part by increasing the number of subscribers and, as a result, enlarging the space available for research reports. In particular those interested in psychological journals are attempting to work out some plan for reducing the paralyzing lag in publication, which has taken tangible form in the *Journal of Psychology*. This periodical and the *Journal of Experimental Education* are published on a coöperative basis, with the author sharing in the costs involved.

General educational journals and periodical literature in subject-matter fields. In a preceding section of this chapter a detailed account of guides to educational literature has been given. At this time it is in order to characterize more fully the field of periodical literature.

Educational journals of general interest. The handbooks or year-books of the Educational Press Association of America, Washington, D. C., which include classified lists of educational periodicals, are the most complete available sources of information on this subject. The *Education Index*, as well as other periodical indexes, publishes lists of the journals represented. At one time a list (discontinued after 1932) of educational periodicals received by the library of the Office of Education was published in its annual educational directory.

The extent to which different types of educational organizations and institutions publish journals representing their special fields of interest is represented in part by examining the classification of journals employed in the year-books of the Educational Press Association of America: general in scope and national in circulation, issued as organs of state education associations, issued by state departments of education, state or regional journals issued by individuals or corporations, local journals issued under the auspices of city boards of education, local journals issued as organs of professional organizations, and journals of institutions for the education of teachers.

In the immediately following list of journals, only those of rather general interest, as distinguished from subject-matter

fields, and those of national scope, will be given. In a separate compilation will be listed those periodicals devoted to subject-matter fields. Some of the journals of general scope given below are organs of certain educational associations, and are so indicated. Those which print a considerable number of factual studies and experiments in contrast to theoretical, speculative, or descriptive discussions will be preceded by an asterisk.

American Journal of Psychology. Cornell University, Ithaca, New York. Quarterly.

* *American School Board Journal.* Bruce Publishing Co., 407 East Michigan Street, Milwaukee, Wisconsin. Monthly.

Bulletin of the American Association of University Professors. American Association of University Professors, 744 Jackson Place, N.W., Washington, D.C. 8 numbers.

Bulletin of the Association of American Colleges. Association of American Colleges, 111 Fifth Avenue, New York City. 4 numbers.

* *California Journal of Secondary Education.* California Society for the Study of Secondary Education, Berkeley, California. 8 numbers.

Catholic Educational Review. Catholic Education Press, 1326 Quincy Street, N.E., Washington, D.C. 10 numbers.

Chicago Schools Journal. Board of Education, Chicago Normal College, Sixty-eighth Street and Stewart Avenue, Chicago, Illinois. 10 numbers.

Child Development. Williams and Wilkins Co., Mt. Royal and Guilford Avenues, Baltimore, Maryland. Quarterly.

Childhood Education. Association for Childhood Education, 1201 Sixteenth Street, N.W., Washington, D.C. 9 numbers.

Education. The Palmer Co., 120 Boylston Street, Boston, Massachusetts. 10 numbers.

Education Digest. Box 100, Ann Arbor, Michigan. 10 numbers.

Educational Abstracts. 230 Fifth Avenue, New York City. 5 numbers.

* *Educational Administration and Supervision.* Warwick and York, 10 E. Centre Street, Baltimore, Maryland. 9 numbers.

* *Educational Law and Administration.* 9 West Fourth Street, Cincinnati, Ohio. Quarterly.

* *Educational Method.* Department of Supervisors and Directors of Instruction, 525 West One Hundred and Twentieth Street, New York City. 9 numbers. (Formerly *Journal of Educational Method.*)

Educational Record. American Council on Education, 744 Jackson Place, N.W., Washington, D.C. Quarterly.

* *Educational Research Bulletin.* Ohio State University, Columbus, Ohio. 9 numbers.
* *Elementary School Journal.* Department of Education, University of Chicago, Chicago, Illinois. 10 numbers.
Journal of Abnormal and Social Psychology. Psychological Review Co., Princeton, N. J. Quarterly.
Journal of Adult Education. American Association for Adult Education, 60 East Forty-second Street, New York City. Quarterly.
Journal of the American Association of University Women. 1634 Eye Street, N.W., Washington, D. C. Quarterly.
* *Journal of Applied Psychology.* Williams and Wilkins Co., Mount Royal and Guilford Avenues, Baltimore, Maryland. Bimonthly.
Journal of Education. New England Publishing Co., 6 Park Street, Boston, Massachusetts. 20 numbers.
* *Journal of Educational Psychology.* Warwick and York, 10 E. Centre Street, Baltimore, Maryland. 9 numbers.
* *Journal of Educational Research.* Public School Publishing Co., Bloomington, Illinois. 9 numbers.
* *Journal of Educational Sociology.* American Viewpoint Society, 13 Astor Place, New York City. 9 numbers.
* *Journal of Experimental Education.* Journal Publishing Co., Madison, Wisconsin. Quarterly.
* *Journal of Experimental Psychology.* Psychological Review Co., Princeton, New Jersey. Bimonthly.
Journal of General Psychology. Clark University Press, Worcester, Massachusetts. Quarterly.
* *Journal of Higher Education.* Ohio State University, Columbus, Ohio. 9 numbers.
* *Journal of Negro Education.* Howard University, Washington, D.C. Quarterly.
* *Journal of Psychology.* Worcester, Massachusetts.
Journal of Social Hygiene. American Social Hygiene Association, 50 West Fiftieth Street, New York City. 9 numbers.
Journal of Social Psychology. Clark University Press, Worcester, Massachusetts. Quarterly.
Journal of the National Education Association. 1201 Sixteenth Street, N.W., Washington, D.C. 9 numbers.
* *Junior College Journal.* American Association of Junior Colleges and School of Education, Stanford University, California. 8 numbers.
Junior-Senior High School Clearing House. School of Education, New York University, New York City. (Formerly *Junior High School Clearing House.*) 9 numbers.
Mental Hygiene. 50 West Fiftieth Street, New York City. Quarterly.
* *Nation's Schools.* 919 North Michigan Avenue, Chicago, Illinois. Monthly.

North Central Association Quarterly. University High School Building, Ann Arbor, Michigan. Quarterly.

* *Peabody Journal of Education.* George Peabody College for Teachers, Nashville, Tennessee. Bimonthly.

* *Pedagogical Seminary and Journal of Genetic Psychology.* Clark University, Worcester, Massachusetts. Quarterly.

* *Personnel Journal.* Personnel Research Federation, Williams and Wilkins Co., Mount Royal and Guilford Avenues, Baltimore, Maryland. Bimonthly. (Formerly *Journal of Personnel Research.*)

* *Phi Delta Kappan.* 1180 East Sixty-Third Street, Chicago, Illinois. 9 numbers. Published by a professional educational fraternity, but is of general interest

Progressive Education. Progressive Education Association. 310 West Ninetieth Street, New York City. 8 numbers.

* *Psychological Abstracts.* American Psychological Association, Prince and Lemon Streets, Lancaster, Pennsylvania. 13 numbers.

* *Psychological Bulletin.* American Psychological Association, Prince and Lemon Streets, Lancaster, Pennsylvania. 10 numbers.

Psychological Review. Psychological Review Co., Princeton, N. J. 6 numbers.

* *Research Bulletin.* National Education Association, Research Division, 1201 Sixteenth Street, N.W., Washington, D. C. 5 numbers.

* *Review of Educational Research.* American Educational Research Association, 1201 Sixteenth Street, N.W., Washington, D. C. 5 numbers.

* *School and Society.* Science Press, Grand Central Terminal, New York City. Weekly.

School Executive. 1126-28 Q Street, Lincoln, Nebraska. Monthly. (Formerly *American Educational Digest.*)

School Life. United States Office of Education, Washington, D. C. 10 numbers.

* *School Review.* Department of Education, University of Chicago, Chicago, Illinois. 10 numbers.

Social Frontier. 66 West Eighty-eighth Street, New York City. 9 numbers.

Social Science Abstracts. Social Science Research Council, Columbia University, New York City. Monthly. (Suspended publication in 1932.)

* *Sociology and Social Research.* University of Southern California, Los Angeles, California. Bimonthly.

* *Teachers College Record.* Teachers College, Columbia University, New York City. 8 numbers.

Teachers Journal and Abstract. Colorado State Teachers College, Greeley, Colorado. 9 numbers. (Suspended publication in 1932, four years before *Educational Abstracts* began.)

Educational periodicals and organizations in subject-matter fields. It seems desirable to enumerate for the benefit of teachers and supervisors of the various school subjects the professional journals, year-books, proceedings, reports, and organizations in the twelve major divisions of instruction. Therefore, each of the twelve divisions (found in the appendix) includes a selected list of periodicals, foundations and boards, and professional associations in the field represented. Wherever possible, a permanent address is given. Information concerning the addresses of organizations which do not have a permanent central office can be secured from the annual educational directory of the United States Office of Education. Additional information concerning most of the publications can be found in the year-books of the Educational Press Association of America.

Books, monographs, year-books, bulletins, surveys, and reports. Although guides to the various types of educational literature have been cited earlier in this chapter, it seems desirable to describe in greater detail the broad field of publications represented by bound volumes in the form of books, monographs, year-books, surveys, proceedings, and reports.

Beginning in November, 1934, the *Education Index* initiated publication of a list of the series (such as textbooks, monographs, and bulletins) indexed as separate publications. It also includes: a directory of publishers; a check-list of professional books; a check-list of publications of institutions, associations, and foundations; and a check-list of documents and reports.

Publications of teacher-training institutions. A large number of research studies in education, in some instances Doctors' dissertations, appear in the publications of the larger schools of education. By far the largest and best known series of publications in the following list is that of Teachers College, Columbia University, which at this writing includes more than six hundred monographs, and consists chiefly of Doctors' studies. A series, relatively limited in number, but of high quality, is the *Supplementary Educational Monographs,* Uni-

versity of Chicago. No attempt has been made to repeat the names of all educational journals sponsored by teacher-training institutions, especially if previously listed in this chapter as of general or national scope.

Catholic University of America, Washington, D. C.—*Catholic Educational Review,* and *Educational Research Bulletin,* continued as *Educational Research Monographs.*

Clark University, Worcester, Massachusetts—psychological monographs and journals.

Colorado State College of Education, Greeley, Colorado—*Bulletins* and *Education Series.*

George Peabody College for Teachers, Nashville, Tennessee—*Peabody Journal of Education, Contributions to Education,* and *Field Studies* of the Division of Surveys and Field Studies.

Harvard University, School of Education, Cambridge, Massachusetts—*Bulletins, Monographs, Studies,* and *Inglis Lectures.*

Indiana University, Bureau of Coöperative Research, Bloomington, Indiana—*Bulletins,* and *Bulletin of the School of Education.*

Johns Hopkins University, Baltimore, Maryland—*Studies in Education.*

Kansas State Teachers College, Emporia, Kansas—*Studies in Education.*

Northwestern University, Evanston, Illinois—*Contributions to Education.*

Ohio State University, Bureau of Educational Research, Columbus, Ohio—*Bulletins, Monographs, Journal of Higher Education,* and *Educational Research Bulletin.*

Pennsylvania State College, State College, Pennsylvania—*Studies in Education.*

Purdue University, Lafayette, Indiana—*Educational Reference Circular,* and *Studies in Higher Education.*

Rutgers University, New Brunswick, New Jersey—*Studies in Education.*

Stanford University, California—*School Economy Series.*

State University of Iowa, Iowa City, Iowa—*Bulletins, Monographs,* and *Studies*—(*a*) Iowa Child Welfare Research Station, and (*b*) College of Education Series.

Stephens College, Columbia, Missouri—*Educational Service Series.*

Teachers College, Columbia University, New York City—*Teachers College Record, Contributions to Education, Lincoln School Monographs,* and *Yearbooks of the International Institute.*

University of California, Bureau of Research in Education, Berkeley, California—*Publications in Education.*

University of California at Los Angeles—*Publications in Education, Philosophy, and Psychology.*

University of Chicago, Department of Education, Chicago, Illinois—*Supplementary Educational Monographs, Laboratory Schools Publications, School Review,* and *Elementary School Journal.*

University of Illinois, Bureau of Educational Research, Urbana, Illinois—*Research Bulletins* and *Research Circulars.*

University of Kansas, Lawrence, Kansas—*Kansas Studies in Education.*

University of Kentucky, Lexington, Kentucky—*Bulletins.*

University of Michigan, Ann Arbor, Michigan—Bureau of Educational Reference and Research *Bulletins* and *School of Education Bulletin.*

University of Minnesota, College of Education, Minneapolis, Minnesota—*Monographs, Studies,* and *Bulletins.*

University of Nebraska, Lincoln, Nebraska—*Educational Research Record, Educational Monographs.*

University of New Mexico, Albuquerque, New Mexico—*Education Series, Bulletin.*

University of North Carolina, Chapel Hill, North Carolina—*High School Journal, Bulletins.*

University of North Dakota, Grand Forks, North Dakota—*Bulletins, School of Education Record.*

University of Oregon, Eugene, Oregon—*Studies in College Teaching, Bulletin.*

University of Pennsylvania, Philadelphia, Pennsylvania—*Educational Outlook.*

University of Southern California, Los Angeles, California—*Educational Monographs.*

University of Virginia, University, Virginia—*Secondary Education in Virginia.*

University of Washington, Seattle, Washington—*Publications in Social Sciences, School of Education Record.*

University of Wisconsin, Bureau of Educational Research, Madison, Wisconsin—*Bulletins.*

Western Reserve University, Cleveland, Ohio—*Curriculum Laboratory Bulletin.*

Yale University, New Haven, Connecticut—*Studies in Religious Education.*

Publications of state and city school systems. State and city manuals, courses of study, school-board reports, superintendents' reports, etc., are valuable sources of information for the student of education and the worker in the public-school

field, especially in the areas of administration, testing, curriculum, and current statistics. Although it is not possible to include a list of the city bureaus of educational research, school boards, and state departments which publish useful monographs, bulletins, and pamphlets, the reader may be referred to an article in the *Teachers Journal and Abstract* for such information.[46] Also the year-books of the Educational Press Association of America are of assistance in identifying the agencies publishing periodicals. Information is available for those interested in the organization and activities of city bureaus of research.[47] The 1932 educational directory of the Office of Education includes an extended list of directors of educational research in state departments, state education associations, city school systems, universities and colleges, teachers colleges and normal schools, and bureaus of child development. In 1930 the *Journal of Educational Research* established in its Department of Research News and Communications a series of descriptions of the work and organization of university, state, and city bureaus of educational research; at intervals progress reports for individual bureaus appear.

Under the direction of H. B. Bruner at Teachers College, Columbia University, a comprehensive collection of courses of study has been assembled and rated or evaluated. The Society for Curriculum Study has begun the publication of an annual selected list of courses of study,[48] and the *Education Index* includes a list of courses of study in the monthly issues. From

46 Frederick L. Whitney and Earle U. Rugg, "Sources of Current Literature in Education," *Teachers Journal and Abstract*, I (January, 1926), 47-53.

47 H. B. Chapman, *Organized Research in Education with Special Reference to the Bureau of Educational Research*. Bureau of Educational Research Monographs, No. 7. Columbus, Ohio: Ohio State University Press, 1927. Pp. x + 222.

Edith A. Wright, *Organization and Functions of Research Bureaus in City School Systems*. Office of Education Leaflet, No. 2, 1931. Washington: Office of Education, 1931.

W. H. Ziegel, *Research in Secondary Schools*. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph, No. 15. Washington: Office of Education, 1933. Pp. vi + 72.

48 H. B. Bruner, "Selected List of Courses of Study Published 1932-1933," *Society for Curriculum Study News Bulletin*, IV (November 27, 1933), 2-7.

———, "Outstanding Courses of Study of 1934," *Society for Curriculum Study News Bulletin*, VI (January 15, 1935), 2-8.

——— and Mabel V. Cassell, "Annual List of Outstanding Courses of Study," *Curriculum Journal*, VI (December 2, 1935), 1-9.

time to time the United States Office of Education publishes a list of courses of study on file in its library.[49]

Survey reports. National foundations and societies, denominational groups, regional organizations, national and state governments, teachers associations in subject-matter fields, and individual school systems have promoted intensive surveys of school facilities and conditions, which provide valuable data concerning public-school systems and higher institutions. In fact, more than one-third of the states, and many cities and counties, have conducted surveys of their school systems. Caswell tabulates the growth of this movement since 1910 by years and indicates the organizations which are active in making such studies.[50] A standard work on this subject includes a selected list of surveys of especial interest to public-school workers.[51] A bulletin of the United States Office of Education includes a summary of surveys of higher education, as well as of city and rural surveys.[52] The extent of this movement in higher institutions is indicated in part by another review of nineteen curriculum surveys.[53] A helpful topical analysis of the content of 234 school surveys, and an extensive list of surveys and references on surveys, are available.[54] Eaton and Harrison have provided a bibliography of 2775 social surveys.[55] The technique of the school survey will be discussed in later chapters (VII and VIII).

49 Edith A. Wright, *List of Courses of Study for Elementary and Secondary Schools, 1930-1935.* United States Office of Education Circular, No. 139. Washington: Office of Education, March, 1935. Pp. 46.

50 H. L. Caswell, *City School Surveys.* Teachers College Contributions to Education, No. 358. New York: Teachers College, Columbia University, 1929.

———, "Is the School Survey Movement Dead?" *Peabody Journal of Education,* VII (September, 1929), 108-14.

51 Jesse B. Sears, *The School Survey,* pp. 429-33. Boston: Houghton Mifflin Co., 1925.

52 Arthur J. Klein, Walter S. Deffenbaugh, Timon Covert, and Edith A. Lathrop, *Educational Surveys.* Bureau of Education Bulletin, No. 11, 1928. Washington: Bureau of Education. Pp. 68.

53 L. E. Blauch, "Curriculum Surveys in Higher Education," *Journal of Higher Education,* IV (May, 1933), 255-60.

54 H. L. Smith and E. A. O'Dell, *Bibliography of School Surveys and of References on School Surveys.* Bulletin of the School of Education, Indiana University, Vol. VIII, Nos. 1 and 2. Bloomington, Ind.: Indiana University, 1931. Pp. 212.

Topical Analysis of 234 School Surveys. Bulletin of the School of Education, Indiana University, Vol. III, No. 4. Bloomington, Ind.: Indiana University, 1927. Pp. 112.

55 Allen Eaton and S. M. Harrison, *A Bibliography of Social Surveys.* New York: Russell Sage Foundation, 1931. Pp. 468.

Selected major investigations. Since the survey movement and other large-scale studies of national significance have received such widespread attention during the past decade, several of these investigations will be listed in the chapter bibliography; they indicate a valuable addition to educational literature, as well as a type of planning and coördination in research. These selected studies may be located in the bibliography under the name of the author or agency represented and include the fields, investigators, and sponsoring agencies named in the following list:

Land-grant colleges	Klein
Secondary education	Koos
Teacher education	Evenden, Charters and Waples, Betts
School finance	Educational Finance Inquiry, Alexander and Covert
Social studies	Commission on the Social Studies of the American Historical Association
English usage	O'Rourke
Child health and protection	Whitehouse Conference on Child Health and Protection
Social trends	President's Committee on Social Trends
Character education	Hartshorne and May
Nature and nurture	National Society for the Study of Education
Reorganization of the American educational system	Committee on Administrative Units of the Commonwealth Fund
Modern foreign language	Henmon, Fife
Latin	Lucasse, Advisory Committee of the American Classical League
Mathematics	Young
Adult education	Carnegie Corporation
Reading	University of Chicago
Genius	Terman
Measurement of intelligence	Thorndike
Class size	Hudelson
Science teaching	Freeman

United States Office of Education. The numerous publications, surveys, and statistical reports of this agency cover a wide range of problems and include the best available single source of information on current educational conditions, contemporary educational literature, educational statistics, and important movements in education. At intervals a publication of the Office of Education indexes by year, author, title, and subject the various bulletins issued over a given period of years, for example, 1910 to 1927.[56] The annual reports of the Commissioner of Education list the projects completed by the Office of Education and those under way. Helpful accounts of the publications and the excellent library of the Office of Education are also available.[57] Under Commissioner Cooper's administration a reorganization of the responsibilities of the Office of Education took place,[58] based upon a conception of the Office of Education as a research organization rather than an administrative agency. Therefore, its policy is to abandon and transfer to other agencies, in so far as possible, such functions as the supervision of the education of natives and the control of the reindeer industry in Alaska. The Office aims to concentrate its attention upon fact-finding, surveys, and research in the many fields of education. In keeping with this new emphasis the name of the former Bureau of Education has been changed to Office of Education. Evidence of this new emphasis is found in the four comparatively recent national surveys of Land-Grant Colleges, Secondary Education, Teacher Education, and School Finance, sponsored by the Office. The Federal Board for Vocational Education is now a division of the Office of Education.

56 Edith A. Wright and Mary S. Phillips, *Bulletins of the Bureau of Education, 1910-1927.* Bureau of Education Bulletin, No. 17, 1928. Washington: Bureau of Education. Pp. 66.

57 Martha R. McCabe and H. R. Evans, "The Library of the Office of Education and Some of Its Special Collections," *School Life,* XV (November, 1929), 47-9.

Sabra W. Vought, "The Library of the Federal Office of Education," *Peabody Journal of Education,* XII (July, 1934), 21-5.

Eleanor M. Witmer and Margaret C. Miller, "United States Office of Education Serial Publications," *Teachers College Record,* XXXIV (January, 1933), 302-11.

58 W. J. Cooper, "Some Responsibilities of the United States Bureau of Education," *Educational Record* (July, 1929), 184-90.

Fortunately, a number of valuable guides for using the publications of the Office and accounts of its organization and activities are available.[59]

Government documents. Other government documents of a less specific educational character than those published by the Office of Education have been issued in large numbers. They cover a wide range of political, economic, and social problems touching federal, state, and local (city, village, county, and township) areas. Detailed assistance is available for canvassing the various types of journals and proceedings, directories and registers, rules and regulations, laws, reports, and special studies.[60] In the bibliography of this chapter are listed certain guides for canvassing government documents. Chapter VI of the present volume includes an extended analysis of procedure in legal research as related to educational problems.

Year-books and other publications of departments of the National Education Association. Attention will be directed later in this chapter to professional and learned organizations which issue important year-books, bulletins, or journals, but it seems advisable at this time to indicate briefly the topics treated in certain series of year-books and publications of especial interest to field workers in education. The annual volume of *Proceedings* of the National Education Association contains abstracts of the addresses presented at the meeting of this organization. In addition to a series of stimulating articles, the *Journal of the National Education Association* usually includes significant current statistics, for example,

59 Carter Alexander, *How to Locate Educational Information and Data, op. cit.*, pp. 123-39.

Bulletins of the Bureau of Education from 1906-1927. Bureau of Education Bulletin No. 17, 1928. Washington: Bureau of Education, 1928.

J. W. Cooper, "The Office of Education," *Scientific Monthly*, XXXVI (February, 1933), 121-30.

List of Publications of the U. S. Bureau of Education, 1867-1910. Bureau of Education Bulletin, No. 3, 1910. Washington: Bureau of Education, 1910.

D. H. Smith, *The Bureau of Education—Its History, Activities, and Organization.* Service Monographs of the United States Government, No. 14. Baltimore, Maryland: Johns Hopkins Press, 1923. Pp. xiv + 158.

60 Carter Alexander, *op. cit.*, pp. 113-22.

Index to the Reports of the Commissioner of Education, 1867-1907. Bureau of Education Bulletin, No. 7, 1909. Washington: Bureau of Education, 1909. Pp. 103.

school statistics concerning the various countries of the world, educational developments in the various states, membership statistics of the Departments of Superintendence, Secondary School Principals, and Elementary School Principals, figures on the growth of the National Education Association and state education associations, information on the growth of allied education associations, and figures on the growth of high schools by states during the present century.

Valuable contributions in the curriculum field have been made by the year-books of the Department of Superintendence. This association, beginning the series in 1923, has published year-books under the following titles: *The Status of the Superintendent* (1923), *The Elementary School Curriculum* (1924), *Research in Constructing the Elementary School Curriculum* (1925), *The Nation at Work on the Public School Curriculum* (1926), *The Junior High School Curriculum* (1927), *The Development of the High School Curriculum* (1928), *The Articulation of the Units of American Education* (1929), *The Superintendent Surveys Supervision* (1930), *Five Unifying Factors in American Education* (1931), *Character Education* (1932), *Educational Leadership* (1933), *Critical Problems in School Administration* (1934), *Social Change and Education* (1935), *The Social Studies Curriculum* (1936), and *Educational Interpretation* (1937).

The Department of Secondary School Principals began publication of its year-books in 1917 and since January, 1926, has issued four bulletins each year.

The Department of Elementary School Principals publishes its *Bulletin* five times a year, one number of which is a year-book. Its fourteenth year-book was issued in 1935.

The Department of Classroom Teachers in 1936 published its ninth year-book, and also issues news bulletins.

The eighth year-book of the Department of Supervisors and Directors of Instruction appeared in 1935. Its official journal is *Educational Method*.

The American Educational Research Association, a depart-

ment of the National Education Association, publishes the *Review of Educational Research,* which has been described earlier in this chapter.

The Research Division of the National Education Association in 1923 began a series of bulletins, the *Research Bulletin,* published five times a year, which has proved of unusual value to public-school workers because of the statistics and summaries of professional literature made accessible in this way. It also issues a series of circulars on a variety of educational problems.

The foregoing and other departments are represented in the annual volume of proceedings of the Association. Some of these departments, not specifically cited above, issue bulletins and even year-books, although space does not permit a listing of such publications here. Detailed information concerning the proceedings, bulletins, and year-books of the various departments of the Association and descriptions of its organization and activities are available elsewhere.[61]

National Society for the Study of Education. Likewise it seems worth while to mention here the specific work of the National Society for the Study of Education, whose year-books are probably the most pretentious and most carefully worked out of any issued by existing educational organizations. The topics which have been discussed or investigated by this society since 1920 are concerned with the problems of new materials of instruction, the education of gifted children, silent reading, intelligence testing, English composition, social studies, vocational education, adapting the schools to individual differences, safety education, extracurricular activities, curriculum-making, possibilities and limitations of training, preschool and parental education, arithmetic, rural education, school textbooks, science teaching, changes in liberal arts colleges, geography, school buildings, the activity movement, edu-

[61] Erwin S. Selle, *The Organization and Activities of the National Education Association.* Teachers College Contributions to Education, No. 513. New York: Bureau of Publications, Teachers College, Columbia University, 1932.
Carter Alexander, *op. cit.,* pp. 140-51.

cational diagnosis, grouping of pupils, and music education, with committees at work on international understanding and the curriculum, reading, organization of higher education, and education as a science. In the current year-book of a given professional organization a list of preceding year-book topics and of those under way will usually be found.

American educational and learned associations other than in subject-matter fields. A selected list of educational and learned organizations interested to a greater or less extent in the general problems of education, as compared with subject-matter associations, is given below. Those organizations preceded by an asterisk issue important publications such as a year-book, journal, volume of proceedings, or bulletin. As has been suggested, the current year-book of a given group usually lists the titles of preceding publications, as well as of reports in progress. Earlier in this chapter may be found more detailed comment on the contributions of certain major year-books. Another part of this volume presents a classification of educational associations and periodicals arranged according to the subject of instruction involved. It will be noted that virtually every type of educational activity is represented by one or more national associations. Information concerning the names and addresses of current officers of these organizations and the place and date of meeting may be found in the annual directory of the United States Office of Education. Where a permanent address of a central office is available, it is given below, although in most instances the officers change frequently.

An examination of the subsequent lists of professional and learned organizations indicates that such groups are more numerous at the secondary and higher levels than at the elementary-school level. This situation is probably a natural consequence of the greater amount of advanced training possessed by secondary and college or university workers, training which places considerable emphasis on research and scholarly activities.

Detailed information is available in published sources con-

cerning the organization of research agencies and institutions in the humanistic and social sciences.[62]

American Association for Adult Education, 60 East Forty-Second Street, New York City, *Monographs, Journal.* Quarterly.

* American Association for the Advancement of Science, Washington, D. C., *Proceedings, Science* (weekly), *Scientific Monthly.*

* American Association of Collegiate Registrars, *Proceedings, Bulletin.* Quarterly.

* American Association of Junior Colleges, *Proceedings, Junior College Journal.* 9 numbers.

American Association of Technical High Schools and Institutions.

* American Association of University Professors, *Bulletin.* 8 numbers. Also occasional special reports.

* American Association of University Women, *Journal* (quarterly), *Monographs.*

* American Council of Learned Societies Devoted to Humanistic Studies, 907 Fifteenth Street, N.W., Washington, D. C., *Bulletins.*

* American Council on Education, 744 Jackson Place, Washington, D. C., *Educational Record.* Quarterly.

* American Educational Research Association, *Review of Educational Research.* 5 numbers.

* American Federation of Organizations for the Hard of Hearing, *Proceedings.*

* American Federation of Teachers, *Bulletin.* Monthly.

* American Psychological Association, *Psychological Review, Psychological Bulletin, Journal of Experimental Psychology, Psychological Monographs, Journal of Abnormal and Social Psychology, Psychological Abstracts, Psychological Index.*

* Association of American Colleges, 111 Fifth Avenue, New York City, *Bulletin.* Quarterly.

* Association of American Colleges and High Schools of the Society of Jesus, *Annual Reports.*

* Association of American Universities, *Proceedings.*

* Association of Colleges and Secondary Schools of the Southern States, *Proceedings, Reports.*

* Association of Colleges for Negro Youth, *Minutes.*

Association of Departments of Education in State Universities and Land-Grant Colleges.

62 W. P. Gee, *Social Science Research Organization in American Universities and Colleges.* New York: D. Appleton-Century Co., 1934. Pp. 276.

F. A. Ogg, *Research in the Humanistic and Social Sciences.* New York: The Century Co., 1928. Pp. 454.

W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research,* Chapters XV-XVIII. New York: Harper and Bros., 1930.

* Indicates a publication representing the interests of the given group.

* Association of Governing Boards of State Universities and Allied Institutions, *Proceedings.*
* Association of Land-Grant Colleges and Universities, *Proceedings.*
* Association of Private School Teachers, *Annual Reports.*
* Association of University and College Business Officers of the Eastern States, *Minutes.*
* Association of Urban Universities, *Proceedings, Reports.*
* College Entrance Examination Board, 431 West One Hundred and Seventeenth Street, New York City, *Annual Reports, Bulletins.*

Head Masters' Association.

Head Mistresses' Association of the East.

Head Mistresses' Association of the Middle West.

Head Mistresses' Association of the Pacific Coast.

* Institute for Education by Radio, *Yearbooks.*
* Middle States Association of Colleges and Secondary Schools, *Proceedings.*

National Association of College Deans and Registrars in Negro Schools.

* National Association of College Women, *Journal.*
* National Association of Deans and Advisors of Men, *Proceedings.*

National Association of High School Supervisors and Inspectors.

* National Association of Principals of Schools for Girls, *Yearbooks.*
* National Association of Public School Business Officials, *Bulletins.*
* National Association of State Universities in the United States of America, *Proceedings.*
* National Catholic Educational Association, *Bulletin.* Quarterly.
* National Committee on Research in Secondary Education, *Bulletins, Reports.*
* National Congress of Parents and Teachers, *Yearbooks, Proceedings.*
* National Education Association, 1201 Sixteenth Street, N.W., Washington, D. C., *Journal* (9 numbers), *Annual Proceedings,* and *Research Bulletin.* 5 numbers.
* National Education Association, Departments of:

Administrative Women.

* Adult Education, *Adult Education.*

Art Education.

* Business Education, *Quarterly.*
* Classroom Teachers, *Yearbooks, Bulletins.*
* Deans of Women, *Bulletins, Yearbooks.*
* Educational Research, *Review of Educational Research.*
* Elementary-School Principals, *Yearbooks, Bulletins.*

Kindergarten Primary Education.

* Lip Reading, *Bulletins.*

Music Education.

* Rural Education, *Bulletins* (*Yearbooks*).

School Health and Physical Education.
Science Instruction.
* Secondary Education, *Bulletins.*
* Secondary School Principals, *Yearbooks, Bulletins.*
* Social Studies, *Social Studies, Yearbooks.*
Special Education.
* Superintendence, *Yearbooks, Bulletins, Official Reports.*
* Supervisors and Directors of Instruction, *Yearbooks, Educational Method.*
* Supervisors and Teachers of Home Economics, *Bulletins.*
* Teachers Colleges, *Yearbooks.*
* Visual Instruction, *Educational Screen and Visual Instruction.*
National Council of Education (strictly speaking, not a department).
National Honor Society of Secondary Schools.
* National Research Council, Division of Education Relations, B and Twenty-first Streets, N.W., Washington, D. C., *Bulletins.*
* National Society for Curriculum Study, *Curriculum Journal.*
* National Society for the Study of Education, *Yearbooks.*
* National Society for the Study of Educational Sociology, *Yearbooks.*
* National Society of College Teachers of Education, *Yearbooks.*
* National Vocational Guidance Association, *Vocational Guidance Magazine.* 8 numbers.
New England Association of College Teachers of Education.
* New England Association of College and Secondary Schools, *Proceedings, Reports.*
* New England College Entrance Certificate Board, *Annual Reports.*
New England Vocational Guidance Association.
* North Central Association of Colleges and Secondary Schools, *North Central Association Quarterly.*
* Northwest Association of Secondary and Higher Schools, *Annual Reports, Bulletins.*
Private School Association of the Central States.
* Progressive Education Association, 310 West Ninetieth Street, New York City. *Progressive Education* (8 numbers), *Bulletins.*
Secondary Education Board.
* Southern Association of Colleges and Secondary Schools, *Proceedings.*
Southern Commission on Higher Institutions.

American foundations and boards. Among the American foundations and boards which have promoted educational inquiry through fellowships, exchange lectureships, encourage-

ment of research, subsidies granted to investigators, and through their own studies, annual reports, and publications are those listed below. The annual directory of the Office of Education includes the names and addresses of officers and the place and date of meeting. The annual reports of these organizations include accounts of work completed and under way. Other surveys of the activities of boards and foundations are available.[63]

American Field Service Fellowships for French Universities, 15 Broad Street, New York City.
Anna T. Jeanes Fund, 726 Jackson Place N.W., Washington, D. C.
Baron de Hirsch Fund, 730 Fifth Avenue, New York City.
Carnegie Corporation of New York, 522 Fifth Avenue, New York City.
Carnegie Foundation for the Advancement of Teaching, 522 Fifth Avenue, New York City.
Commission for Relief in Belgium Educational Foundation, 42 Broadway, New York City.
Commonwealth Fund, 41 East Fifty-seventh Street, New York City.
Engineering Economics Foundation, 3 Joy Street, Boston, Massachusetts.
General Education Board, 61 Broadway, New York City.
Harmon Foundation, 140 Nassau Street, New York City.
John F. Slater Fund, 726 Jackson Place, N.W., Washington, D. C.
John Simon Guggenheim Memorial Foundation, 120 Broadway, New York City.
Josiah Macy Junior Foundation, 565 Park Avenue, New York City.
Julius Rosenwald Fund, 4901 Ellis Avenue, Chicago, Illinois.
Kahn Foundation for the Foreign Travel of American Teachers, 270 Madison Avenue, New York City.
Milbank Memorial Fund, 40 Wall Street, New York City.
Payne Fund, 1 Madison Avenue, New York City.
Phelps-Stokes Fund, 101 Park Avenue, New York City.
Rockefeller Foundation, 49 West Forty-ninth Street, New York City.
Russell Sage Foundation, 130 East Twenty-second Street, New York City.
Spelman Fund, 49 West Forty-ninth Street, New York City.

63 *A Handbook of Educational Associations and Foundations in the United States.* Bureau of Education Bulletin, No. 16, 1926. Washington: Bureau of Education. Pp. iv + 82.

Henry R. Evans, *Educational Boards and Foundations, 1926-1928.* Bureau of Education Bulletin, No. 9, 1929. Washington: Bureau of Education. Pp. 12.

Pedro E. Y. Rio, *Thirteen Educational Foundations and American Higher Education.* Philadelphia: Temple University, 1935. Pp. 108.

International educational associations and foundations. The student of education and field worker should recognize that international, as well as national and regional associations, societies, and foundations, are at work in the advancement of the science and practice of education. Evidence of international interest in education and of intellectual coöperation is found in such organizations, in numerous exchange scholarships and professorships, and in the granting of funds for research on an international basis. Current periodical literature also provides tangible evidence of this interest. For the selected organizations listed below, the names and addresses of officers, and place and date of meeting may be found in the annual educational directory of the United States Office of Education. Where permanent addresses are available, they are given.

Institute of International Education, 2 West Forty-fifth Street, New York City.
International Bureau of Education, 44 Rue des Maraichers, Geneva, Switzerland.
International Council of Religious Education, 203 N. Wabash Avenue, Chicago, Illinois.
International Education Board, 49 West Forty-ninth Street, New York City.
World Association for Adult Education, 16 Russell Square, London, W.C. 1, England.
World Federation of Education Associations, Galata Post Box 392, Istanbul, Turkey.

Series of professional textbooks, public-school textbooks, and book lists. Certain publishing houses issue professional books in series, such as the *Riverside Textbooks in Education* (Houghton Mifflin), and the *Appleton-Century Series in Supervision and Teaching*. Some workers find it helpful to examine the titles of volumes in such series when in search of information on a given educational problem. A list of these series in education has been made available.[64] The *Education*

64 Frederick L. Whitney and Earle U. Rugg, "Sources of Current Literature in Education," *Teachers Journal and Abstract*, I (January, 1926), 47-53.

Index publishes the titles of such series as are indexed in its columns.

Book reviews and lists of current publications, published in professional journals, are helpful in locating new titles whether members of an educational series or individual volumes.

The Society for Curriculum Study has initiated the publication of a list of textbooks for the elementary and secondary levels. The list for 1931-33 includes 120 elementary and 1057 secondary and junior-college texts, classified by school subjects.[65] The total number of such textbooks published in 1934 was 460.

The *American Educational Catalogue*, the *Cumulative Book Index*, and the *Publishers' Weekly* are also useful in securing a list of recent textbooks for public schools, with the *United States Catalogue* available for somewhat older books.

The *Education Index* is valuable in locating book lists dealing with a variety of educational topics. An annual publication of the American Library Association is especially complete; it gives all the lists of the association up to its date of publication.[66]

Alexander has provided a useful and somewhat detailed discussion of how book lists and textbooks may be located.[67]

Educational reference works. Although encyclopedias and more specialized reference works in education and psychology are of value, especially to those without advanced training or without other adequate library facilities, it must be recognized that the service rendered by such handbooks to the advanced student and research worker is limited. The expense of frequent revision and the brevity of treatment caused by limited space are problems faced by all editors and publishers, as well

[65] M. E. Herriott, "Elementary Textbooks of 1931-1933." and "Secondary and Junior College Textbooks of 1931-1933." *Society for Curriculum Study News Bulletin*, V (February 12 and April 9, 1934), 1-16, 1-76.
——— and Others, "Textbooks of 1934," *Society for Curriculum Study News Bulletin*, VI (January 15, 1935), 9-46.
——— and Others, "Textbooks of 1935," *Curriculum Journal*, VII (February, 1936), 15-43.

[66] American Library Association, *Books and Pamphlets on Library Work*. Chicago: American Library Association. Published annually.

[67] Carter Alexander, *op. cit.*, pp. 183-6, 216-9.

as users, of such reference volumes. A revision of Monroe's encyclopedia would be especially welcome, although a very large undertaking. Among these works are: Paul Monroe's *An Encyclopedia of Education,* F. Watson's *The Encyclopedia and Dictionary of Education,* J. M. Baldwin's *A Dictionary of Philosophy and Psychology,* H. C. Warren's *Dictionary of Psychology* (1934), *The Classroom Teacher* (Chicago), Mudge's *Guide to Reference Books,* and the general reference works and encyclopedias such as the *Britannica* and *International.*

A more complete list of dictionaries, encyclopedias, and related publications in education and psychology, including those published in Germany, Austria, France, and England follows:

UNITED STATES

H. Kiddle and A. J. Schem, *Cyclopedia of Education,* 1877, first in the English language.

James M. Baldwin, *Dictionary of Philosophy and Psychology,* 1901, three volumes; revised in 1928, Macmillan.

Paul Monroe, *Cyclopedia of Education,* 1911-13, five volumes, Macmillan.

M. B. Hillegas, *Classroom Teacher,* 1927-28, thirteen volumes.

H. C. Warren, *Dictionary of Psychology,* 1934, Houghton Mifflin; defines ten thousand terms.

H. B. English, *A Student's Dictionary of Psychological Terms,* 1929, Antioch College.

M. E. Haggerty, *Topics in Psychology,* 1929, University of Minnesota, 2584 items.

C. W. Odell, *A Glossary of Three Hundred Terms Used in Educational Measurement and Research,* 1928, University of Illinois.

D. A. Robertson, *Standard Terminology in Education,* 1927, American Council on Education.

L. Belle Voegelein, *List of Educational Subject Headings,* 1928, Ohio State University.

EDUCATIONAL ENCYCLOPEDIAS IN FOREIGN COUNTRIES

Germany

I. G. C. Wörle, 1835.

K. A. Schmid, 1876-87, ten volumes.

W. Rein, 1903-10, ten volumes.

Austria
Joseph Loos, 1906, two volumes.

France
F. Buisson, 1911.

England
A. E. Fletcher, a one-volume handbook.

Foster Watson, *The Encyclopedia and Dictionary of Education,* 1921, four volumes, Pitman.

Graduate theses in education. Suggestions have been made earlier in this chapter for canvassing systematically the related studies in the form of Masters' and Doctors' theses. For the sake of emphasis, even at the risk of some repetition, a fuller statement of the canvass of theses on related problems is made at this time. Like most other fields, the graduate thesis in education does not ordinarily have a sale sufficiently large to allow publication and distribution on a commercial basis. Exceptions to this statement may be found in the monograph series of such institutions as Columbia and Harvard, although universities which publish the Doctor's thesis usually require the student to underwrite the cost of publication. However, the majority of doctorate studies are unpublished, except for a brief abstract, and distribution of studies printed in full or in part is quite limited. Few Masters' theses are printed except as summaries appear in educational journals or in volumes of graduate abstracts. Therefore, it will be recognized that, except for the worker who visits the library of the university where a given degree was awarded, most graduate theses are comparatively inaccessible. This condition is being remedied in part by interlibrary loans of theses and by the collection of graduate studies assembled by the Office of Education at Washington for lending purposes. The Office distributes occasional lists of its available theses and annual lists of all theses completed in education. In view of such difficulties, many graduate schools publish lists of theses completed or abstract volumes summarizing such studies. Some institutions

provide lists of graduate investigations under way in order to reveal centers of interest, promote a measure of coördination in research, and avoid unnecessary duplication. The United States Library of Congress has an annual list of printed American doctoral studies, including all fields, beginning with 1912.[68] In certain fields representative journals list annually thesis titles under way or completed in the area represented, which is of value to investigators and field workers.

Among the institutions represented in the chapter bibliography, which have compiled lists of theses completed or abstracts of such studies are California (Joyal), a group of California universities (Touton), Chicago, Cincinnati (Good), Illinois (Gregg and Hamilton), Indiana State Teachers College, Iowa, Kentucky, Michigan, Minnesota (Engelhardt and Otto, Grinnell, Umstattd, Fink), Pennsylvania State College (Peters and Struck), Pittsburgh (Buckner), Temple, and Texas institutions (Eby and Frost).

Bibliographies or abstracts of theses in special fields are represented in the chapter bibliography as follows: secondary school administration (Douglass, Eikenberry, Reavis and Butsch, Roemer, Touton), sociology, chemistry (West and Hull), science (West and Hull), modern foreign language (Doyle), business education (Haynes and Graham), physical education (Browne), and Negro education (Knox).

Other available information deals with Doctors' theses under way in education (Good), Doctors' theses completed over a ten-year period (Monroe), and theses on file with the Office of Education for lending purposes. Earlier in this chapter reference was made to two other helpful sources for locating graduate theses and dissertations, with the first reference devoting some space to interlibrary loans.[69]

[68] United States Library of Congress, *A List of American Doctoral Dissertations Printed in 1931*. Washington: Government Printing Office, 1933. See other lists.
Also see D. B. Gilchrist, *Doctoral Dissertations Accepted by American Universities, 1933-34*. Number 1. New York: H. W. Wilson Co., 1934. Pp. 98. See later numbers.

[69] Carter Alexander, *op. cit.*, pp. 152-9, 223-9.
Clara E. Derring, "Lists and Abstracts of Masters' and Doctors' Dissertations in Education," *Teachers College Record*, XXXIV (March, 1933), 490-502.

Leaders in education and psychology, and educational directories. Most of the preceding portion of this chapter has been concerned with the various types of educational literature available. It seems desirable to devote some space to the institutions, agencies, leaders, authors, and investigators who prepare or sponsor such information. The characteristics and training of the "man behind the gun" are important matters in military organizations and operations. No less significant for the field of research are the characteristics, training, distribution, activities, positions, institutional affiliations, etc., of those who conduct scientific investigations and produce educational literature. This problem is discussed at some length in Chapter XV in terms of the training and supervision of research workers; however, it seems appropriate at this time to enumerate the various guides supplied by biographical directories; analyses of the characteristics and activities of educators, scientists, and psychologists; and directories and statistics of the institutions with which such workers are affiliated.

Biographical directories. The directories which provide biographical data concerning prominent workers in education, psychology, and allied scientific fields are: *Who's Who, Who's Who Among North American Authors, Who's Who in America, Who's Who in American Education, Psychological Register, Leaders in Education, American Men of Science,* and the *Phi Delta Kappa Directory* (publication of a national professional fraternity in education.) Other biographical directories for securing information about individuals are listed in the chapter bibliography. More detailed guidance for this type of library procedure has been provided by Alexander, who describes briefly the various biographical directories.[70]

Although few biographical data are given in the membership lists of professional organizations (such as the National Society for the Study of Education, National Society of College Teachers of Education, Sections Q and I of the American Association for the Advancement of Science, American Educational Research

[70] Carter Alexander, *op. cit.*, pp. 230-42.

Association, Department of Superintendence, Department of Elementary-School Principals, Department of Secondary-School Principals, Department of Supervisors and Directors of Instruction, and the American Psychological Association), frequently the limited information provided is sufficient to meet a given need. In most instances these lists appear in a year-book, journal, or other official organ. Obviously, it is inadvisable in the limited space available to compile from these directories a list of workers prominent in the different fields of educational writing and research. The various studies mentioned in the bibliographies of this book are a fair indication of the individuals most active in the several phases of educational research.

Likewise, it seems impracticable to suggest a list of contributions made by individual workers in the various fields, or a statement of current research projects. By the time this chapter reaches the reader, such a list of contributions would not be complete and the research projects no longer would be contemporary. The intellectual activity and growth of the university student and worker in service will be stimulated more effectively, and his individual interests met more adequately, if he performs these services for himself. The type of information outlined in the present chapter makes this canvass possible with a minimum of waste motion.

It will be recognized that the nature of the contribution made varies with the individual worker. An editorial writer states that there are two types of leaders in education—innovators who establish "experimental" schools where traditional subjects are abolished and centers of interest set up, and scientists who search for facts on which to base curriculum materials and new procedures in promoting the learning process.[71] Certainly the progressive student of education and teacher in service will desire to become acquainted with the contributions of both types of educational workers. Another educational editor suggests that there are three kinds of leaders who make

71 "Invention and Appraisal," *Educational Method*, IX (December, 1929), 129-30.

valuable contributions—the administrator, the investigator, and the interpreter.[72]

Attempts to compile selected lists of educational writers and workers. Although it seems inadvisable to present a list of frequent contributors to the literature of educational research, it is of interest to note the activities considered in two attempts to compile such a selected group. One of the authors' classes used Plan I in compiling a list of 168 contributors to educational literature of a factual nature. Miss Jane Adams, at Stanford University, used Plan II in choosing one hundred eminent educators. The amount of overlapping in the two resulting groups of workers is evidenced by the fact that seventy of the one hundred men on the Adams list were represented in the group of 168 discovered by Plan I.

Of course, the shortcomings of such attempts to identify educational leaders, caused by the sins of omission and commission, are evident without extended comment. It will be recognized that mere frequency of publication and number of years served in a particular type of position do not indicate relative values in terms of the contribution made to education. Such books as Dewey's *Democracy and Education* and *The School and Society* have had more influence on educational philosophy than hundreds of certain other published volumes. The relatively short period of service permitted to Inglis was of more significance to secondary education than the work and writing of many others of less vision and insight. At any rate the check-lists reproduced below do suggest useful activities, experiences, and areas of service in the field of educational endeavor.

Plan I [73]

1. Monroe, *Ten Years of Educational Research*, 1918-1927 (Authors with three or more references to their credit, two points for each reference.)

72 J. E. Morgan, "Educational Interpretation and the Printed Word," *School and Society*, XXX (July 20, 1929), 79-83.

73 Used by a class in Thesis Writing and Research at the University of Cincinnati.

2. List of Sixty Educational Books, *Journal of the National Education Association,* for past five or more years (Ten points for each title.)

3. Professional year-books and proceedings (One point for work as a committee member or contributor to a chapter.)
   - Classroom Teachers
   - Elementary-School Principals
   - Secondary-School Principals
   - Department of Superintendence
   - National Education Association Proceedings
   - American Association of Teachers Colleges
   - National Conference of Supervisors and Directors of Instruction
   - National Society for the Study of Education
   - National Society of College Teachers of Education

4. *Teachers Journal and Abstract,* from date of first appearance (One point for each article.)

Plan II [74]

I. Inclusion of name in 1930-31 *Who's Who in America* (All material for checking was secured from the individual's biography in *Who's Who* except the score on magazine articles which was the result of checking the *Readers' Guide* for the years 1920 to 1930 inclusive.)

II. Ratings:	Points
1. Magazine articles (educational) (Estimate allowance to be made where there is a large number of one-page articles or articles of obviously minor importance, or department or official reports not distinctly of author's composition.)	1 each
2. Books on education Co-author—2 points New edition—2 points Educational articles in encyclopedias	4 each 1 each
3. Editor of educational books	1 each
4. Editor of educational series of books	2 each
5. Editor of educational journal (for each five-year period)	1 each
6. Writing in other fields	
7. Educational surveys made (as director or member of committee)	1 each

[74] Used by Jane Adams at Stanford University.

8.	Educational or intelligence tests	1 each
9.	Service on educational committee	1 each
10.	War service (educational)	1 total
11.	Highest degree earned	
	Ph.D. or Ed.D. —2	
	M.A. —1½	
	B.A. —1	
12.	Honorary degrees	1 each
13.	Member, or officer, of professional educational association	1 or 2 — total
14.	Member, or officer, of Phi Beta Kappa or any honorary educational fraternity	1 or 2 — total
15.	Positions held:	
	Elementary or high school	½
	Normal school or college	1
	College president	3
	University professor	1½
	Some qualifications, where rating not equable, as, university professor:	
	1 year only	½
	2—5 years	1
	10 or more	2
	20 or more	4
	Dean, school of education	3
	President of university	4
	City or county superintendent	1
	State superintendent of schools	3
	United States Commissioner of Education	4
	United States Office of Education	1
	Summer school (college or university)	½

It is of more than passing interest, as well as of informational value, to note the manner in which certain educational leaders with national and international reputations have been recognized by their institutions, fields, or students, or by compilations of lists of their publications: celebration of the seventieth birthday of John Dewey,[75] commemoration of the

75 "In Honor of John Dewey," *Teachers College Record*, XXXI (December, 1929), 207-44.
"John Dewey," *Journal of the National Education Association*, XVIII (December, 1929), 281-96.
M. H. Thomas and H. W. Schneider, *A Bibliography of John Dewey*, New York: Columbia University Press, 1929. Pp. 172.

twenty-fifth anniversary of Thorndike's appointment to the staff of Teachers College of Columbia University,[76] recognition of the contributions of Charles H. Judd together with a list of his publications,[77] a review of the work of the late B. T. Baldwin,[78] a series of articles on the life and work of E. P. Cubberley and a book in his honor,[79] the W. T. Harris Centennial,[80] a quarter of a century of service by Paul Monroe,[81] the writings [82] of Nicholas Murray Butler, and the history of psychology in autobiography.[83] Two current attempts to analyze the social attitudes and ideas of leaders in American education have attracted a great deal of attention and are well worth the attention of the critical reader.[84]

Although the reader will doubtless agree that it is undesirable for authors or students of research to compile an extended or purportedly complete list of scientists, psychologists, or educational leaders, some profit by way of intellectual stimulation may accrue to the beginner in graduate work through scanning lists of the presidents of two of the most scholarly American organizations, the American Association for the Advancement of Science and the American Psychological Association. The presidents of the latter organization are listed in the annual directory (year-book) of its members.

[76] "Annotated Chronological Bibliography of Publications by E. L. Thorndike," *Teachers College Record*, XXVII (February, 1926), 466-515.

[77] "In Honor of Charles Hubbard Judd," *Zeta News* (Phi Delta Kappa, University of Chicago), XII (April, 1927), 1-33.

[78] Dorothy E. Bradbury and Marion Hossfeld, "A Review of the Published Writings of Bird Thomas Baldwin," *Psychological Bulletin*, XXVIII (April, 1931), 257-76.

[79] "Cubberley (A Series of Articles on His Life and Work)," *California Quarterly of Secondary Education*, VIII (April, 1933), 229-49.

Also see the commemorative volume of papers by J. C. Almack and Others, *Modern School Administration*. Boston: Houghton Mifflin Co., 1933. Pp. 382.

[80] "William Torrey Harris," *International Education Review*, IV (1935), 235-316. A series of articles on the contributions of Harris.

[81] I. L. Kandel, Editor, *Twenty-five years of American Education*: Collected Essays. New York: The Macmillan Co., 1924. Pp. xvi + 469.

[82] M. H. Thomas, Compiler, *Bibliography of Nicholas Murray Butler, 1872-1932*. New York: Columbia University Press, 1934. Pp. 438.

[83] Carl Murchison, Editor, *A History of Psychology in Autobiography*, Vols. I, II. Worcester, Mass.: Clark University Press, 1930, 1932. Pp. 516, 407.

[84] Norman Woelfel, *Molders of the American Mind:* A Critical Review of the Social Attitudes of Seventeen Leaders in American Education. New York: Columbia University Press, 1933. Pp. 304.

Merle Curti, *The Social Ideas of American Educators*. Part X, Report of the Commission on the Social Studies, American Historical Association. New York: Charles Scribner's Sons, 1935. Pp. xxiv + 613.

facts concerning 192 presidents of colleges belonging to the Association of American Universities, the North Central Association of Colleges and Secondary Schools, and the Southern Association of Colleges and Secondary Schools, as gleaned from *Who's Who in America*.[100] Palmer discusses fifty-five changes in college presidencies and gives information concerning the experience, vital statistics, motives in acceptance, etc., of these presidents.[101] Robinson bases certain conclusions on an analysis of the sex of college presidents and on statements from prominent educators.[102]

Psychologists and their laboratories have also received a considerable amount of attention in current periodical literature. Fernberger gives a cross section of the distribution and publications of members of the American Psychological Association.[103] Ching-Ju Ho includes an analysis of the vocational histories of prominent psychologists in his personnel studies of scientists.[104] Cattell discusses the distribution and organization of psychologists in America.[105] Garvey lists for 117 institutions information concerning the date of the first psychology laboratory, first director, amount of original grant, date of first publication, and author.[106] Cattell[107] and Fernberger[108] discuss

100 H. P. Rainey, "Some Facts about College Presidents," *School and Society*, XXX (October 26, 1929), 580-4.

101 A. M. Palmer, "Newly Elected College Presidents," *School and Society*, XXX (December 21, 1929), 852-6.

102 F. B. Robinson, "Women as Prospective College Presidents," *School and Society*, XXX (August 24, 1929), 245-52.

103 Samuel W. Fernberger, "Statistical Analyses of the Members and Associates of the American Psychological Association, Inc., in 1928: A Cross Section of American Professional Psychology," *Psychological Review*, XXXV (November, 1928), 447-65.
———, "The Publications of American Psychologists," *Psychological Review*, XXXVII (November, 1930), 526-44.
V. A. Jones, "Fields of Instruction and Research in Psychology as Represented by Members of the American Psychological Association," *Journal of General Psychology*, X (January, 1934), 211-4.

104 Ching-Ju Ho, *Personnel Studies of Scientists in the United States*. Teachers College Contributions to Education, No. 298. New York: Teachers College, Columbia University, 1928. Pp. 60.

105 J. M. Cattell, "Psychology in America," *Science*, LXX (October 11, 1929), 335-47; *Scientific Monthly*, XXX (February, 1930), 114-26.

106 C. R. Garvey, "List of American Psychology Laboratories," *Psychological Bulletin*, XXVI (November, 1929), 652-60.

107 J. M. Cattell, "Early Psychological Laboratories," *Science*, LXVII (June 1, 1928), 543-8.

108 S. W. Fernberger, "The American Psychological Association: A Historical Summary, 1892-1930," *Psychological Bulletin*, XXIX (January, 1932), 1-89.

respectively early psychological laboratories and the growth of the American Psychological Association.

Information is also available concerning the foreign-language training of holders of the Ph.D. degree, methods of training great teachers, and the longevity of educators. Betts and Kent describe the foreign-language equipment of 2,325 Doctors of Philosophy; naturally it is expected that the individuals of this group will furnish much of the educational leadership in their respective fields.[109] Kelly and Anderson inquired of 349 representative college and university executive officers concerning methods of producing great teachers.[110] Luckey reports data concerning the length of life of eminent educators in Greece, Italy, Scotland, Switzerland, France, Germany, England, and the United States.[111]

Directories and statistics of educational institutions. Much significant information is to be found in the educational directories of accrediting organizations, of state and city school systems, and of higher institutions. The United States Office of Education publishes an annual educational directory which includes such items of information as principal state school officers, county superintendents, superintendents of public schools, superintendents of Catholic parochial schools, universities and colleges, presidents or deans of professional schools, educational boards and foundations, and educational and learned associations, as well as a list of other available educational directories. The Office of Education also publishes lists of accredited secondary schools and higher institutions, and statistical surveys of the school system at all levels. Patterson's *American Educational Directory* is a useful handbook. Other directories, handbooks, or statistical surveys represented in the chapter bibliography deal with universities and colleges

109 G. H. Betts and R. A. Kent, *Foreign Language Equipment of 2,325 Doctors of Philosophy*. Northwestern University Contributions to Education, No. 2. Bloomington, Ill.: Public School Publishing Co., 1929. Pp. 152.

110 Robert L. Kelly and Ruth E. Anderson, "Great Teachers and Some Methods of Producing Them," *Journal of Educational Research*, XX (June, 1929), 22-30.

111 G. W. A. Luckey, "Longevity of Eminent Educators," *School and Society*, XXVIII (August 25, 1928), 244-8.

(Halle, Hurt, MacCracken, Robertson, Walters), junior colleges (Campbell, Eells), Christian education (Kelly and Anderson), Catholic colleges and schools, graduate schools (Hughes), presidents of American colleges and universities, private-school teachers, private schools for American boys and girls, etc. The chapter bibliography should be scanned rapidly to locate the particular type of handbook or directory desired. Detailed directions for use of such reference volumes in collecting information about individuals or institutions are available in another source.[112]

Another chapter (XI) of this book deals with the statistical concepts essential to correct interpretation of educational data and statistics. Tyler has recommended a desirable content for courses designed to give training for intelligent reading of statistical literature.[113] The range in items of information collected by ten different state departments of education has been analyzed by Reavis to show what types of facts are available in the states in question.[114] General volumes of statistics listed in the chapter bibliography, which cover a wide range of topics, including education, are the *Statistical Abstract of the United States,* the *World Almanac,* and the *Statesman's Yearbook.*

News items, quotations, and pictures. There are many times when the educational worker has occasion to search for news items, quotations, proverbs, pictures, illustrations, and portraits. An excellent discussion of library procedure in locating such information has been provided,[115] and in the chapter bibliography a number of valuable guides for use in this type of work are listed.

Systematic organization of educational literature and information. The school worker who sees the problems of educa-

112 Carter Alexander, *How to Locate Educational Information and Data, op. cit.,* pp. 187-99, 230-42.

113 R. W. Tyler, "Statistics Needed by Readers," *Educational Research Bulletin,* IX (April 16, 1930), 205-11.

114 W. C. Reavis, "Items of Information Collected by Departments of Public Instruction of Ten Representative States," *Elementary School Journal,* XXIX (May, 1929), 666-73.

115 Carter Alexander, *op. cit.,* pp. 243-63.

tion as component parts of a unified whole, rather than in isolation, promises most in the solution of such difficulties. A similar recognition of relationships is helpful in working with the literature of educational investigation. Some workers have found it worth while at intervals, in maintaining perspective, to review an outline of the entire range of educational problems at all levels—elementary, secondary, and higher. (For example, see the analyses in the appendix.)

A rather detailed statement of the problems of secondary education is presented in the accompanying outline as an illustration of the way in which each major level or field of education may be subdivided. The literature of secondary education falls rather naturally under such headings. It may be suggested that the worker in secondary education will find it convenient and profitable to group educational information according to this, or a similar, organization of topics of interest. It is entirely possible that many workers may prefer to organize materials along functional lines, such as administration, supervision, curriculum, psychology, etc., rather than by levels of instruction. As has been suggested, secondary education has been used here only as an incomplete example of what may be done by way of classification and subdivision. Attention already has been directed to the importance of subject headings in library work.

DIVISIONS OF THE FIELD OF SECONDARY EDUCATION

I. Secondary Administration and Supervision
   1. Educational administration, organization, and management
   2. Business administration, finance, buildings and grounds
   3. School legislation
   4. School surveys
   5. Extracurricular activities
   6. Educational and vocational guidance
   7. Marks and examinations
   8. Pupil grouping
   9. Schedule-making
   10. Records

11. Size of class
12. Student government
13. Relation to community and higher institutions

II. Psychology of the Secondary School and Measurement
1. Psychological tests
2. Educational tests and measurements
3. Statistical methods
4. Psychology of learning
5. Adolescent psychology
6. Individual differences
7. Education of exceptional children
8. Experimental education, research, and the scientific movement
9. Psychology of the school subjects
10. Failure and elimination, diagnostic and remedial work

III. General Theory and General Methods of Teaching
1. Aims and objectives
2. Selection and organization of subject-matter
3. Economical bases of learning: self-activity, motivation, interest, apperception, frame of mind, etc.
4. Types of learning and teaching
5. Study problems: directed study, reading, how to study, use of books
6. Miscellaneous methods and problems: project, problem, conversational and discussion, lecture, laboratory, questioning, and visual methods
7. Educational philosophy
8. Educational sociology

IV. Secondary Curriculum and Special Method
1. Commercial and business education
2. English
3. Fine arts
4. Foreign languages
5. Home economics
6. Manual and industrial arts
7. Mathematics
8. Moral and character education
9. Music
10. Physical and health education
11. Science
12. Social studies

V. History of Secondary Education
1. Educational biography
2. Current educational conditions
3. Comparative secondary education

VI. Reorganization and Adjustment in the Secondary School
   1. Junior high school
   2. Junior college
   3. Curriculum

Concluding statement. The competent physician must keep constantly abreast of the latest discoveries in the field of medicine, since human life itself is at stake. He knows the specialist to whom a difficult case should be referred for most effective treatment. Of course, the most skilled practitioner or surgeon cannot keep in mind all the details of his calling. However, he is adept in locating information promptly, when needed, in his case books and medical journals. The successful lawyer must be able readily to locate information pertinent to the case at hand in the records of court decisions and in the statutes. Certainly those in charge of the intellectual and educational development of youth are under an equally great obligation to secure the best available information concerning the most effective learning, teaching, and administrative procedures. Obviously the careful student of education, the research worker and investigator, the critical supervisor and administrator, and the thoughtful classroom teacher should become familiar with the location and use of the sources of educational information listed in this chapter, even though he actually reads regularly and systematically only a small portion of the available material.

When Thomas A. Edison was a boy he set out to read all the material in the Detroit Public Library, which of course he did not accomplish. However, during his long life, he did read everything available on the subjects with which he was working, as well as on many other apparently remote matters. His established procedure was to determine what others had done and then go forward from this point.[116]

The bibliographical survey of related factual, experimental, theoretical, and historical materials orients the investigator and the problem in terms of the adequacy of the available evidence,

116 T. A. Boyd, *Research*, p. 72. New York: D. Appleton-Century Co., 1925.

Pp. viii + 212. Also see annual supplements in the *Elementary School Journal*.

BYE, E. C., editor. *A Bibliography of the Teaching of the Social Studies*. New York: H. W. Wilson, 1933 (revised). Pp. 104.

CAMPBELL, D. S. "Directory of the Junior College, 1934," *Junior College Journal*, IV (January, 1934), 205-20. Also see later annual directories.

CAMPBELL, D. S. "Directory of the Junior College, 1936," *Junior College Journal*, VI (January, 1936), 209-23.

CARLSON, Pearl G. "Periodicals and Their Indexing," *Peabody Journal of Education*, VI (July, 1928), 30-2.

CARR, Margaret J. S. *Accredited Secondary Schools in the United States*. Office of Education Bulletin, No. 17, 1934. Washington: Office of Education, 1934. Pp. vi + 128.

CASON, Hulsey, and LUBOTSKY, Marcella. "The Influence and Dependence of Psychological Journals on Each Other," *Psychological Bulletin*, XXXIII (February, 1936), 95-103.

CHAMPNEYS, Mary C. *An English Bibliography on Examinations (1900-1932)*. International Institute Examinations Inquiry. London: Macmillan and Co., Ltd., 1934. Pp. xxiv + 140.

CHARTERS, W. W., and WAPLES, Douglas. *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929. Pp. xx + 666.

CLARK, R. "The Periodical Reading of Teachers-to-Be," *School and Society*, XXX (December 7, 1929), 773-5.

COLE, Robert D. *Modern Foreign Languages and Their Teaching*. New York: D. Appleton and Co., 1931. Pp. xxiv + 598. Reviews the investigations in the field.

COLEMAN, Algernon, and JACQUES, Agnes. *An Annotated Bibliography of Modern Language Teaching, 1927-1932*. Chicago: University of Chicago Press, 1933. Pp. 296.

COLLINS, E. A. "Contributions to Educational Periodicals," *Peabody Journal of Education*, VI (March, 1929), 278-81.

COOK, Katherine M., and REYNOLDS, Florence E. *The Education of Native and Minority Groups:* A Bibliography, 1932-34. Office of Education Pamphlet, No. 63, 1935. Washington: Office of Education, 1935. Pp. 25.

COOK, P. A. W. "A Guide to the Literature on Negro Education," *Teachers College Record*, XXXIV (May, 1933), 671-7.

COPELAND, J. I. "Periodical Check-list for a Teachers College Library," *Peabody Journal of Education*, XII (July, 1932), 37-47, 49.

CORNELINSON, Signe. "Content of State Educational Journals, 1929-30 and 1930-31." Unpublished Master's thesis, University of Chicago, 1932.

COWLEY, W. H. *The Personnel Bibliographical Index*. Columbus, Ohio: Ohio State University, 1932. Pp. vi + 434.

* CRAWFORD, C. C. *The Technique of Research in Education*, Chapter XV. Los Angeles: University of Southern California, 1928.

CURTIS, F. D. *A Digest of Investigations in the Teaching of Science in the Elementary and Secondary Schools*. Philadelphia: P. Blakiston's Son and Co., 1926. Pp. x + 342.

CURTIS, F. D. *Second Digest of Investigations in the Teaching of Science.* Philadelphia: P. Blakiston's Son and Co., 1931. Pp. xx + 424.

DAVIS, E. W. "Aids to Occupational Research: A Guide to Available Source Materials," *Occupations,* XIII (March, 1935), 503-13.

DAVIS, R. A., and BALLARD, C. R. "The Development of Research in Learning," *Journal of Educational Psychology,* XXIII (March, 1932), 226-35. Analysis of material on learning found in sixty-five periodicals over a period of forty years.

DAVIS, S. E. *Character and Development of Educational Periodicals in the United States During the Nineteenth Century.* Bureau of Education Bulletin, No. 28, 1919. Washington: Bureau of Education. Pp. 126.

DECH, A. O. "A Guide to the Literature of the Curriculum," *Teachers College Record,* XXXV (February, 1934), 407-14.

DERRING, Clara E. "Lists and Abstracts of Masters' Theses and Doctors' Dissertations in Education," *Teachers College Record,* XXXIV (March, 1933), 490-502.

DEWEY, Evelyn. *Behavior Development in Infants:* A Survey of the Literature on Prenatal and Postnatal Activity, 1920-1934. New York: Columbia University Press, 1935. Pp. 321.

DILLMAN, Pauline I. "Magazines in the Junior College Library," *Junior College Journal,* IV (February, 1934), 227-31.

DOUGLASS, H. R. "Abstracts of Unpublished Masters' Theses in the Field of Secondary-School Administration (Minnesota)," *Bulletin of the Department of Secondary-School Principals of the National Education Association,* No. 47, May, 1933. Berwyn, Ill.: H. V. Church. Pp. 100.

DOWNS, R. B. "Mobilization of Library Resources," *School and Society,* XLIII (March 14, 1936), 368-70.

DOYLE, H. G. "Doctors' Degrees in Modern Foreign Languages, 1934-35," *Modern Language Journal,* XX (October, 1935), 37-41.

* DUTCHER, G. M., and Others, Editors. *A Guide to Historical Literature.* New York: The Macmillan Co., 1931. Pp. 1222.

EBY, Frederick, and FROST, S. E. *Titles of Graduate Theses and Dissertations Written in the Field of Education at Six Leading Educational Institutions in Texas.* Austin, Tex.: University of Texas, 1934.

EDWARDS, Newton. "Methods and Materials of Legal Research," *Review of Educational Research,* IV (February, 1934), 85-91.

EELLS, W. C. *Bibliography on Junior Colleges.* Office of Education Bulletin No. 2, 1930. Washington: Office of Education. Pp. x + 168. Also see supplements in the *Junior College Journal.*

——— "Status of the Junior College in the United States, 1933-34," *School and Society,* XXXIX (January 27, 1934), 126-8.

——— "Status of the Junior College in the United States, 1934-35," *School and Society,* XLI (February 9, 1935), 204-7.

EIKENBERRY, D. H., and Others. *Abstracts of Unpublished Masters' Theses in the Field of Secondary-School Administration.* Bulletin of the Department of Secondary-School Principals of the National Education Association, No. 39, January, 1932. Cicero, Ill.: H. V. Church. Pp. 172. Covers theses completed at Ohio State University.

ENGELHARDT, Fred, and OTTO, H. J. *Masters' and Doctors' Theses in Education, 1912-1928.* Minneapolis, Minn.: University of Minnesota, 1929. Pp. 32.

EVENDEN, E. S. *Summary and Interpretation.* National Survey of the Education of Teachers, Vol. VI. Washington: Office of Education, 1935. Pp. 253.

FAY, Lucy E., and EATON, Anne. *Instruction in the Use of Books and Libraries.* (Third edition, revised.) Boston: F. W. Faxon Co., 1928. Pp. 475.

FIFE, R. H. "The Teaching of Modern Foreign Languages: A National Survey," *Journal of Educational Research,* XXIII (April, 1931), 296-307.

FINK, Stuart D., and UMSTATTD, J. G. *Abstracts of Masters' and Doctors' Theses in Education, University of Minnesota, July 1, 1930 to July 1, 1931.* Educational Research Bulletin, No. 4, Eta Chapter, Phi Delta Kappa, College of Education, University of Minnesota. Minneapolis, Minn.: Phi Delta Kappa, University of Minnesota, 1932. Pp. 72.

FRANKE, P. R., and DAVIS, R. A. "Changing Tendencies in Educational Research," *Journal of Educational Research,* XXIII (February, 1931), 133-45.

FREEMAN, E. M. "Procedures and Results of Efforts to Reorganize Science Instruction in the University of Minnesota," *Peabody Journal of Education,* VI (January, 1929), 204-18.

GILBERT, L. C. "Professional Reading of Young Students of Education," *School Review,* XL (October, 1932), 606-12.

GOOD, Carter V. "Doctors' Theses Under Way in Education, 1934-1935," *Journal of Educational Research,* XXVIII (January, 1935), 376-99. This service began in January, 1931.

——— "Doctors' Theses Under Way in Education, 1935-1936," *Journal of Educational Research,* XXIX (January, 1936), 384-406.

* ——— *How to Do Research in Education,* Chapter II. Baltimore: Warwick and York, 1929.

——— *Teaching in College and University.* Baltimore: Warwick and York, 1929. Pp. xii + 558.

———, and Others. *Abstracts Graduate Theses in Education, Teachers College, University of Cincinnati, 1927-1931.* Cincinnati, Ohio: Teachers College, University of Cincinnati, 1931. Pp. xxvi + 396.

GOODENOUGH, Florence L. "Trends in Modern Psychology," *Psychological Bulletin,* XXXI (February, 1934), 81-97. Based on the *Psychological Index* since 1894 and *Psychological Abstracts* from 1927 to 1932.

* GRAHAM, Bessie. *The Bookman's Manual:* A Guide to Literature. (Fourth edition, revised and enlarged.) New York: R. R. Bowker Co., 1935. Pp. xii + 716.

GROPP, Regina, "A Guide to the Literature on Commercial Education," *Journal of Business Education,* X (June, 1935), 19-20.

GRAY, W. S. *Summary of Investigations Relating to Reading.* Supplementary Educational Monographs, No. 28. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 276. Also see

annual supplements in the *Elementary School Journal* and *Journal of Educational Research.*

GREGG, R. T., and HAMILTON, T. T. *Annotated Bibliography of Graduate Theses at the University of Illinois.* University of Illinois Bulletin, Vol. XXVIII, No. 40. Urbana, Ill.: University of Illinois, 1931. Pp. 80.

GRINNELL, J. E., and UMSTATTD, J. G. *Abstracts of Masters' and Doctors' Theses in Education, University of Minnesota, July 1, 1929, to July 1, 1930.* Educational Research Bulletin, No. 2, Eta Chapter, Phi Delta Kappa, University of Minnesota. Minneapolis, Minn.: Perine Book Co., 1931. Pp. 36.

GRIZZELL, E. D. "A Nation-Wide Study of Standards for Secondary Education," *Junior-Senior High School Clearing House,* IX (December, 1934), 241-2.

HAINES, Helen E. *Living with Books:* The Art of Book Selection. Columbia University Studies in Library Service, No. 2. New York: Columbia University Press, 1935. Pp. xiv + 506.

HALLE, Rita S. *Which College?* (Second revised edition.) New York: The Macmillan Co., 1934. Pp. 368.

HARRIS, Mabel. "Non-Professional Library Instruction in Teachers Colleges," *Peabody Journal of Education,* XII (September, 1934), 86-95.

HARTSHORNE, Hugh, and MAY, M. A. *Studies in the Nature of Character.* Vols. I, II, and III. New York: The Macmillan Co., 1928-30. Pp. xxii + 414 + viii + 306, 504, 560.

HAYNES, B. R., and GRAHAM, Jessie. *Research in Business Education.* Los Angeles, Calif.: C. C. Crawford, 1932. Pp. 232. Includes abstracts of theses in business education.

HENMON, V. A. C. "Some Significant Results of the Modern Foreign Language Study," *Journal of Educational Research,* XIX (February, 1929), 79-91. Includes a list of the seventeen volumes of the American and Canadian Committees, which are published by The Macmillan Co. and by the University of Toronto Press, Toronto, Canada, 1927-31.

HESTON, F. M. *A Survey of College Surveys.* Lexington, Ky., University of Kentucky Press: The Author, 1934. Pp. 229.

HILDRETH, Gertrude. *Bibliography of Mental Tests and Rating Scales.* New York: Psychological Corporation, 1933. Pp. 242.

* HOCKETT, H. C. *Introduction to Research in American History.* New York: The Macmillan Co., 1932. Pp. 168.

HUDELSON, Earl. *Class Size at the College Level.* Minneapolis, Minn.: University of Minnesota Press, 1928. Pp. 300.

HUGHES, R. M. "Report of the Committee on Graduate Instruction," *Educational Record,* XV (April, 1934), 192-234. Includes lists of schools judged competent to do doctorate work in the various fields of learning.

———, and Others. *A Study of the Graduate Schools of America.* Oxford, Ohio: Miami University, 1925. Pp. 32.

HULL, Callie, and WEST, C. J. "The Eleventh Census of Graduate Research Students in Chemistry and Chemical Engineering, 1934," *Journal of Chemical Education,* XII (July, 1935), 339-43.

HURT, H. W. *The College Blue Book.* Vol. I, Colleges of Liberal Arts and Sciences (1923); Vol. II, Professional and Technical Education (1924); Vol. III, Music and Fine Arts (1925). Chicago: College Blue Book.

——— *The 1933 College Blue Book.* Hollywood-by-the-Sea, Fla.: College Blue Book, 1933. Pp. 588.

HURT, Peyton. "The Need of College and University Instruction in Use of the Library," *Library Quarterly,* IV (July, 1934), 436-48.

———"Bridging the Gulf Between the College Classroom and the Library," *Library Journal,* LIX (October 1, 1934), 748-51. Indicates the need for systematic instruction in library usage.

HUTCHINS, Margaret, and Others. *Guide to the Use of Libraries.* New York: H. W. Wilson Co., 1928. Pp. 251.

JOYAL, A. E. *Abstracts of Doctors' Theses in Education at the University of California, 1898 to March, 1933.* Berkeley, Calif.: Lambda Chapter, Phi Delta Kappa, 1933. Pp. 104.

KELLY, R. L., and ANDERSON, Ruth E. *Christian Education Handbook for 1934.* New York: Christian Education, 1934. Also see earlier and later editions.

KLEIN, A. J. *Survey of Land-Grant Colleges and Universities,* Vols. I, II. Office of Education Bulletin, No. 9, 1930. Washington: Office of Education. Pp. 998, 922.

KNOX, E. O. "The Negro as a Subject of University Research," *Journal of Negro Education,* II (April, 1933), 165-74.

KOOS, L. V., and Others. *Summary.* Office of Education Bulletin, No. 17, 1932. National Survey of Secondary Education Monograph, No. 1. Washington: Office of Education, 1934. Pp. x + 232.

KUNKEL, B. W. "The Distribution of College Teachers," *School and Society,* XLI (March 23, 1935), 405-8.

LANCASTER, J. H., "A Guide to the Literature on Education of Teachers," *Educational Administration and Supervision,* XIX (May, 1933), 363-72.

LEUENBERGER, H. W. "The *Junior College Journal:* An Analysis," *Junior College Journal,* VI (February, 1936), 249-54.

* LOUTTIT, C. M. *A Handbook of Psychological Literature.* Bloomington, Ind.: Principia Press, 1932.

——— "Psychological Journals: A Minor Contribution to the History of Psychology," *Psychological Review,* XXXVIII (September, 1931), 455-60. Analysis of subject, country, and time distribution represented.

LUCASSE, Florence J. "What the Classical Investigation Has Accomplished," *Journal of Educational Research,* XX (June, 1929), 15-21. Deals with the teaching of Latin.

LYLE, G. R. "A Regional Loan System," *Journal of Higher Education,* V (December, 1934), 475-7. Describes a coöperative plan of lending journals and expensive books for libraries.

——— *Classified List of Periodicals for the College Library.* Boston: F. W. Faxon Co., 1934. Pp. xviii + 102.

LYMAN, R. L. *Summary of Investigations Relating to Grammar, Language, and Composition.* Supplementary Educational Monographs

No. 36. Chicago: Department of Education, University of Chicago, 1929. Pp. viii + 302.

——— *The Enrichment of the English Curriculum.* Supplementary Educational Monographs, No. 39. Chicago: Department of Education, University of Chicago, 1932. Pp. viii + 252. A review of investigations in this field.

MACCRACKEN, J. H. *American Universities and Colleges.* Baltimore: Williams and Wilkins Co., 1932. Pp. xiv + 1066. A directory of higher institutions.

MANSKE, A. J., and ALEXANDER, Carter. "Guide to the Literature on Secondary Education," *School Review,* XLII (May, 1934), 368-81.

MARTIN, C. W. "Problems of Higher Education as Found in Periodical Literature," *Peabody Journal of Education,* IX (May, 1932), 372-6.

MCSWAIN, E. T., and ALEXANDER, Carter. "Guide to the Literature on Elementary Education," *Elementary School Journal,* XXXV (June, 1935), 747-59.

MONROE, W. S., and ENGELHART, M. D. *A Critical Summary of Research Relating to the Teaching of Arithmetic.* University of Illinois Bulletin, Vol. XXIX, No. 5. Bureau of Educational Research Bulletin, No. 58. Urbana, Ill.: University of Illinois, 1931. Pp. 116. Covers 128 studies.

* ———, and Others. *Ten Years of Educational Research, 1918-1927.* University of Illinois Bulletin, Vol. XXV, No. 51. Bureau of Educational Research Bulletin, No. 42. Urbana, Ill.: University of Illinois, 1928. Pp. 368.

MOODY, Katherine T. *The Library Within the Walls.* New York: H. W. Wilson Co., 1929. Pp. 514.

* MUDGE, I. G. *Guide to Reference Books.* (Sixth edition.) Chicago: American Library Association, 1935. Also see earlier editions and the informal supplements.

NEWLON, J. H., and Others. "George Drayton Strayer," *School Executives Magazine,* XLIX (June, 1930), 451-6. An account of the contributions of Strayer to the field of educational administration.

* ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research,* Chapter XXI. New York: Henry Holt and Co., 1929.

OGG, F. A. *Research in the Humanistic and Social Sciences.* New York: The Century Company, 1928. Pp. 454.

OLIVER, T. E. *The Modern Language Teacher's Handbook.* Boston: D. C. Heath and Co., 1935. Pp. 706.

O'ROURKE, L. J. *Rebuilding the English-Usage Curriculum to Insure Greater Mastery of Essentials:* A Report of a Nation-Wide Study of English. Washington: Psychological Institute, 1934. Pp. x + 98.

PETERS, C. C. *Abstracts of Studies in Education at the Pennsylvania State College,* Part V. Penn State Studies in Education, No. 12. State College, Pa.: School of Education, Penn State College, 1935. Pp. 56.

———, and HARTMANN, G. W. *Abstracts of Studies in Education at the Pennsylvania State College, Part IV.* State College, Pa.: Pennsylvania State College, 1934. Pp. 80.

———, C. C., and STRUCK, F. T. *Abstracts of Studies in Education at the Pennsylvania State College.* Penn State Studies in Education,

No. 2. State College, Pa.: Pennsylvania State College, 1931. Pp. 96.

——— *Abstracts of Studies in Education at the Pennsylvania State College, Part II.* Penn State Studies in Education, No. 4. State College, Pa.: Pennsylvania State College, 1932. Pp. 64.

RATCLIFFE, Ella B. *Accredited Higher Institutions, 1934.* Office of Education Bulletin No. 16, 1934. Washington: Office of Education, 1934. Pp. vi + 176.

REAVIS, W. C., and BUTSCH, R. L. C. *Abstracts of Unpublished Masters' Theses in the Field of Secondary-School Administration.* Bulletin of the Department of Secondary-School Principals of the National Education Association, No. 24, 1929. Cicero, Ill.: H. V. Church, 1929. Pp. 202.

* REEDER, W. G. *How to Write a Thesis,* Chapter III. Bloomington, Ill.: Public School Publishing Co., 1930.

ROBERTSON, D. A. *American Universities and Colleges.* New York: Charles Scribner's Sons, 1928. Pp. xii + 884. Also see the later directory under the name of MacCracken.

ROEMER, Joseph. *Abstracts of Unpublished Masters' Theses in the Field of Secondary-School Administration.* Bulletin of the Department of Secondary-School Principals of the National Education Association, No. 43, 1932. Cicero, Ill.: H. V. Church, 1932.

RUGG, E. U. *Curriculum Studies in the Social Sciences and Citizenship.* Colorado Teachers College Education Series, No. 3. Greeley, Colo.: Colorado State Teachers College, 1928. Pp. xiv + 214.

RYAN, W. C. *The Literature of American School and College Athletics.* Carnegie Foundation for the Advancement of Teaching Bulletin, No. 24. New York: Carnegie Foundation for the Advancement of Teaching, 1929. Pp. xlvi + 306.

ST. JOHN, J. L. "A Use of Journals by Research Men," *Science,* LXX (September 27, 1929), 309.

SCHIEFFELIN, Barbara, and SCHWESINGER, Gladys C. *Mental Tests and Heredity, Including a Survey of Non-Verbal Tests.* Eugenics Research Association Monograph Series, No. 3. New York: Galton Publishing Co., 1930. Pp. 298.

* SCHLUTER, W. C. *How to Do Research Work,* Chapters III, IV. New York: Prentice-Hall, 1926.

SCHWESINGER, Gladys C. *Heredity and Environment:* Studies in the Genesis of Psychological Characteristics. New York: The Macmillan Co., 1933. Pp. viii + 484.

SEFTON, Alice Allene. "A Guide to the Literature of Physical Education, Including Certain Aspects of Health Education and Recreation," *Research Quarterly of the American Physical Education Association,* VI (December, 1935), 3-47.

SHANNON, J. R. "An Analysis of the Subject Matter of Education Discussed in Lay Magazines," *School and Society,* XXXVII (June 3, 1933), 715-6.

SMITH, Dora V. "The Contributions of Research to Teaching and Curriculum-making in English, January 1933, through June, 1934," *English Journal, College Edition,* XXIV (May and June, 1935), 363-74, 451-61.

SMITH, H. L., and KRUEGER, L. M. *A Brief Summary of Literature on Leadership.* Bulletin of the School of Education, Indiana University, Vol. IX, No. 4, September, 1933. Bloomington, Ind.: Indiana University, 1933. Pp. 80. Includes the topics of genius and eminence, traits of leaders, control techniques used by leaders, theories of leadership, and leadership training.

———, and NOFFSINGER, F. R. *Bibliography of School Buildings, Grounds and Equipment.* Bulletin of the School of Education, Indiana University, Vol. IX, No. 2, March, 1933. Bloomington, Ind.: Indiana University, 1933. Pp. 182.

——— *Bibliography of College and University Buildings, Grounds, and Equipment.* Bulletin of the School of Education, Indiana University, Vol. X, No. 2, March, 1934. Bloomington, Ind.: Indiana University, 1934. Pp. 200.

——— *Bibliography of School Buildings, Grounds, and Equipment,* Parts III, IV. Bulletin of the School of Education, Indiana University, Vol. IX, No. 3, June, 1933; Vol. XI, No. 2, March, 1935. Bloomington, Ind.: Indiana University, 1933, 1935. Pp. 130, 216.

* SPAHR, W. E., and SWENSON, R. J. *Methods and Status of Scientific Research,* Chapters VIII, IX. New York: Harper and Bros., 1930. Special application to political and social science.

STODDARD, G. D., and WELLMAN, Beth L. *Child Psychology.* New York: The Macmillan Co., 1934. Pp. xii + 420. Reviews the literature in this field.

STOKES, A. P. "The Contribution of Boards and Foundations," *Educational Record,* XII (July, 1931), 322-32.

STRANG, Ruth. *Personal Development and Guidance in College and Secondary Schools.* New York: Harper and Bros., 1934. Pp. vi + 342. A summary of investigations in this field.

———"Trends in Educational Personnel Research," *Personnel Journal,* X (October, 1931), 179-88.

TAUBER, Abraham. "A Guide to the Literature on Speech Education," *Quarterly Journal of Speech,* XX (November, 1934), 507-24.

TERMAN, L. M., and Others. *Genetic Studies of Genius,* Vols. I, II, and III. Stanford University, Calif.: Stanford University Press, 1925-30. Pp. 648, 842, 508.

THARP, J. B. "Second Annual Survey of Research and Experimentation in Modern Foreign Language Teaching," *Modern Language Journal,* XX (October, 1935), 31-6.

THORNDIKE, E. L., and Others. *The Measurement of Intelligence.* New York: Bureau of Publications, Teachers College, Columbia University, 1927. Pp. 616.

———, Strayer, G. D., and Caldwell, O. W. "Report of the Accomplishments of the Institute of Educational Research on the Occasion of Its Tenth Anniversary (Teachers College, Columbia University)," *Teachers College Record,* XXXIII (November, 1931), 100-61.

TOUTON, F. C. "Theses Written in California Universities in Candidacy for Graduate Degrees in Education During the Academic Year, 1932-1933," *California Quarterly of Secondary Education,* IX (October, 1933), 77-94.

——— "Theses Written in California Universities in Candidacy for Graduate Degrees in Education During the Academic Year, 1933-34," *California Journal of Secondary Education*, X (October, 1934), 58-67.

———, and Others. *Abstracts of Unpublished Masters' Theses in the Field of Secondary-School Administration*. Bulletin of the Department of Secondary-School Principals of the National Education Association, Nos. 34 and 36, January and April, 1931. Cicero, Ill.: H. V. Church, 1931. Pp. 110, 68.

UMSTATTD, J. F., and GRINNELL, J. E. *Abstracts of Masters' and Doctors' Theses in Education, University of Minnesota, July 1, 1928, to July 1, 1929*. Educational Research Bulletin, No. 1, Eta Chapter, Phi Delta Kappa, University of Minnesota. Minneapolis, Minn.: Perine Book Co., 1931. Pp. 28.

VISHER, S. S. "Starred Scientists," *Journal of Higher Education*, II (February, 1931), 78-80. An analysis of *American Men of Science* in terms of the institutions from which they graduated.

WALTERS, Raymond. "Statistics of Registration in American Universities and Colleges, 1934," *School and Society*, XL (December 15, 1934), 785-801.

——— "Statistics of Registration in American Universities and Colleges, 1935," *School and Society*, XLII (December 14, 1935), 801-19.

* WARD, G. O. *The Practical Use of Books and Libraries*. (Fifth edition, revised.) Boston: F. W. Faxon Co, 1933. Pp. 195.

WATSON, G. B. *Experimentation and Measurement in Religious Education*. New York: Association Press, 1927. Pp. xii + 296.

WEST, C. J., and HULL, Callie. "Doctorates Conferred in the Sciences by American Universities, 1932-1933," *Science*, LXXVIII (September 15, 1933), 241.

——— "Doctorates in Chemistry and Related Fields Conferred by American Universities, 1932-33," *Journal of Chemical Education*, X (November, 1933), 693-703.

* WHITNEY, F. L. *Methods in Educational Research*, Chapter V. New York: D. Appleton and Co., 1931.

———, and RUGG, E. U. "Sources of Current Literature in Education," *Teachers Journal and Abstract*, I (January, 1926), 47-53.

WINCHELL, Constance M. *Locating Books for Inter-Library Loan*. New York: H. W. Wilson Co., 1930. Pp. 170.

WIRTH, Louis, and SHILS, E. A. "The Literature of Sociology, 1934," *Social Studies*, XXVI (November, December, 1935), 459-75, 525-46.

WITMER, Eleanor M. "Educational Research: A Bibliography on Sources Useful in Determining Research Completed or Under Way," *Teachers College Record*, XXXIII (January, 1932), 335-40.

———, and MILLER, Margaret C. "Guides to Educational Literature in Periodicals: Indexes, Abstracts, Bibliographies," *Teachers College Record*, XXXIII (May, 1932), 719-30.

——— "United States Office of Education Serial Publications," *Teachers College Record*, XXXIV (January, 1933), 302-11.

YOUNG, J. W. *The Reorganization of Mathematics in Secondary Education*, Part I. Boston: Houghton Mifflin Co., 1927. Pp. xvi + 182. Originally published in 1923.

Abstracts of Dissertations and Theses in Education, 1917-1931. Bureau of Educational Reference and Research Monograph, No. 1. Ann Arbor, Mich.: School of Education, University of Michigan, 1932. Pp. vi + 138.

"Abstracts of Unpublished Masters' Theses, Indiana State Teachers College, 1931 and 1932," *Teachers College Journal,* III (July, 1932), 251-300.

"Abstracts of Unpublished Masters' Theses, Indiana State Teachers College, 1933," *Teachers College Journal,* IV (July, 1933), 277-320.

"Abstracts of Unpublished Masters' Theses, Indiana State Teachers College, 1933 and 1934," *Teachers College Journal,* V (July, 1934, Section I), 217-69.

"Abstracts of Unpublished Masters' Theses, Indiana State Teachers College, 1934 and 1935," *Teachers College Journal,* VI (July, 1935), 181-96.

Agricultural Index. New York: H. W. Wilson Co., 1916—.

A.L.A. Catalogue. Chicago: American Library Association, 1926. Pp. 1295.

A.L.A. Catalogue Supplement, 1926-1931. Chicago: American Library Association, 1933. Pp. 330.

A.L.A. Portrait Index. Edited by W. C. Lane and Nina E. Browne. Washington: Superintendent of Documents, 1906. Pp. 1601.

American Catalogue of Books. New York: Publishers' Weekly, 1876-1910.

American Educational Catalogue. New York: Publishers' Weekly, 1872—.

American Library Association, Committee on Public Documents. *Public Documents, State, Municipal, Federal, and Foreign.* Chicago: American Library Association, 1934. Pp. 233.

American Men of Science. Edited by J. M. Cattell. New York: Science Press, 1906—.

American Newspaper Annual and Directory. Philadelphia: N. W. Ayer, 1880—.

American School and University: A Year-book Devoted to the Design, Construction, Equipment, Utilization, and Maintenance of Educational Buildings and Grounds. New York: American School Publishing Corporation, 1928—.

American Universities and Colleges. Edited by J. H. MacCracken for the American Council on Education. (Second Edition, revised and enlarged.) Baltimore, Md.: Williams and Wilkins Co., 1932. Pp. 1066.

An Analytical Bibliography of Universal Collected Biography Comprising Books Published in the English Tongue in Great Britain and Ireland, America, and the British Dominions. Compiled by Phyllis M. Riches. London: The Library Association, Chaucer House, Malet Place, W. C., 1, 1934. Pp. 709.

Art Index. New York: H. W. Wilson Co., 1930—.

Authors Today and Yesterday: A Companion Volume to Living Authors. Edited by S. J. Kunitz (Dilly Tante, pseudonym) and Others. New York: H. W. Wilson Co., 1933. Pp. 726.

Baird's Manual of American College Fraternities. Edited by F. W. Shepardson. Menasha, Wis.: Banta Publishing Co., 1930. Pp. xxii + 734. Twelfth and Semi-Centennial Edition.

Bibliographie Pedagogique Internationale. Paris: International Institute of Intellectual Coöperation, 1935. Pp. 142. A 1934 handbook of references on national systems of education, with a 1935 supplement.

Biographical Directory of the American Congress, 1774-1927. Washington: Government Printing Office, 1928. Pp. 1740.

Book Review Digest. New York: H. W. Wilson Co., 1905—.

Carnegie Corporation, sponsor of six studies of adult education published by The Macmillan Co., 1926-1928.

The Classical Investigation Conducted by the Advisory Committee of the American Classical League, Part I. Princeton, N. J.: Princeton University Press, 1924. Pp. 306.

Conclusions and Recommendations of the Commission: Report of the Commission on the Social Studies of the American Historical Association. New York: Charles Scribner's Sons, 1934. Pp. xii + 168.

Cumulative Book Index. New York: H. W. Wilson Co. Monthly.

Dictionary of American Biography. New York: Charles Scribner's Sons, 1928—.

Doctoral Theses in Education, I. University of Iowa Studies in Education, Vol. IX, No. 1. Iowa City, Iowa: University of Iowa, 1934. Pp. 206.

Doctoral Theses in Education, II. University of Iowa Studies in Education, Vol. IX, No. 3. Iowa City, Iowa: University of Iowa, 1934. Pp. 122.

Doctoral Theses in Education, III. Edited by A. M. Christensen and J. C. Dewey. University of Iowa Studies in Education, Vol. X, No. 1, Iowa City, Iowa: University of Iowa, 1935. Pp. 54.

"Educational Books of 1934," *School and Society,* XLI (March 30, 1935), 432-48.

Educational Finance Inquiry, published in thirteen volumes by The Macmillan Co., 1923-24.

Education Index. New York: H. W. Wilson Co., 1929—.

Educational Press Association of America, *Yearbooks.* Washington, D. C.: Educational Press Association, 1926—.

Educational Yearbook, International Institute of Teachers College, Columbia University. Edited by I. L. Kandel. New York: Bureau of Publications, Teachers College, Columbia University, 1924—. Deals with school systems of various countries and with major educational problems of the world.

Familiar Quotations: A Collection of Passages, Phrases, and Proverbs Traced to Their Sources in Ancient and Modern Literature by John Bartlett. Tenth Edition, Revised and Enlarged, by Nathan H. Dole. Boston: Little, Brown and Co., 1914. Pp. 1454.

General Index to Illustrations. By J. C. Ellis. Boston: F. W. Faxon Co., 1931. Pp. 467.

A Guide to the Current Periodicals and Serials of the United States and Canada. By H. O. Severance. Ann Arbor, Mich.: George Wahr, 1931. Pp. 432.

A Handbook for Private School Teachers. Compiled by Porter Sargent. Boston: Porter Sargent, 1930. Pp. 797.

A Handbook of Private Schools for American Boys and Girls. Compiled by Porter Sargent. Boston: Porter Sargent, 1915—.

A History of Our Times: The United States, 1900-1925. Five volumes. By Mark Sullivan. New York, London: Charles Scribner's Sons, 1926—.

The Home Book of Quotations, Classical and Modern. By B. E. Stevenson. New York: Dodd, Mead and Co., 1934. Pp. 2605.

Hoyt's New Encyclopedia of Practical Quotations: Drawn from the Speech and Literature of All Nations, Ancient and Modern, Classic and Popular, in English and Foreign Text. By J. K. Hoyt. Revised and Enlarged by Kate L. Roberts. New York and London: Funk and Wagnalls, 1922. Pp. 1343.

"Index of Theses and Dissertations Prepared at Temple University, 1908-1935." Compiled by Maurice F. Tauber. Philadelphia: Temple University Library, 1935. Pp. 44. (Mimeographed.)

Index to Illustrations. By F. J. Shepard. Chicago: American Library Association, 1924. Pp. 89.

Index to Legal Periodicals and Law Library Journal. New York: H. W. Wilson Co., 1914—.

Index to Poetry and Recitations: Being a Practical Reference Manual for the Librarian, Teacher, Bookseller, Elocutionist, etc., Including over Fifty Thousand Titles. By Edith Granger. Chicago: A. C. McClurg and Co., 1924. Pp. 1059. Revised Edition. Supplement, 1929. Pp. 519.

Industrial Arts Index. New York: H. W. Wilson Co., 1913—.

International Index. New York: H. W. Wilson Co., 1913—.

Leaders in Education. Edited by J. M. Cattell. New York: Science Press, 1932—.

Living Authors: A Book of Biographies. Edited by S. J. Kunitz (Dilly Tante, pseudonym). New York: H. W. Wilson Co., 1931. Pp. 466.

Loyola Educational Index. Chicago: Loyola University Press, 1928 only.

Materials and Methods of Legal Research with Bibliographical Manual. By F. C. Hicks. Rochester, N. Y. Lawyers Coöperative Publishing Co., 1923. Pp. 626.

Municipal Index. New York: American City Magazine Publishing Corporation, 1924—.

National Catholic Welfare Conference Bureau of Education, *1928 Directory of Catholic Colleges and Schools.* Washington: National Catholic Welfare Conference Bureau of Education, 1928. Pp. 592. Also see later editions.

Nature and Nurture: Their Influence upon Intelligence and Their Influence upon Achievement. Twenty-seventh Yearbook of the National Society for the Study of Education, Parts I and II. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. x + 466, xiv + 398.

Nature Index. By J. C. Ellis. Boston: F. W. Faxon Co., 1930. Pp. 319.

New Dictionary of Thoughts: A Cyclopedia of Quotations from the Best Authors of the World, both Ancient and Modern, Alphabetically Arranged by Subjects. Compiled by Tryon Edwards, and revised and enlarged by C. N. Catrevas. London and New York: Classic Publishing Co., 1931. Pp. 732.

Newspaper and the Historian. By L. M. Salmon. New York: Oxford University Press, 1923. Pp. 566.

The Nuttall Dictionary of Quotations: from Ancient and Modern, English and Foreign Sources. By P. A. Nuttall. London: Warne, 1930. Pp. 658.

Occupational Index. New York: National Occupational Conference, 1936—.

Official Congressional Directory for the Use of the United States Congress. Washington: Government Printing Office. Issued for each session.

Patterson's American Educational Directory. H. L. Patterson, Compiler and Editor. Chicago: American Education Co., 1904—.

Periodicals Directory: A Classified Guide to a Selected List of Current Periodicals, Foreign and Domestic. By Carolyn F. Ulrich. New York: R. R. Bowker Co., 1932. Pp. 323.

Phi Delta Kappa Directory. Chicago: Phi Delta Kappa Educational Fraternity, 1931. Pp. 409.

Poole's Index to Periodical Literature. Boston: Houghton Mifflin Co., 1802-1881. Third Edition, Revised.

Poole's Index to Periodical Literature Supplements. Boston: Houghton Mifflin Co., 1882-1906.

Presidents of American Colleges and Universities. New York: Robert C. Cook Co., 1933—.

Psychological Index. Princeton, N. J.: Psychological Review Co., 1894—.

Public Affairs Information Service. New York: Public Affairs Information Service, 1915—.

Publishers' Weekly. New York: R. R. Bowker Co.

Putnam's Complete Book of Quotations, Proverbs and Household Words: A Collection of Quotations from British and American Authors, with Many Thousands of Proverbs, Familiar Phrases and Sayings, from All Sources, Including Hebrew, Arabic, Greek, Latin, French, German, Italian, Spanish, and other Languages. By W. G. Benham. New York: G. P. Putnam's Sons, 1926. Pp. 1224.

Readers' Guide Supplement. New York: H. W. Wilson Co., 1907-1919.

Readers' Guide to Periodical Literature. New York: H. W. Wilson Co., 1900—.

"Religious Education Bibliography, January, 1933 to September, 1934," *Religious Education,* XXX (July, 1935), 40-65.

Recent Social Trends in the United States: Report of the President's Research Committee on Social Trends. New York: McGraw-Hill Book Co, 1933. Pp. xcvi + 1568. A series of thirteen monographs bound under one cover or obtainable separately.

Recent Theses in Education: An Annotated List of 242 Theses Deposited with the Office of Education and Available for Loan. Office of Education Pamphlet No. 26, December, 1931. Washington: Office of Education, 1932. Pp. iv + 42.

"The Reorganization of the American Educational System," *School and Society,* XXVII (April 28, 1928), 509-15. Lists sixteen completed or projected studies which the Committee on Administrative Units of the Commonwealth Fund has sponsored and subsidized, 1922-29. Also see the following reference.

The Reorganization of the American Educational System: Final Report of the Committee on Administrative Units of the Commonwealth

Fund. University of Buffalo Studies, Vol. VII, No. 1. Buffalo, N. Y.: University of Buffalo, 1928. Pp. 18.

Rus: A Biographical Register of Rural Leadership in the United States and Canada. Compiled by L. H. Bailey and Ethel Z. Bailey. Ithaca, New York, 1930. Pp. 769. Fourth Edition.

School Supply and Equipment Directory. New York: School Management, Inc., 1934—.

"Sixty Educational Books of 1934," *Journal of the National Education Association,* XXIV (April, 1935), 127-30.

Social Work Yearbook. New York: Russell Sage Foundation, 1930—.

Statesman's Yearbook. New York and London: Macmillan Co., 1864—.

"Student's Dissertations in Sociology," *American Journal of Sociology,* XL (July, 1934), 74-103.

Teachers College Studies in Education and Psychology (Abstracts). Temple University Bulletin, Vol. I. Philadelphia: Temple University (Graduate Division of Teachers College in Cooperation with Alpha Eta Chapter of Phi Delta Kappa), 1934. Pp. 64.

"Theses in Business Education," *Journal of Business Education,* VI (October and November, 1931), 25-6.

Theses in Education, University of Kentucky. Bulletin of the Bureau of School Service, Vol. V, No. 4, June, 1933. Lexington, Ky.: University of Kentucky, 1933. Pp. 62.

United States, Bureau of Foreign and Domestic Commerce. *Statistical Abstract of the United States.* Washington: Government Printing Office, 1878—.

United States Catalogue. New York: H. W. Wilson Co., 1928. Fourth Edition.

United States Catalogue Supplement. New York: H. W. Wilson Co., 1932.

United States Government Publications. By Anne M. Boyd. New York: H. W. Wilson Co., 1931. Pp. 329.

United States Government Documents. By J. I. Wyer. Chicago: American Library Association, 1933. Pp. 56.

United States Office of Education. *Educational Directory.* Washington: Government Printing Office, 1912—.

Union List of Serials in Libraries of the United States and Canada. Edited by Winifred Gregory. New York: H. W. Wilson Co., 1927. See later supplements.

University of Chicago, a series of studies in reading, utilizing especially an elaborate technique of photographing eye-movements. *Supplementary Educational Monographs.* Chicago: Department of Education, University of Chicago.

University of Chicago Abstracts of Theses, Humanistic Series, Vol. IV, 1925-1926. Chicago: University of Chicago Press, 1928. Pp. x + 478. Also see later volumes in the series.

University of Pittsburgh, The Graduate School, *Abstracts of Theses, Researches in Progress, and Bibliography of Publications,* Vol. VI, 1930. University of Pittsburgh Bulletin, Vol. XXVII, No. 3. Pp. iv + 464.

Whitehouse Conference on Child Health and Protection, a series of 36 reports published by The Century Co., 1930-1934.

Who's Who. London: Black; New York: The Macmillan Co., 1849—.
Who's Who in America. Chicago: A. N. Marquis Co., 1899—.
Who's Who in American Education. New York: Robert C. Cook Co., 1928—.
Who's Who in Government, Vol. I. New York: Biographical Research Bureau, 1930. Pp. 800. Supplement, 1931. Pp. 58.
Who's Who in the Nation's Capital. Washington: Ransdell, 810 Rhode Island Avenue, N. E., 1930. Pp. 860. Second Edition.
William Torrey Harris, 1835-1935: A Collection of Essays. Edited by E. L. Schaub. Chicago: Open Court Publishing Co., 1936. Pp. vi + 136.
The World Almanac. New York: World Telegram, 1868—.
Yearbook of School Law. Edited by M. M. Chambers. 744 Jackson Place, Washington: M. M. Chambers, 1933—.

CHAPTER IV

THE FORMULATION AND TESTING OF HYPOTHESES

Definition of a hypothesis. When the mind has before it a number of observed facts about some phenomenon which has attracted its attention for one reason or another, there is a tendency to form some generalization relative to the character of the phenomenon. These tentative generalizations formed about the character of phenomena under observation are called *hypotheses.* (A *hypothesis* is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon, and it is employed as a basis for action in the search for new truth. When the hypothesis is fully established it may take the form of facts, principles, or theories.) Usually sound theories relative to complex phenomena are reached only after many hypotheses have been tried out and discarded or modified to harmonize with established facts. Whether true or false, our present-day theories of learning have, for example, been derived only through the careful checking, discarding, and modifying of a long series of hypotheses. A hypothesis, therefore, is a guess, supposition, or tentative inference as to the existence of some fact, condition, or relationship relative to some phenomenon which serves to explain such facts as already are known to exist in a given area of research and to guide the search for new truth.

Importance of hypotheses. It is sometimes proposed that one collect all of the facts about the objects of educational research without any preconceived idea about them. The difficulty with this conception is that one ordinarily sees only those things for which one looks and, unless the investigator approaches the study of the more complex phenomena of life with some ideas about the probable facts, conditions, and relationships involved, he will not learn much about them. The

hypothesis thus serves the threefold function of limiting the field of investigation, of sensitizing the observer to pertinent facts, and of colligating the facts observed about different phenomena into some simple form. In the first place, if the field is not limited, much valuable time is wasted in aimless research. If one has lost or misplaced some object about the home, it is ordinarily much better to attempt to recall the circumstances surrounding the loss of the object, to restrict the area for search, than to search the entire house from cellar to attic each time some article is misplaced. And so it is with the study of the problems of life and education. To limit the search to profitable areas of investigation, the research worker must bring to each investigation ideas of the most probable facts, conditions, and relationships involved; this procedure conserves valuable time in the search for truth. A second function served by the hypothesis is to sensitize the individual to facts, conditions, and relationships that might otherwise be passed by unheeded. It is a well-known psychological fact that attention is selective and that the purpose of the investigator determines in a very real way the things observed. If one is, therefore, to observe the important antecedents of the objects of educational research, he must be sensitized to them by carefully chosen suppositions. Finally, the hypothesis serves the important function of offering a simple means of collecting large bodies of unorganized facts into one comprehensible whole. Like a good classification, a good hypothesis serves the important function of linking together related facts and information and organizing them into wholes. To be most helpful, a hypothesis must serve these three functions.

The use of hypotheses in different types of research. In a succeeding chapter of this book the methods of research are reduced to four major types: (1) historical research; (2) normative-survey research; (3) experimental research; and (4) other complex causal research. Each of these types of research may be made to serve different purposes: to furnish a reliable record of past events, to trace the sequence of events

by which some past or present observed condition may have arisen, to describe the status of some past or present phenomenon, to discover the antecedents of events in the present, etc. The use of hypotheses will vary somewhat with the type of research employed and the purpose to be served. In historical research the purpose may be either to produce a faithful record of the past, irrespective of present-day problems, or to extend the experiences with phenomena in the present to the past in order to make the view of the phenomena more complete. For the latter purpose, hypothetical thinking serves the conventional purposes of limiting the search, sensitizing the observer, and colligating facts. When the purpose, however, is to produce a faithful record of the past, irrespective of present felt needs, little or no use is made of hypothetical thinking except in establishing the record itself. In normative-survey research the investigator may or may not employ the hypothetical type of thinking, depending upon his purpose. If he desires merely to know the status of certain phenomena—for example, the age, training, and experience of elementary-school teachers—little or no use may be made of the hypothetical type of thinking. If, however, the investigator is working with some problem for which the solution depends upon study of the status of various diversified phenomena and their relationships—for example, the play interests of children of different nationalities, the relative cost of consolidated and nonconsolidated rural schools, or sex differences in the academic achievement of secondary-school pupils—hypothetical thinking may play an important rôle, serving the more important functions of this type of thinking. Either rightly or wrongly, hypothetical thinking does not appear to assume the significant rôle in normative-survey research that it does in either experimental or uncontrolled causal research. In these types of research hypothetical thinking is best developed and plays an important part.[1]

[1] R. H. Wheeler, "Postulates for a Theory of Education: II, A Methodology for Educational Research," *Journal of Educational Research*, XXIX (November, 1935), 187-95.

Experiment is not the main source of scientific principles. It is the means of *testing* a deduction. Insight and creative imagination, relative to observation, are the important sources of principles.

Measurement is not the source of laws. Rather, it permits expression of a previously conceived law in mathematical terms. A conception of a law is necessary before an experiment can be planned, apparatus constructed, and units of measurement decided upon. In other words, measurement depends upon the conception of laws.

Two important aspects of hypotheses in thinking. There are two aspects of hypotheses, as used in thinking, that need to be considered: (1) the discovery of hypotheses and (2) the testing of hypotheses. These facts suggest three questions: (*a*) How does one secure ideas as to the most profitable areas of investigation? (*b*) What are the characteristics of a good hypothesis? and (*c*) How are the hypotheses tested? Each of these three questions will be considered in some detail in the remaining pages of this chapter.

The discovery of hypotheses. One of the most important aspects of any investigation is that of securing sound ideas about the facts, conditions, and relationships involved in the phenomenon. This itself has two phases: one, that of getting ideas; and the other, that of securing good ideas. If ideas are not good, much valuable time and energy are wasted, and definite harm may be done by delaying the correct solution to an important problem. How, then (and this problem needs careful consideration), does one secure sound ideas about the facts, conditions, and relationships involved in the problems of educational research?

The importance of being well-informed. Reference has been made earlier to a statement that the original mind is the well-informed mind. As a matter of fact, it would be difficult to over-emphasize the importance of being well informed about both the specific problem under investigation and related phenomena. Frequently, ideas of what to do in some particular situation (for example in studying the abilities of teachers), arise not so much out of one's knowledge of the situation itself as out of information concerning related phenomena. The

science of chemistry, for example, has been built up around the ideas of the kinds, amounts, and arrangements of the constituents of matter. Thus, there are qualitative chemistry, quantitative chemistry, etc. This fact suggests the idea of qualitative and quantitative differences in the abilities of teachers. Again, one reads in the study of physics that many objects with very different exteriors may operate according to the same principle, and that the principle rather than the exterior is the important consideration. This suggests the idea of, and the importance of, principles of teaching, and that specific teacher and pupil activities, significant as they are, represent merely the superficial aspects of good teaching. Such theories of teaching arise not merely from one's knowledge of teaching itself but from information concerning a related science.

For further evidence of the necessity of being well informed, one may turn to the events of ordinary life where frequently there is occasion to determine the causes or antecedents of phenomena of one sort or another: one's car fails to operate satisfactorily, one is not feeling as well as one desires, or one's fruit orchard is not producing as it should, etc. If one possesses the appropriate knowledge, the necessary adjustments may be exceedingly simple. Even if one must employ the services of a trained worker, there, too, the first essential to expertness is to be well informed. The expert mechanic, doctor, or agriculturalist is one who is well informed about the antecedents of the ordinary instances of malperformance, and who has become skilled in locating these causal or conditioning factors through practice. In a similar fashion the expert educational diagnostician, whether in the laboratory or in the field, is the one who is exceedingly well informed. Although the primary function of the field worker is not to produce educational generalizations for general consumption, he must be a student of the educative process, and he must be well informed both in this capacity and as a practitioner. This point of view has been emphasized in Chapters II and III.

The preceding reference to the practitioner calls to mind the

importance of first-hand contact with the objects of research. Many experienced research workers advise that investigators come into direct contact with the objects of study as soon as possible through some sort of a preliminary investigation, survey, or experiment. The point of this suggestion arises out of the difficulty of obtaining an accurate picture of phenomena from mere verbal descriptions. These statements suggest the danger involved in having others do a considerable part of one's research. It is true, of course, that research involves much routine work, some of which can be delegated, but if the data are collected entirely by others, the investigator loses contact with the object of study itself. This may mean that many important relationships pass unobserved or that he lacks the intimate knowledge of the processes involved, information essential to the formation of correct generalizations. The importance of this point in the school system of to-day with its exaggerated emphasis on administrative procedure can hardly be overemphasized.

Importance of examining with care the common-place features of objects. The research worker should be vividly aware of the fact that he has been reared in an environment which predisposed him to look at phenomena in particular ways. The aspects of phenomena which one has been trained to observe may not be the important ones for the purposes of the investigation in progress, or the generalizations formed about them may or may not be true. So thoroughly habituated are persons to their ordinary ways of thinking about things, that it is exceedingly difficult to see conditions in any other than the customary light. Because of this very important psychological fact, it is essential that those engaged in research be alert, not merely to the new and incidental features of objects, but to their more obvious features.

In an analysis of the characteristics of good and poor teachers[2] made by one of the authors the investigator studied

2 A. S. Barr, *Characteristic Differences in the Teaching Performance of Good and Poor Teachers of the Social Studies*. Bloomington, Ill.: Public School Publishing Co., 1929. Pp. 127.

not merely the more conventional aspects of teaching—the assignment, motivation, and provisions for individual differences —but also many of the less conventional phases of instruction: the number of times the teacher gestured, whether she stood or sat as she taught, the character of her comment, etc. He realized that, although the more conventional aspects of teaching are probably important, there are doubtless other less conventional phases of instruction of equal significance which have not been generally observed. Some persons were very much disturbed by the unconventionality of this study. The author, however, really desired to know why some teachers succeed and others fail, and did not wish to be hampered by the ordinary conventionalities of educational or investigational procedure.

In his investigation of the *Qualities Related to Success in Teaching*, Knight [3] studied a large number of the probable determiners of teaching ability, including the teacher's age, experience, salary, intelligence, professional information, professional study, penmanship, normal-school marks, and interest in the subject taught, with the hope that he might find qualities related to teaching success. In choosing qualities for analysis he attempted to free himself from current conceptions of which factors were and were not related to teaching success.

What the writers are attempting to emphasize here is the importance of freeing one's self from the bonds of conventional thinking and procedure, and of looking with the greatest care at all of the ordinary and extraordinary concomitants of phenomena.

Importance of seeing beyond the superficial aspects of objects. Reference has already been made to the fact that in physics, objects with very different exteriors may operate according to the same principle. This observation appears particularly important in the study of teaching, where the real determiners of effective learning and teaching seem not to be the immediately observable activities of the teachers and the

[3] F. B. Knight, *Qualities Related to Success in Teaching*. Teachers College Contributions to Education, No. 120. New York: Bureau of Publications, Teachers College, Columbia University, 1922. Pp. 67.

pupils, but the less easily discernible uniformities which lie back of these activities. Many of the complications in the study of learning and teaching arise from the fact that the visible manifestations of these phenomena are so much in evidence that it is difficult to center attention upon the fundamental conditioning or underlying factors. In the preceding section of this chapter the desirability of noting carefully the more obvious features of things was emphasized, since one's training and one's conventional points of view may lead to the neglect of important aspects of phenomena. In the present section the importance of extending the search for vital relationships beyond the superficial aspects of phenomena to underlying principles, conditions, and uniformities is emphasized. Objects which appear to be quite unlike may possess many similarities. The investigator must keep himself alert to the similarities of seemingly unlike situations.

The importance of noting the uniform connection of events. All suspected relationships of events are suggested as the result of observing one thing to happen along with or shortly after or prior to another. As one changes the type of classroom discussion from that of general pupil-participation to uninterrupted pupil-reports, a decrease in the percentage of pupil-attention is observed, with the conclusion that the uninterrupted pupil-report is in some manner associated with pupil-attention. It is also noted that if pupils are required to repeat a great number of times certain types of activities, they eventually learn and if not they do not learn, with the conclusion that drill is essential to certain types of learning. One notes when acquiring certain facts in history, geography, and grammar that they are soon forgotten, but that when one learns to skate, swim, or perform some other difficult act of skill, such activities are almost never forgotten, and one concludes that things learned functionally are retained longer than those acquired in the conventional, academic fashion, etc. The almost universal condition for the formulation of generalizations is that one observe the concomitant occurrence of conditions and

events. Such observations may be utilized in the formation of new hypotheses by enabling us to be more alert to the sequence of events.

Moreover, although the careful noting of the concomitant occurrence of conditions and events is an important means of discovering hypotheses, one may be misled by attendant circumstances. There is, for example, an interesting argument in progress at present in the field of learning about the function of repetition in learning. Early psychologists emphasized the fact that repetition was an essential condition for learning. Some present-day psychologists hold the view, however, that repetition (which we ordinarily associate with learning) is merely an incidental feature of learning and that it is only necessary because as repeated attempts to learn are made, the appropriate condition sooner or later is provided by random efforts, and learning takes place. Whether this contention is valid or not is aside from the present discussion. It is true, however, in noting the sequence of events as a means of discovering new hypotheses, that the superficial features of phenomena are frequently mistaken for true causes when they are merely attendant circumstances or incidental to the real determiners of the results observed. The observer cannot be too careful in this respect.

The importance of analogy in the formation of hypotheses. In reasoning from analogy one employs what is known about one object or relationship to explain what is not known about another. If two things resemble each other in one or more respects and a certain generalization is known to be true for one situation, it is considered to be true for the other. Reasoning from analogy is generally condemned as a method of proof; it is, however, a fruitful source of hypotheses. Reference has already been made to the qualitative and quantitative differences in teaching performance. Although such a conception of teaching may or may not prove helpful, it arises out of a bit of analogical thinking in which the study of teaching is considered similar to the chemical analysis of physical objects.

Students of chemistry have been successful in studying physical objects by centering their efforts upon three fundamental aspects of these objects: (1) the presence and absence of certain known qualities or constituents, (2) the quantitative variation of the constituents in objects, and (3) the arrangement of constituents. This suggests that teaching might be approached in a similar manner. The present emphasis upon diagnosis in education arose from its successful application in medicine and has proved a helpful concept. The theories of instincts, recapitulation, and gregariousness found in earlier educational discussions arose from the analogies derived from the study of biology. This list of illustrations might be greatly extended. The well-informed general reader of scientific literature will indeed find many helpful suggestions and analogies in the physical and biological sciences.

The fact that reasoning from analogy must be employed with great care has already received emphasis. The fallacy of analogical reasoning involves three rather common errors. In the first place, since analogy arises from noting the similarities of objects, it frequently may neglect important differences. In the second place, points of resemblance must be weighed and not merely counted. The mere number of resemblances between objects may or may not be important. Finally, the resemblance between objects may be of a superficial or non-essential nature. Science is concerned with essential likenesses and differences.

The importance of thinking about things. In the preceding sections of this chapter the authors have attempted to offer specific suggestions to aid the student in securing worth-while ideas about the nature and relationships of the objects of educational research. One way is to be well-read, and another is to come into first-hand contact with phenomena by systematically observing them or experimenting with them. A third method is to examine carefully the common-place features of objects—the things that others may have passed by as unimportant. One may also discover the antecedents of objects in some uniformity not immediately observed but brought to light

by probing beneath the surface of things; or one may get an idea in terms of an analogy taken from some related science. It is not easy to give helpful suggestions concerning these less well-analyzed aspects of scientific thinking, but it is hoped that the recommendations made may prove of some value to the reader.

A less helpful and less concrete suggestion, but at the same time a fundamental condition for securing ideas, is to think about them. In the study of complex phenomena one may secure the necessary insight into their essential qualities only after years of careful observation and painstaking investigation, during which time many hypotheses may have been tried and rejected. Kepler is said to have tried no less than nineteen different hypotheses before he hit upon his theory of planetary motion. Even when one has worked with an object for a long time, he is frequently surprised to see clearly certain hitherto unobserved aspects. Almost every one has had the experience of seeing the vague impressions of his first contact with things become clear and precise upon further contact with the situations in question. The impressions become distinct only after one has been forced to consider them from many points of view. As a rule, it is only by prolonged efforts at thinking that one achieves any very worth-while ideas.

Characteristics of a good hypothesis. To serve its intended purposes, the hypothesis must possess four important characteristics: (1) a good hypothesis is in agreement with the observed facts; (2) a good hypothesis does not conflict with any law of nature which is known to be true; (3) a good hypothesis is stated in the simplest possible terms; and (4) a good hypothesis permits of the application of deductive reasoning.

(1) ***A good hypothesis is in agreement with the observed facts.*** Although not all of the facts have been observed in the formation of a hypothesis, in so far as they have been observed the hypothesis must be in agreement with the facts. A single unexplained conflict between fact and hypothesis is disastrous

to the latter. This principle is stated sometimes as requiring that the hypothesis be plausible and conceivable, and phrased thus is, of course, entirely satisfactory as long as one remembers that, although a hypothesis may appear inconceivable and absurd to the ordinary mind, it may agree with the observed facts and therefore be plausible to the trained worker. One of the most successful theories of physical science, for example, involves the most absurd suppositions. Gravity is a force which appears indifferent to intervening objects, and its action seems instantaneous. Notwithstanding these apparent absurdities, the law of gravitation seems well founded. In the formulation of a hypothesis, therefore, one is merely attempting to determine some simple colligation of the facts which is in agreement with the observed facts.

(2) *A good hypothesis does not conflict with any law of nature which is known to be true.* The idea involved in this principle of hypothetical thinking is not very different from that expressed in the preceding principle, which emphasized that the hypothesis must not conflict with known facts. In the second characteristic of a good hypothesis, emphasis is placed upon the fact that the hypothesis must not conflict with the known laws of nature. It might be stressed here that there are many illustrations of apparently conflicting theories of learning and teaching in the field of education, ranging all the way from general theories of learning to details of the teaching process, from Gestalt psychology, behaviorism, and associationalism to questions of whether one should add up or down in learning to add, whether one should learn to spell by rule or rote memory, whether one learns best from the visual or auditory presentation of materials, etc. These conflicting theories of learning and teaching arise partly out of the failure of research workers to produce hypotheses that are in agreement with fact, to place sufficient restrictions upon their generalizations (generalizations true for one set of conditions may not be true for another set, etc.), and to explain apparent conflicts. Not until it is proven that a generalization does not conflict with other commonly

accepted generalizations should it be accepted as true. In the application of this latter principle, one must not, of course, be misled by superficial appearances, since a slight modification of the hypothesis or a reformulation of the law with which it appears to conflict may bring about agreement. One may be only a special application of the other, or both may be merely special applications of some other unconceived and more fundamental generalization.

(3) *A good hypothesis is stated in the simplest possible terms.* This principle is suggested by the law of parsimony, which implies that one be stingy in the formulation of hypotheses. It is also sometimes called Occam's razor, after William of Occam, a scholastic philosopher who said that entities are not to be multiplied beyond necessity. It is also called the principle of economy, which states that the ultimate generalizations of a science should be reduced to as small a number as possible. If the law of parsimony is not to be violated, the number of hypotheses must not be needlessly multiplied, thus the necessity for formulating each in the simplest and most fundamental terms.

(4) *A good hypothesis permits the application of deductive reasoning.* This principle is of the utmost importance because a hypothesis cannot be verified until deductions can be made from it which are capable of empirical verifications. Since the validity of a hypothesis is to be proved by its conformity with fact, it is entirely valueless unless stated in such form that its inferred consequences may be compared with the facts of observation. There are two important ideas involved in this principle: one that a good hypothesis must lend itself to deductive reasoning, and the other that the hypothesis must be verifiable. Reference has already been made to the first of these ideas. Because of the importance of being able to verify hypotheses, much emphasis is also placed in logic upon the second idea. One can, for example, imagine all sorts of mystical forces operating in things, but inasmuch as one could never decide whether such forces exist or not, it would be a waste of time to indulge in

this type of imagination. To serve the purposes of science, therefore, a hypothesis must be capable of verification, as by comparing its deducible consequences with the facts of observation.

Testing of hypotheses. There are two fairly important means of testing hypotheses: (1) the study of hypotheses for logical consistency; and (2) the study of hypotheses for agreement with fact. Although it probably goes without saying that the second of these means appears to be the more fundamental of the two, the first is not without value.

Study of hypotheses for logical consistency. The study of hypotheses for logical consistency is a phase of thinking in which the average educational worker appears none too well trained. In the first place, this procedure consists of checking the logical character of the reasoning by which the consequences of hypotheses are deduced for verification. Although one will not usually desire to recast the argument in the form of a syllogism or proposition, a knowledge of the pitfalls and fallacies of deductive reasoning, which can be found in an elementary treatise on the subject of logic, will prove exceedingly valuable. This point is particularly important, inasmuch as the appeal to the facts of observation does not, of course, verify hypotheses, but merely the results deduced from them. After one has painstakingly compared the deduced consequences of an hypothesis with the observed facts, one must still, by careful reasoning, determine the status of the hypothesis. In the second place, the study of hypotheses for logical consistency involves checking them for agreement with the already known laws of nature. One of the characteristics of a good hypothesis, to which reference has already been made, is agreement with the established laws of nature. It must not conflict with the highest and simplest laws of good thinking, and it must not disagree with those principles of science which are considered valid beyond reasonable doubt. The fact that conflicts exist means that the consequences of the theory are not verified if previous discoveries are correct, and one must, there-

fore, show that earlier discoveries are invalid before one can verify the hypothesis. Therefore, by studying the logical character of the reasoning by which the consequences of hypotheses are deduced for verification, and the agreement with already known laws of nature, suggested inferences are tested in *thought*, for logical coherence, before they are tested in *action*.

Study of hypotheses for agreement with fact. In the study of hypotheses for agreement with fact, one reasons that if the hypothesis is true certain facts, conditions, or relationships will be found; then one looks to see if these conditions are present. If it is found that the results agree with the theoretically deduced consequences, and if there is no reason to believe that only the localized conditions in question could produce the results observed, then the probabilities that the hypothesis is a true generalization are relatively great. One may test the hypothesis by applying it to already known facts or by a new appeal to experience. The failure of educational theorists to keep this fact in mind has led to needless confusion over the relative merits of science and of philosophy in the study of educational problems. Science and philosophy employ the same mental techniques. Philosophy starts with the already available data of experience, formulates hypotheses in the light of these data, and returns to the data for verification. Science does likewise, but if the data are incomplete, contradictory, or gathered under conditions that may cast doubt upon their trustworthiness, science makes a new appeal to experience, wherein the data are collected, recorded, and manipulated according to the conventions of science. The element of newness contributed by science is this new appeal to experience wherein new data are collected presumably with greater care than the data already available.

The reader should also realize that although it is customary to assign some fixed position to the formulation of hypotheses in the sequence of mental steps which constitute scientific thinking, it is impossible to do so except in a very tentative way. When one is confronted with a problem, he begins to think

about it in terms of known facts. A hypothesis is formed, and employed in the collection of additional data. These data may be found: (1) in one's own experiences, recorded or unrecorded; (2) in the recorded past experiences of other persons with similar problems based either upon incidental or systematic observation; or (3) in an appeal to new experience wherein the data are collected according to the conventions of science. New hypotheses may arise at any stage in the thinking process. In a single investigation many hypotheses may be formed, employed for the time being, and discarded or modified in favor of new hypotheses. If the data already available are adequate for the testing of the hypothesis, no new appeal to experience will be necessary. Whether additional information is necessary will depend, of course, upon the nature of the problem and the character and completeness of the available data.

Concluding statement. In this chapter an attempt has been made to indicate briefly the nature and importance of the use of hypotheses in educational research. A hypothesis is a guess, supposition, or tentative inference as to the existence of some fact, condition, or relationship, which serves to explain the facts known to exist about some object under investigation. The hypothesis serves the important function of limiting the field of investigation, of sensitizing the observer to pertinent facts, and of offering a simple means of linking the facts together. The importance of being well informed, of examining with great care the common-place features of objects, of seeing beyond the superficial aspects of objects, of noting the uniform connection of events, of analogical reasoning, and of thinking about things was emphasized as a means of getting ideas about the antecedents of the objects of educational research. The characteristics of a good hypothesis are: (1) it is in agreement with the observed facts; (2) it does not conflict with any law of nature which is known to be true; (3) it is stated in the simplest possible terms; and (4) it admits of deductive reasoning. There are two fairly important means employed in the testing of hypotheses: (1) the analysis of hypotheses for logical

consistency, and (2) the study of hypotheses for agreement with fact. Much of the theorizing about the relative merits of science and of philosophy in educational research has arisen out of a misconception of the nature and use of the hypothesis in thinking.

Problems and Exercises

1. Formulate three hypotheses, which merit testing, relating to important educational issues or problems of to-day.
2. Select one of the investigations cited in the bibliography at the end of this chapter, or some other equally satisfactory study, and evaluate the hypotheses which appear there, in terms of the principles developed in this chapter.

Selected References †

a. General References

Bacon, Francis. *Novum Organum:* or a True Guide to the Interpretation of Nature. (A new translation by the Reverend G. W. Kitchin.) Oxford: Oxford University Press, 1885. Pp. xxix + 338.

Bain, Alexander. *Logic:* Deductive and Inductive. (New and revised edition.) New York: D. Appleton and Co., 1880. Pp. viii + 731.

Ballantine, William G. *Inductive Logic.* Boston: Athenaeum Press, 1896. Pp. viii + 174.

Bosanquet, Bernard. *Logic:* or the Morphology of Knowledge. Two volumes. (Second edition.) Oxford: Clarendon Press, 1911. Vol. I, pp. xvii + 398; Vol. II, pp. viii + 240.

Broad, C. D. *Scientific Thought.* New York: Harcourt, Brace and Co., Inc., 1923. Pp. 555.

* Burtt, Edwin Arthur. *Principles and Problems of Right Thinking:* A Textbook for Logic, Reflective Thinking, and Orientation Courses. New York: Harper and Brothers, 1928. Pp. xii + 590.

Carmichael, R. D. *The Logic of Discovery.* Chicago: The Open Court Publishing Co., 1930. Pp. ix + 280.

* Creighton, James Edwin. *An Introductory Logic.* (Fourth revised edition; Fifth edition, 1932, with H. R. Smart.) New York: The Macmillan Co., 1920. Pp. xvi + 502.

Descartes, Rene. *Discourse on the Method of Rightly Conducting the Reason and Seeking Truth in the Sciences.* (Fifth Edition.) Edinburgh: William Blackwood and Sons, 1873. Pp. xli + 212.

Dewey, John. *How We Think.* Boston: D. C. Heath and Co., (A restatement of the relation of reflective thinking to the educative process.) 1910. Pp. vi + 224. New edition, 1933. Pp. x + 301.

† A limited number of references have been marked by an asterisk for the guidance of the reader. Also see the bibliographies at the ends of other chapters dealing with specific methods of research.

——— *Studies in Logical Thinking.* Chicago: University of Chicago Press, 1909. Pp. xiii + 388.

——— *The Sources of a Science of Education.* New York: Horace Liveright, 1929. Pp. 77.

ENRIQUES, Federigo. *Problems of Science.* Chicago: The Open Court Publishing Co., 1914. Pp. xvi + 392.

* FOWLER, Thomas. *The Elements of Inductive Logic.* (Third edition, corrected and revised.) Oxford: Clarendon Press, 1876. Pp. xxvii + 360.

HERSHEL, John Frederick William. *Discourse on the Study of Natural Philosophy.* Philadelphia: Carey and Lea, 1831. Pp. vii + 379.

HUME, David. *Enquiries Concerning the Human Understanding, and Concerning the Principles of Morals.* (Second edition.) Oxford: Clarendon Press, 1902. Pp. xl + 371.

* JEVONS, W. Stanley. *The Principles of Science:* A Treatise on Logic and Scientific Method. (Second edition.) London: Macmillan and Co., Ltd., 1924. Pp. xliv + 786.

* JOHNSON, Allen. *The Historian and Historical Evidence,* Chapter VII. New York: Charles Scribner's Sons, 1926. An excellent discussion of the hypothesis in historical work.

KELLEY, Truman Lee. *Scientific Method:* Its Function in Research and in Education. Columbus, Ohio: Ohio State University Press, 1929. Pp. viii + 195. New York: The Macmillan Co., 1932. Pp. x + 234.

* MCCLURE, Matthew Thompson. *An Introduction to the Logic of Reflection.* New York: Henry Holt and Co., 1925. Pp. xviii + 479.

MILL, John Stuart. *A System of Logic, Ratiocinative and Inductive:* Being a Connected View of the Principles of Evidence and Methods of Scientific Investigation. New York, London: Longmans, Green and Co., 1884. Pp. xvi + 622.

MINTO, William. *Logic, Inductive and Deductive.* New York: Charles Scribner's Sons, 1915. Pp. xii + 373.

NUNN, T. Percy. *The Aim and Achievements of Scientific Method.* London: Macmillan and Co., Ltd., 1907. Pp. x + 144.

POINCARE, Jules Henri. *Science and Method.* New York: Charles Scribner's Sons, 1914. Pp. 288.

REISER, Oliver L. *Humanistic Logic for The Mind in Action.* New York: Thomas Y. Crowell Co., 1930. Pp. x + 326.

RITCHIE, A. D. *Scientific Method:* An Inquiry into the Character and the Validity of Natural Laws. New York: Harcourt, Brace and Co. London: Kegan Paul, Trench, Trubner and Co., Ltd., 1923. Pp. viii + 204.

* ROBINSON, Daniel S. *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method. New York: D. Appleton and Co., 1924. Pp. xviii + 390. Second edition, 1930. Pp. xviii + 393.

THOMSON, John Arthur. *An Introduction to Science.* New York: Henry Holt and Co., 1911. Pp. 256.

VENN, John. *The Principles of Empirical or Inductive Logic.* London: Macmillan and Co., Ltd., 1889. Pp. xx + 594.

WELTON, J. *A Manual of Logic.* Two Volumes. (Second edition.) London: W. B. Clive, 1912. Pp. xxii + 411 + 23; viii + 292 + 23.

——— *The Logical Bases of Education.* London: Macmillan and Co., Ltd., 1919. Pp. xvi + 288.

* WESTAWAY, F. W. *Scientific Method:* Its Philosophy and Its Practice. (Fourth edition.) London: Blackie and Son, Ltd., 1931. Pp. xviii + 522.

* WHEELER, R. H. "A Set of Postulates for Educational Theory: I, The Background," *Journal of Educational Research,* XXVIII (January, 1935), 321-33.

WHEWELL, William. *History of the Inductive Sciences.* Three Volumes. (Third edition with additions.) London: John W. Parker and Son, 1857. Pp. xxxii + 394, xii + 488, xiv + 565.

* WOLF, A. *The Essentials of the Scientific Method.* New York: The Macmillan Co., 1925. Pp. 160.

b. Illustrative Materials **

BARR, A. S. "A Study of the Amount of Agreement Found in the Results of Four Experimenters Employing the Same Experimental Technique in a Study of the Effects of Visual and Auditory Stimulation on Learning," *Journal of Educational Research,* XXVI (September, 1932), 35-45. The author offers data upon the repeatability of educational experimentation on assumptions underlying the experimental study of education. In this instance the hypothesis to be tested is the repeatability of educational experimentation.

——— *Characteristic Differences in the Teaching Performance of Good and Poor Teachers of the Social Studies.* Bloomington, Ill.: Public School Publishing Co., 1929. Pp. vii + 127. An uncontrolled causal investigation in which the author puts to test a definite hypothesis relative to the distinguishing characteristics of good and poor teachers.

BETTS, Gilbert L. "The Influences of Teacher Tenure Laws on Supply and Demand," *Journal of Educational Research,* XXVIII (October, 1934), 118-31; (November, 1934), 175-86. After stating the general objective of tenure laws the author raises the following question: Do such laws in fact lead toward or away from this objective? The hypothesis is implied.

BRIGGS, David H., and JORDAN, A. M. "Influence of the Assignment on Learning," *Journal of Educational Psychology,* XXII (December, 1931), 659-66. The authors investigate the amount of added learning accruing from five assignment procedures. The hypothesis is implied.

CARROL, Herbert A. "Generalization of Bright and Dull Children: A Comparative Study with Special Reference to Spelling," *Journal of Educational Psychology,* XXI (October, 1930), 489-99. A study of the comparative ability of bright and dull children to generalize. The hypothesis is implied.

EAMES, Thomas H., and PEABODY, Robert W. "A Non-Reader Reads," *Journal of Educational Research,* XXVIII (February, 1935), 450-5. A case study of reading disability presented to direct attention to the possibility of improvement in reading from a program of re-education, based upon a study of physical, psychological, and me-

** Only a few references are given; many more can be found in the literature of education. In studying the literature of research for evidences of hypothetical thinking, it should be remembered that the reports are made at the conclusion of the process and represent merely those phases of the thought process that the author chooses to describe.

chanical handicaps rather than additional drill. The hypothesis is implied.

FREEMAN, Frank N., and ABERNETHY, Ethel M. "Comparative Retention of Typewriting and of Substitution with Analogous Material," *Journal of Educational Psychology*, XXI (December, 1930), 629-47. The authors offer data to test the common assumption that motor habits deteriorate less with the lapse of time than do associations between words or other symbols.

GATES, Arthur I. *Generalization and Transfer in Spelling*. New York: Bureau of Publications, Teachers College, Columbia University, 1935. Pp. vi + 80. After presenting a historical survey of previous investigations the author proposes to compare the value of a program which employs a variety of generalization devices with one that employs no such device. The hypothesis is implied.

GILBERT, Luther C. "A Study of the Effect of Reading on Spelling," *Journal of Educational Research*, XXVIII (April, 1935), 570-6. The hypothesis of this investigation was suggested by a previous investigation.

LEHMAN, Harvey C., and WITTY, Paul A. "Sex Differences: Interest in Tasks Requiring Mechanical Ability and Motor Skill," *Journal of Educational Psychology*, XXI (April, 1930), 239-45. The purpose of this investigation is to test the popular assumption of conspicuous sex differences in motor and mechanical skills.

LORGE, I., and THORNDIKE, E. L. "The Influence of Delay in the After-Effect of a Connection," *Journal of Experimental Psychology*, XVIII (April, 1935), 186-94. The authors cite previous conflicting results and propose to study the influence of sheer empty delay in the after-effect of a connection. The hypothesis is implied.

MCGEOCH, Grace O. "A Revaluation of the Whole-Part Problem in Learning," *Journal of Educational Research*, XXVI (September, 1932), 1-5. The author presents a critical summary of previous investigations, concluding that the relative efficiencies of the whole and part methods are functions of a number of factors there enumerated. An excellent example of the process by which hypotheses are derived.

SALISBURY, Rachel. "A Study of the Transfer Effects of Training in Logical Organization," *Journal of Educational Research*, XXVIII (December, 1934), 241-54. The author introduces her article by emphasizing the importance for learning, of organization and of training in organization. The hypothesis is implied.

VITELES, Morris S. "The Influence of Age of Pubescence Upon the Physical and Mental Status of Normal School Students," *Journal of Educational Psychology*, XX (May, 1929), 360-8. The author reviews previous investigations and indicates the need for additional data. A survey investigation with an implied hypothesis.

CHAPTER V

THE CLASSIFICATION OF RESEARCH METHODS

Introduction. After the investigator has selected a problem for study and has become thoroughly familiar with its possibilities through a careful bibliographical survey of the field represented, it is necessary to determine what methods or techniques of collecting data are most appropriate in solving the problem or in verifying the hypotheses formulated. The present chapter will consider the classification of research methods; illustrative enumerations of research procedures in the fields of education, psychology, and sociology; and some information concerning frequency of the use of investigational techniques. Finally, the authors' conception of a pattern of research methods, as determining the organization of subsequent chapters of this book, will be outlined.

At this time no definition or explanation of the various types of research is attempted, since this is the function of the later chapters. In the interests of simplicity and variety of expression, no distinction is made between such terms as methods, techniques, procedures, and types of research, although the term *devices* is used frequently to indicate less fundamental or less basal procedures such as data-collecting instruments in the form of questionnaires, check-lists, score cards, etc. These statements raise a question concerning the meaning of the term *data,* as it is used in educational investigation. Monroe and Engelhart have provided good illustrations of various types of data.[1]

Data include all concepts, facts, and principles used in thinking out the answers to thought questions. In other words, data are the things

[1] Walter S. Monroe and Max D. Engelhart, *The Techniques of Educational Research*, p. 27. University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928.

we use in thinking. The meaning of these statements will be more apparent if we note some of the types of data.

1. Ages of school children
2. Scores made on standardized tests
3. School marks, and other facts from school records
4. Answers to questionnaires
5. Expenditures for educational purposes
6. Assessed values and tax rates
7. Measures of school buildings
8. Statements of beliefs or opinions
9. School laws
10. Counts of things such as school children, number of pages, etc.
11. Principles
12. Descriptions of schools, events, etc.
13. Observations
14. Historical information
15. Errors in children's compositions
16. Stenographic reports of lessons

The same authors emphasize that when the problem has been adequately defined, at least the types of data needed for its solution are indicated. Therefore "collecting data" does not mean bringing together whatever data may be easily accessible, but rather, those specified by the problem. The illustrations of data in the preceding list indicate that a variety of techniques are necessary in bringing together needed information. Moreover, the solution of a given problem may involve the collection of several types of data and the use of an equal number of research techniques.

Classification of educational research. A decade ago there was a limited amount of material in print for the investigator interested in the methodology of educational research. Now the number of discussions of investigational techniques,[2] many with an individual classification of types of research, is so large and varied in character that the reader may feel considerable confusion about the meaning, terminology, and classification of research in education. This confusion appears to develop

2 For an annual bibliography on this subject, see the September or October number of the *Journal of Educational Research*, for example, Carter V. Good, "Selected Bibliography on the Methodology of Educational Research and Related Problems, 1934-1935," *Journal of Educational Research*, XXIX (October, 1935), 156-70.

from three conditions. (1) There may be disagreement as to the scope of such expressions as research, scientific, experimental, etc. One frequently reads, for example, that there are four types of research: (*a*) philosophical, (*b*) scientific, (*c*) historical, and (*d*) statistical. Are the historical, philosophical, and statistical methods of research scientific? Is there an historical, a philosophical, a statistical method of research? Is statistical procedure a method of research or a method of analyzing data applicable to several types of research? (2) The use of the name of a phase or part of the research process to describe the total activity—descriptive, causal, analytical, questionnaire, etc.—is often misleading. (3) The material may fail to indicate clearly the point of view from which classifications are made.

Methods of research may be classified from many points of view: the *fields* to which applied: education, history, philosophy, psychology, biology, etc.; *purpose:* description, prediction, determination of causes, determination of status, etc.; *place* where it is conducted: in the field or in the laboratory; *application:* pure research or applied research; *data-gathering devices* employed: tests, rating scales, questionnaires, etc.; *character of the data* collected: objective, subjective, quantitative, qualitative, etc.; *symbols* employed in recording, describing, or treating results: mathematical symbols or language symbols; *forms of thinking:* deductive, inductive, etc.; *control of factors:* controlled and uncontrolled experimentation; *methods employed in establishing causal relationship:* agreement, difference, residues, and concomitant variation. Where there is a shifting of the point of view in a given classification, without warning or explanation, the result almost always is confusing; it is similar to that of a shelf of books classified in several ways simultaneously: color, size, cost, title, etc. Although the problem here described is primarily one of terminology, it is nevertheless exceedingly important, especially when one wishes to describe the procedures used in one's own investigations or to give systematic instruction in the methodology of research.

The preceding paragraph sets forth the point of view expressed in the introduction to a symposium on the classification of educational research in which eighteen individuals participated.[3] It seems significant for comparative purposes to enumerate the classifications prepared by a number of the contributors to this symposium, including Almack, Ayer, Dashiell, Gates, Johnson, Kelley, McCall, Ruch, Symonds, Trabue, Whitney, Woody, Kilpatrick, and Freeman.

John C. Almack lists as techniques of research: historical (applied to documents), normative (applied to data of record), experimental (applied to experiment), and conceptual or classificatory (applied to natural experiment). He lists statistics, record forms (questionnaire), calculating machines, charts (correlation), and instruments of precision as devices or tools of research.[4]

Fred C. Ayer considers five phases of research activity important in school administration: analysis, refinement of instruments, experimentation, practical application, and dissemination.

J. F. Dashiell discusses direct observational (other than experimental), experimental, survey, historical, and speculative methods of research.

Arthur I. Gates states that representative tests or devices used by scientists, philosophers, historians, statisticians, and others engaged in the pursuit of truth include methods of determining validity of facts previously reported, methods of securing valid data by means of observation of a present event, and methods of securing valid conclusions or generalizations or principles.

Palmer O. Johnson has prepared an unusually complete outline of procedures in educational research:

A. Documentary analysis
1. Historical

3 A. S. Barr and Others, "A Symposium on the Classification of Educational Research," *Journal of Educational Research*, XXIII (May, 1931), 353-82; XXIV (June, 1931), 1-22.

4 Also see John C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Co., 1930. Pp. xviii + 310.

2. Legal
   (*a*) Statutes
   (*b*) Decisions
3. Courses of study
4. Records and reports
   (*a*) Institutional
   (*b*) State
   (*c*) Federal
   (*d*) Private foundations
   (*e*) Surveys
   (*f*) Educational associations
   (*g*) Foreign school systems
5. Textbooks

B. Indirect observation
   1. Check-lists
   2. Correspondence
   3. Questionnaires
   4. Rating scales
      (*a*) Graphic
      (*b*) Order of merit ranking
      (*c*) Man-to-man comparison
      (*d*) Paired comparisons
      (*e*) Range of values

C. Direct observation without instrumental control
   1. Ordinary observation
   2. Unstandardized interview

D. Direct observation with instrumental control
   1. Experimental methods
      (*a*) One-group
      (*b*) Equivalent-groups
      (*c*) Rotation
   2. Learning
   3. Physiological
   4. Psycho-physical
   5. Standardized interview
   6. Test methods
   7. Verbal reports

E. Composite methods
   1. Case method
   2. Case-group method
   3. Activity analysis
   4. Job analysis
   5. Field studies
   6. Survey

Truman L. Kelley distinguishes between four types of research: the field of logic, metaphysics, pure mathematics, etc.; history; experimental science; and forecasting.[5]

William A. McCall's classification of research according to the methods or instruments employed is as follows:[6]

1. One-group experimental method
2. Equivalent-groups experimental method
3. Rotation-groups experimental method
4. Varying-concomitants method
5. Correlation and partial-correlation method
6. Causal-investigation method
7. Case method
8. Genetic method
9. Bibliographical method
10. Comparative method
11. Analytical method
12. Statistical method
13. Questionnaire method
14. Test method
15. Rating method
16. Quantitative method
17. Historical methods
18. Sociological methods
19. Psycho-physical methods
20. Scientific methods
21. Philosophical methods

G. M. Ruch names historical, philosophical, and scientific (experimental) research as fundamental to the solution of educational problems. He considers statistical method a powerful tool in both description and inference and the ally of all methods.

Percival M. Symonds lists historical investigation, descriptive survey, analytical survey, discovering relationships, experimentation, and development of techniques as methods of research.[7]

5 Also see Truman L. Kelley, *Scientific Method*. New York: The Macmillan Co., 1932. Pp. x + 234.

6 Also see William A. McCall, *How to Measure in Education* and *How to Experiment in Education*. New York: The Macmillan Co., 1922, 1923. Pp. xiv + 416, xvi + 282.

7 Also see Percival M. Symonds, "A Course in the Technique of Educational Research," *Teachers College Record*, XXIX (October, 1927), 24-30.

M. R. Trabue mentions as special tools and methods used in the selection and collection of data: experimentation, measurement, observation, interview, questionnaire, correspondence, recording, and reading. He includes in the process of analysis, evaluation, and organization of data the statistical and individual (case) methods.

F. L. Whitney's classification includes historical, descriptive, experimental, philosophical, and predictive research.[8]

Clifford Woody's outline follows:

I. According to techniques employed in the collection of the data (Survey and case studies may be classed in either category, depending upon the techniques used.)
   1. Questionnaire studies
      (*a*) Letters
      (*b*) Inquiry or information blanks
      (*c*) Interviews
   2. Observational studies
      (*a*) Activity analysis
      (*b*) Job analysis
      (*c*) Analysis of recorded observed responses
   3. Experimental studies
      (*a*) Uncontrolled experimental
      (*b*) Controlled experimental

II. According to the method of treatment of data
   1. Historic
   2. Philosophic
   3. Statistical

As one of the critics of the symposium to which the preceding writers contributed, William H. Kilpatrick distinguishes between three kinds of research: scientific, historic, and philosophic.

Another critic of the symposium, Frank N. Freeman, outlines a classification of educational research based on method:

1. Description
   (*a*) Historical techniques: discovery and criticism of documents
   (*b*) Survey of contemporary conditions—techniques: examination

8 Also see F. L. Whitney, *Methods in Educational Research*. New York: D. Appleton and Co., 1931. Pp. xviii + 336. Chapter III includes a tabular classification of twenty-two concepts of methods of educational research taken from twelve sources.

of records, observation, testing and measurement, statistical and graphic formulation

(*c*) Account of genesis or development—techniques: observation, keeping and examination of records, testing and measurement, statistical and graphic formulation

2. Analysis and comparison
   (*a*) Analysis of particular processes—techniques: observation and laboratory experiment
   (*b*) Individual and group comparison—techniques: observation, testing or rating, statistical and graphic formulation of results
   (*c*) Case study—techniques: observation, keeping and examination of records, testing and synthesis of results
3. Systematic account and explanation of relations
   (*a*) Statistical analysis of relations—techniques: techniques of gathering data in common with other methods, statistical and graphic methods of showing correlation
   (*b*) Experimental variation—technique: comparison of individuals or groups under controlled conditions, by the introduction of a single variable, the use of a parallel control group or the rotation of groups
4. Forecasting (?)
   Doubt has already been expressed as to the acceptability of forecasting as a type of research.
5. Evaluation (?)
   This is what commonly goes by the name of philosophy. It is a question whether evaluation should be separated from the foregoing types of research. It should frequently stand as the culminating stage of particular investigations. Evaluation as often carried on is speculation or the expression of prejudice rather than research. It is possible, however, that one procedure may be set apart as different from the preceding and may be made the basis of further evaluation. This procedure is the synthesis of the results of a number of researches so as to apply to practical problems the facts which bear on them from many angles.

For the sake of completeness a few classifications not represented in the symposium may be mentioned briefly. Space does not permit individual comment on the adequacy of the classifications represented in the symposium or on the outlines of research methods which follow. A general statement is made later in this chapter concerning the inconsistencies present in similar classifications.

Monroe and Engelhart give illustrations of subjective, ana-

lytical, experimental, historical, interview, legal, questionnaire, survey, test-construction, and observation techniques.[9]

A. Subjective data
   1. Formulation of criteria to be used as a basis for estimates
   2. Use of criteria
B. Objective data
   1. Techniques employed in collecting
      (*a*) Analysis
         (1) Analysis of textbooks
         (2) Analysis of pupil performances
         (3) Analysis of records
      (*b*) Experimental procedures
         (1) One-group method
         (2) Equivalent-group method
         (3) Rotation method
      (*c*) Historical
      (*d*) Interview
      (*e*) Legal
         (1) Statutes
         (2) Decisions
      (*f*) Questionnaire
         (1) Opinion
         (2) Facts
      (*g*) Survey
      (*h*) Test construction
         (1) Scale
         (2) Tests
      (*i*) Observation
   2. Forms in which used
      (*a*) Raw
      (*b*) Transmuted

Crawford's classification includes experimental, historical, psychological, case study, survey, curriculum making, job analysis, interview, questionnaire, observation, measurement, statistical, tabular and graphic, and library techniques.[10]

Waples and Tyler discuss techniques of analysis, reading and recording, observation, personal interview and group con-

9 W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*, pp. 28-38. University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928.

10 C. C. Crawford, *The Technique of Research in Education*. Los Angeles, Calif.: University of Southern California, 1928. Pp. 320.

ference, obtaining written statements by question blanks, checklist, sampling, classification, summarizing, evaluation, individual judgment, group rating, comparison, space and frequency counts, testing, and experimentation.[11]

Koos recognizes the questionnaire, experiment, measurement, documentary analysis, case, mathematics, and survey.[12]

Abelson's rather novel scheme includes descriptive, causal, evaluative, constructive, and integrative methods.[13]

Schluter's classification includes experimental, survey, historical, and philosophical methods of research.[14]

The National Committee on Research in Secondary Education in 1927 discussed the following types of research problems and methods: historical, experimental, philosophical, survey, case, and questionnaire.[15]

A psychologist has analyzed the methods of child study as follows:[16]

1. Incidental observation
2. Biography
3. Systematic observation
4. Questionnaire
5. Psychoanalysis
6. Case history
7. Direct measurement and simple tests
8. Tests of complex functions
9. Ratings
10. Experiment
11. Experiment involving random control groups
12. Experiment involving paired control groups
13. Control by statistical devices
14. Factor analysis

11 Douglas Waples and R. W. Tyler, *Research Methods and Teachers' Problems*, Chapter VI. New York: The Macmillan Co., 1930.

12 L. V. Koos, *The Questionnaire in Education*. New York: The Macmillan Co., 1928. Pp. viii + 178.

13 H. H. Abelson, *The Art of Educational Research*, Chapter III. Yonkers-on-Hudson, New York: World Book Co., 1933.

14 W. C. Schluter, *How to Do Research Work*. New York: Prentice-Hall, 1927. Pp. vii + 137.

15 A. J. Jones and Others, *An Outline of Methods of Research with Suggestions for High School Principals and Teachers*. Bureau of Education Bulletin, No. 24, 1926. Washington: Bureau of Education, 1927. Pp. vi + 31.

16 J. E. Anderson, "The Methods of Child Psychology," *Handbook of Child Psychology*, pp. 11-12. (Second revised edition.) Edited by Carl Murchison. Worcester, Mass.: Clark University Press, 1933.

Two other psychologists distinguish between eight methods of research in child psychology: observational, rating, experimental, test, questionnaire, clinical, introspective, and psychoanalytic.[17]

A sociologist has analyzed the methods of sociological research applicable to a study of child-development under the heading of methods of research, techniques for collecting data, and approaches:[18]

Methods of Research

1. The historical method
2. The survey method
3. The case method
4. The statistical method
5. The experimental method
6. Combinations of the above

Techniques of Collecting Data

1. The questionnaire: mailed, as an interview outline
2. The interview (questionnaire outline; case-history outline)
3. Autobiographies
4. Moving pictures
5. Tests and rating scales
6. Observation: participant observer, controlled experimentation, detached observation
7. Documentary evidence: diaries, letters, census information, court proceedings, government publications (national, state, local), private agency reports, research studies, etc.
8. Combinations of the above techniques

Approaches

1. Philosophical or theoretical
2. Historical
3. Anthropological
4. Economic
5. Biological

17 G. D. Stoddard and Beth L. Wellman, "Methods of Research in Child Psychology," in "Methods and Techniques of Educational Research," *Review of Educational Research*, IV (February, 1934), 65-71.

18 R. G. Foster, "Objective Methods of Sociological Research Generally Applicable to Child-Development Studies," *Journal of Educational Sociology*, IX (October, 1935), 79-87.

6. Psychological
7. Psychiatric and psychoanalytic
8. Sociological (contemporary culture)

Another sociologist, Fry, includes in the techniques of social investigation direct observation, the interview, questionnaires and enumerations, experimentation and tests, and combined methods of study such as the social survey.[19]

Two excellent bibliographies on methods and techniques of educational research are available. One reviews the application of appropriate research techniques to investigations in the fields of curriculum building, teacher personnel, school organization, special methods in the elementary school, secondary-school methods of teaching, school finance, building surveys, educational tests, child psychology, pupil personnel and guidance, school law, library work, and the laboratory. Of course, a number of individual classifications of research methods are apparent in these reviews.[20] The bibliography by Barr and Rudisill is grouped under a working classification with subheadings similar in most respects to the scheme employed in the present chapter.[21]

Frequency of use of research methods. Before outlining the classification of research techniques to be followed in this book, it is of interest to cite certain attempts to determine frequency of use of the various investigational methods. The reader should be cautioned that these analyses are partly subjective, since they are based upon the given author's individual conception of educational research and of investigational methods. In all probability the resulting frequencies in the classification would be different if the analysis were repeated by another worker. Granted that there is no evidence concerning the reliability of these classifications, such frequency tabu-

19 C. L. Fry, *The Technique of Social Investigation.* New York: Harper and Bros., 1934. Pp. xiv + 315.

20 "Methods and Techniques of Educational Research," *Review of Educational Research,* IV (February, 1934), 1-119.

21 A. S. Barr and Mabel Rudisill, *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education.* Bulletin of the Bureau of Educational Research, No. 13, June, 1931. Madison, Wis.: University of Wisconsin. Pp. 129.

lations possess at least historical interest and emphasize the desirability of developing and using a simple, consistent classification of methods—of distinguishing between fundamental modes of attack on educational problems and mere devices used in the collection or analysis of data. Confusion of major methods and data-collecting devices has been frequent.

Koos reports an analysis of 581 studies in terms of investigational methods employed.[22] His findings are reported in Table VII, which is self-explanatory.

TABLE VII

NUMBERS OF STUDIES UTILIZING THE DIFFERENT METHODS OF INVESTIGATION AS SOURCES AND THE NUMBERS AND PERCENTAGES OF STUDIES TREATED QUANTITATIVELY

Method of Investigation	Total Number	Number Quantitative	Per Cent Quantitative
Questionnaire	143	141	98.6
Experiment	137	134	97.8
Measurement	109	106	97.3
Documentary analysis	145	120	82.8
Case method	13	7	53.8
Others	34	34	100.0
All Methods	581	542	93.3

Bixler presents an analysis of the basal methods of research and of the techniques of collecting data found in one hundred Doctors' dissertations accepted during 1924-25. The results are found in Table VIII.[23] It is recognized that some theses employ more than one method and are therefore represented more than once in the tabulation.

Douglass has made a valuable analysis, reported in non-

22 L. V. Koos, *op. cit.*, p. 53.

23 H. H. Bixler, *Check Lists for Educational Research*, pp. 85-7. New York: Teachers College, Columbia University, 1928.

tabular form, of types and fields of secondary-curriculum research in 1929.[24]

TABLE VIII

ANALYSIS OF THE METHODS OF RESEARCH AND OF TECHNIQUES OF COLLECTING DATA USED IN ONE HUNDRED DISSERTATIONS

Method or Technique	Eleven Universities	Teachers College Columbia University	Total
	N = 27	N = 73	N = 100
I. Methods of research			
A. Historical method	6	15	21
B. Experimental method			
1. One-group	3	9	12
2. Equivalent-groups	8	13	21
3. Rotation	0	0	0
C. Case method	2	7	9
D. Case-group method	0	1	1
E. Investigational methods	20	56	76
II. Techniques of collecting data			
A. Measurement			
1. Evaluation and selection of existing tests	11	27	38
2. Construction of new tests	10	13	23
3. Administration of tests	12	25	37
4. Scoring of tests	12	20	32
B. Interviews	5	11	16
C. Questionnaires	11	31	42
1. Necessity for, and value of, shown	6	16	22
2. Scientific selection and arrangement of items	3	3	6
3. The original form presented	5	15	20
D. Judgments or ratings	9	14	23
1. Qualifications of the judges	3	8	11
E. Personal observation, including stenographic reports	3	8	11

Franke and Davis provide an interesting tabulation of magazine articles by decades from 1890 to 1930 in terms of

24 H. R. Douglass, "Types and Fields of Curriculum Research in Secondary Education During 1929," *School Review*, XXXVIII (November, 1930), 656-62.

the methods used in educational research.[25] For present purposes, only the analysis for the decade 1920-29 is reproduced in Table IX. The authors call attention to: (1) the comparatively small amount of research using the historical, legal, comparative-survey, and case-study methods (this is true of all year-periods); (2) the relatively large number of articles which used the questionnaire, correspondence, and interview methods, during the first two periods, 1890-1899 and 1900-1909 (a marked decline of these methods is noted during the last two periods); (3) the marked increase of statistical method from 1910 to the present time; (4) the rapid rise of experimental techniques from 1910 to 1919, with some decrease from 1920 to 1929 (this decline during the last period is probably due to the influence of the testing movement).

Good's tabulation by five-year periods of 397 Teachers College (Columbia) Doctors' dissertations in terms of research techniques employed forms Table X.[26]

It will be noted that the relative frequency of use of research methods in Doctors' dissertations at Teachers College, Columbia University, is not the same in every instance as that reported for magazine articles by Franke and Davis.[27] In the series of studies analyzed in Table X, it is evident that the purely philosophical or subjective thesis is infrequent and is becoming increasingly so. The historical and legal methods are a fair proportion of the total, although they are not employed frequently in secondary education. Former interest in philosophical, theoretical, and historical problems has shifted to legal and foreign aspects of education, but the technique involved is much the same. The questionnaire-correspondence method has been used in one-half of the Doctors' dissertations printed in this series since 1924. This seems an overworking of a useful device, especially in secondary education. Students

25 Paul R. Franke and Robert A. Davis, "Changing Tendencies in Educational Research," *Journal of Educational Research*, XXIII (February, 1931), 133-45.

26 Carter V. Good, "Fields and Types of Research in Education, 1918-1931," *Journal of Educational Research*, XXIV (June, 1931), 33-43.

27 Paul R. Franke and Robert A. Davis, *op. cit.*

TABLE IX

DISTRIBUTION OF THE AMOUNT OF RESEARCH PRODUCED IN 1920-1929 ANALYZED ACCORDING TO METHODS

Method	Articles		Pages	
	Number	Per Cent	Number	Per Cent
Historical—Legal	17	.85	154	.80
Comparative—Survey	88	4.38	774	4.00
Questionnaire—Correspondence—Interview	303	15.06	2988	15.86
Statistical	852	42.37	7798	40.34
Experimental	514	25.56	4932	25.11
Case Studies	31	1.54	382	1.98
Job Analysis—Activity Analysis—Social Survey	206	10.24	2305	11.92
Totals	2011	100	19333	100

TABLE X

CLASSIFICATION OF TECHNIQUES OF RESEARCH IN 397 TEACHERS COLLEGE (COLUMBIA) CONTRIBUTIONS TO EDUCATION

Technique	Period						Total times technique used
	1905 1909	1910 1914	1915 1919	1920 1924	1925 1929	1930	
Philosophical	6	5	0	3	7	0	21
Historical, legal	17	17	8	13	44	2	101
Questionnaire	4	6	5	11	101	28	155
Statistical	10	20	25	49	196	41	341
Experimental	1	3	4	14	36	8	62
Case	0	0	0	4	3	2	9
School survey	0	1	2	0	14	0	17
Analysis	1	1	4	7	30	13	56
Total Theses	23	31	29	57	213	44	397*

*This, the total number of theses, is less than the total number of times the various techniques were used.

seem to recognize the criticism aroused by indiscriminate use of the questionnaire and seek to avoid the term by substituting such labels as question forms, data sheets, research blanks, and history blanks. Naturally statistical procedures have been employed in a majority of the theses. More experimental studies are needed, especially in secondary education. This is a type of research little used before 1920 in this series of dissertations, and apparently not at all in secondary education before 1920. There are real possibilities in wider use of the case method, which is recent in its application to education. Within the five years from 1925-1930 the technique of analysis (activities, textbooks, difficulties, etc.) was applied more frequently than before. In certain instances, however, this method proves to be a mechanical tabulation of frequency counts hardly in keeping with the sort of problem-solving contribution expected of the doctoral candidate. A number of graduate students participated in school surveys between 1925 and 1929 and used portions of the data accumulated as Doctors' dissertations. Valuable field experience may be secured in this way.

Certain comparisons of the data of Tables IX and X are in order. Evidently many more graduate students than writers of magazine articles use historical or legal techniques of research. There is no evidence during the decade 1920-1930 of a decrease in the use of the overworked questionnaire methods by graduate students, in fact, quite the contrary. It is to be expected that theses will emphasize objective statistical treatment of data more than is the case in magazine articles, although such procedures are common in both types of educational literature. In both articles and theses experimental techniques have been on the increase. Case studies have been relatively infrequent in the two analyses reported above, which also agree approximately on the extent to which the various techniques of analysis have been employed.

Classification of research methods used in this book. Foregoing portions of this chapter have outlined the various ways in which contemporary workers in the field of educational re-

search have classified methods of investigation. It is recognized that some confusion may result for the beginner from such a diversity of classifications, but such categories are useful for comparative purposes and historical interest. The student should remember, however, that all fundamental research shares the goal of truth and the elements of critical reflective thinking.

No particular profit would result from, and indeed space is not available for, an attempt to evaluate these enumerations of research procedures. The critical reader may examine any desired classification in terms of internal consistency or conformity to the steps in problem solving, or compare it with any other plan or with that employed in this book. It becomes immediately apparent that many of the foregoing outlines fail to distinguish between basal or fundamental approaches to problem solving (as in the case of the historical and experimental methods), devices for collecting data (questionnaires, check-lists, rating scales, etc.), and procedures for analyzing and interpreting data (for example, statistics, logic, and philosophy). Certainly the classifications cited at the beginning of this chapter in terms of fields involved, place where conducted, application made, etc., have little value for the present purpose.

No attempt is made to characterize one method as more important than another, since the purpose to be served and the conditions to be met must determine the value of a research method in a given situation. The value of a machine gun, a rifle, a shotgun, and a revolver as a weapon must be determined in relative rather than absolute terms. The difficulty of establishing a sharp line of demarcation between fundamental methods of research and minor techniques or devices for collecting or analyzing data will be recognized; since, under the direction of an expert, what was a minor technique in a different situation or in the hands of a beginner—the case study, for example—may become a major procedure in the approach to truth. Therefore, the present arrangement of in-

vestigational procedures is intended merely as a working classification of the various methods or techniques of collecting educational data, without any claim for finality.

Rarely does a given study represent a single method of investigation. Frequently several modes of attack must be employed in the collection of data adequate for the solution of a problem. Symonds appropriately cautions the worker concerning the current tendency to overemphasize differences in research techniques:[28]

> The customary classifications of research techniques into types of research overemphasize differences which are matters of relative emphasis only. In certain cases the whole investigation comprises a resumé and evaluation of past events, and we have historical research. Even in an experimental inquiry, however, one should precede his work by knowing what others have done in the past on the same topic or in the same field. Again all research should include statistical methods, although at times this use of statistics may be exceedingly elementary and simple. In historical study, however, which would seem to be as far removed from the statistical as possible, one should not draw conclusions on the basis of a single event. For example, one should not draw conclusions as to the nature of the academy in the eighteenth century from the description of one such academy. The question of sampling arises wherever generalizations are to be made, and sampling is a statistical issue.

In attacking such an educational problem as adaptation of the instructional program to varying needs, it is clear that four major approaches are possible: (1) to examine the evidence and experience of the past as an aid in analyzing and interpreting the present situation (historical research); (2) to canvass present practice with respect to plans for dealing with such differences, or to set up norms or central tendencies through testing and measurement against which the extent of differences may be checked (normative-survey research); (3) under controlled conditions, with only a single variable, to try out in classroom or laboratory different ways of adjusting to varying pupil needs in order to determine the effectiveness

[28] A. S. Barr and Others, "A Symposium on the Classification of Educational Research," *Journal of Educational Research*, XXIII (May, 1931), 375.

of a given procedure (experimental research); (4) to determine relationships through statistical manipulation of data, correlational calculations, for example, or to diagnose the origin or cause of differences through intensive case or genetic study or causal-comparative group analysis, and possibly to follow such analyses by remedial prescription and practice (types of research especially adapted to studying complex causal relationships).

Some readers may say that this is an academic and logical rather than a functional and psychological classification, but in reality this fourfold division is as functional as problem-solving itself, involving as it does the major or fundamental modes of attack on educational problems. It is as psychological as the sequence and pattern of reflective thought,[29] since later paragraphs show the place of a variety of procedures in the collection, analysis, and interpretation of data. Into this reasonably consistent and complete pattern of scientific method may be blended with little difficulty each of the research classifications enumerated earlier in this chapter. In so doing, logic and philosophy are not excluded from the picture, but have a definite place and contribution, as pointed out later. The paragraphs which follow outline briefly this simple classification of research methods. Later chapters include detailed discussions of these techniques.

1. *Historical research.* The historical method is considered a major approach to educational truth. Much of the emphasis of recent years in historical research has been diverted to the study of legal aspects of education, including statutes and court decisions. Both the more general historical problems and specialized legal research involve painstaking examination of the original sources and documentary study. Analytical works of a bibliographical and summary nature may well be classified

29 J. Stanley Gray, "A Neglected Phase of Educational Research," *Journal of Educational Research*, XXIX (October, 1935), 83-90. Points out that the steps in problem solving or good thinking are essentially the same, and urges that each investigational step or procedure be recognized and evaluated in the light of its significance and relationship to the complete act of problem solving.

under this heading. Critical summaries require research ability of high order, if the work of analysis and synthesis is well done, and are valuable contributions to educational literature. Historical research is discussed in Chapter VI.

2. *Normative-survey research.* This method may utilize a number of tools and procedures, such as questionnaires, tests, check-lists, rating scales, score cards, interviews, etc. For this type of investigation several specialized procedures have been developed: for making comparisons (between periods in history, nations, regions, states, counties, cities, districts, schools, grades, departments, subjects, school enterprises etc.), for revealing status or central tendencies, for making predictions of future performances, and sometimes for determining causes of present conditions. These procedures, for the most part normative in character, may be classified as established phases of the normative-survey technique. The national surveys of secondary education and teacher training, already listed in Chapter III, the Modern Foreign Language Study, the Educational Finance Inquiry, and the educational year-books of the International Institute of Teachers College, Columbia University, are good examples of this method. Testing surveys properly belong in this category.

Techniques of analysis (as applied to activities, jobs, social needs or usage, books, courses of study, difficulties, etc.) have been borrowed from the industrial world to aid in determining what activities to emphasize most profitably in the school. These methods have been applied frequently in analyzing social need or usage as a guide in curriculum reorganization. They usually result in central tendencies of the normative-survey type. The normative-survey method is discussed in Chapters VII and VIII under six types of studies employing: (*a*) survey-testing, (*b*) questionnaire, (*c*) documentary-frequency, (*d*) interview, (*e*) observational, and (*f*) survey-appraisal procedures, including school surveys.

3. *Experimental research.* The experimental method also is considered a major type of educational research. The ex-

perimental technique, whether used in classroom or laboratory, has possibilities for solution of numerous and significant learning and teaching problems through the process of controlled observation and measurement. Of course the greatest difficulty in using this method with human beings is the control of variable factors. In experimental work, the logical principle of "difference" is employed, since with all factors save one controlled and equated for subjects or groups, differences appearing as a result of the operation of the single variable are noted. The experimental method, including the control of variable factors, is discussed in Chapter IX.

The laboratory method almost always involves a type of experimental approach, although usually it is a more intensive study of a smaller number of subjects than classroom experimentation where the group technique prevails. Obviously, it is a special form of the experimental method, and is discussed in Chapter IX.

4. *Other methods of research especially adapted to studying complex causal relationships.* In certain other types of investigation one observes an effect and seeks to determine its cause; for example, in the case of a teacher who has done poorly in her instructional duties, a pupil who has failed in one or more school subjects, or a class which has made relatively little progress in attaining its educational goals.[30]

The investigator may concentrate his attention on single instances of poor work, conducting a diagnostic type of analysis similar to intensive case-study procedure, or he may seek to determine the causes of poor performance common to a number of instances. Research concerned with such causal-comparative relationships involves the logical principle of "agreement" in that situations are compared to discover likenesses or common factors which may produce, let us say, good teaching or poor teaching. Case-study procedures, diagnostic and prognostic instruments, and correlation techniques have

[30] A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, Chapter IV. New York: D. Appleton and Co., 1931.

been used extensively in this type of research, which is discussed in Chapter X.

The case method has been borrowed from medicine, law, social service, and military science, and applied in education to problems of abnormality, brightness, dullness, adjustment, adolescence, problem children, special talents and defects, mental and physical growth, etc. Although the intensive analysis of many individual cases may result in the establishment of central tendencies and generalizations as in the survey or normative method, the case technique because of its emphasis on diagnosis seems to merit treatment as a causal type of investigation which employs both documentary and non-documentary evidence written up in the form of case histories.

The genetic method is developmental in character, involving a series of observations (often uncontrolled), or cross sections. In this type of research causal factors frequently are investigated. Genetic studies are similar to normative-survey investigations in the sense that norms of development or attainment are involved. They are of an experimental character when controlled conditions of observation and measurement are established.

Both case and genetic methods involve a type of historical approach. Excellent examples of both procedures are found in the Stanford *Genetic Studies of Genius*.[31] Gesell's and Baldwin's growth studies are outstanding illustrations of the genetic type of research.[32] Case and genetic methods are discussed in Chapter X.

Distinguishing characteristics of the major research methods. This fourfold classification may be presented to advantage in tabular form, with the sources of data, type of

[31] L. M. Terman and Others, *Genetic Studies of Genius*, Vols. I, II, III. Stanford, Calif.: Stanford University Press, 1925, 1926, 1930. Pp. 648, 842, 508.

[32] Arnold Gesell, *Infancy and Human Growth*. New York: The Macmillan Co., 1928. Pp. 418.

Arnold Gesell and Others, *An Atlas of Human Behavior*, Vols. I and II. New Haven, Conn.: Yale University Press, 1934. Pp. 922.

B. T. Baldwin, *The Physical Growth of Children from Birth to Maturity*. University of Iowa Studies in Child Welfare, Vol. I, No. 1. Iowa City, Iowa: University of Iowa, 1921. Pp. 412.

control, approach, and typical purposes indicated for each research method. The chief sources of data are direct and indirect observation, with the aid of various measuring instruments, data-gathering devices, and documents. Observation may be under controlled conditions, as in experimental and laboratory studies, or uncontrolled, as in historical and in most survey studies. The approach may be longitudinal, with a fairly long time span, as in historical and in most genetic and case-study research (with a limited number of subjects in genetic and case investigations), or cross-sectional, as in normative-survey and experimental work (with sampling of a fairly large number of cases over a relatively short period of time in normative-survey studies). It will be noted that any of the four methods of research may be employed to determine causal relationships, although this is not the primary purpose of normative-survey studies. Some interesting comparisons may be noted in the last column with respect to the typical forms in which the results of the several types of research are stated.

Devices, tools, or aids in the collection, analysis, and interpretation of data. There are certain procedures not of themselves fundamental research methods in the search for truth, but which rather serve as tools or devices in collecting or analyzing data. The use of questionnaires, check-lists, rating scales, and interviews is discussed in Chapters VII and VIII. The questionnaire is a useful, if overworked and abused, device for securing educational data. The interview is in part an oral-questionnaire technique. Check-lists, rating scales, and score cards may be forms of the questionnaire.

Statistical techniques are discussed in still another chapter (XI) which deals with the analysis, classification, and summarization of data. The statistical method may be considered as a way of manipulating data rather than as a technique for securing new information. Of course there are a few pieces of research in which new formulae, machines, or statistical devices, are worked out, for example, a statistical slide-rule, machines for testing and for drill, or a new method for obtain-

SOME DISTINGUISHING CHARACTERISTICS OF THE MAJOR RESEARCH METHODS

Method	Source of Data	Type of Control	Approach	Typical Purposes	Typical Forms for Stating Results
1. Historical.....	Direct observation as an eye-witness; indirect observation through documents, remains, and eye-witnesses	Uncontrolled observation	Longitudinal	Accurate record of past events Status of phenomena at given times Interpretation and evaluation of present-day problems and procedures Determination of causal relationships	Verbal exposition and interpretation
2. Normative-survey.....	Direct observation, as in the interview and measurement; indirect observation, through questionnaires, check-lists, etc.	Chiefly uncontrolled observation, but controlled in the case of testing	Cross-sectional	Status and comparison of objects and conditions at the present time (In some cases causal relationships may be involved.)	Measures of central tendency and variability
3. Experimental....	Direct observation and measurement	Controlled observation	Cross-sectional	Determination of causal relationships, evaluation and comparison experimentally of educational procedures	Amounts and reliabilities of experimentally produced changes
4. Other methods especially adapted to studying complex causal relationships					
(*a*) Causal—comparative	Direct observation and measurement	Uncontrolled observation	Cross-sectional	Determination of causal relationships	Group likenesses and differences
(*b*) Correlation	Direct observation and measurement	Chiefly uncontrolled observation	Cross-sectional	Determination of causal relationships and prediction	Coefficients of correlation (simple, partial, and multiple) and regression equations
(*c*) Case study	Direct and indirect observation, measurement, and documentary evidence	Chiefly uncontrolled observation	Longitudinal	Determination of causal relationships	Individual case histories
(*d*) Genetic	Direct observation and measurement	Controlled and uncontrolled observation	Longitudinal preferably, but may be cross-sectional	Determination of change, growth, and development Discovery of characteristic traits and norms at different age levels Determination of causal relationships	Growth norms

ing correlation coefficients. Test construction and testing studies involve extensively the following statistically derived characteristics: central tendency, variability, reliability, validity, and relationship. The appropriate place for discussion of tests and test construction is in Chapter VII, along with certain other data-gathering devices.

It is apparent that some of these data-collecting devices provide quantitative and objective data—for example, the salaries of teachers or the average daily attendance of pupils; others secure qualitative and subjective information—for example, the rating of a teacher, a textbook, or a school building. In analyzing data secured through such media, it is necessary in some cases, especially qualitative or subjective studies, to use verbal methods, where statistical procedures and terms do not apply. However, these are problems for consideration in the appropriate subsequent chapters (XI and XII).

Comment should be made concerning the disposal of so-called philosophical techniques in this book. Many students of objective methods in educational research do not concede the existence of a philosophical technique of investigation. However, it is to rationalization, good thinking, and sound logic that one must turn in the interpretation of data and in determining ultimate goals and values. Even though this technique of thinking is not accepted everywhere as a type of research, it must be admitted that subjective technique has led to important contributions to educational literature.

Will Durant has expressed strikingly the relationship between science and philosophy, by saying that mere facts mean little except in relation to desire, purpose, a whole, and in terms of perspective and valuation.[33] "Science gives us knowledge, but only philosophy can give us wisdom." If science is the foundation of the cathedral of learning, philosophy is the spire which points onward and upward.

Space is not available in this chapter for a more detailed statement of the place of philosophy in educational research.

[33] Will Durant, *The Story of Philosophy*, p. 3. New York: Simon and Schuster, 1926.

The authors find its chief function in the interpretation and evaluation of data, as well as in the formulation of hypotheses. Therefore, the contribution of philosophical and logical procedures is discussed in other chapters (IV, XI, and XII) which deal with problems of setting up hypotheses, critical analysis of evidence, and formulation of conclusions and generalizations. At this time, the interested reader should examine current discussions of the place of science and philosophy in education.[34] Burton in particular has emphasized the close relationship between philosophy and science, although he devotes separate chapters to "The Science of Education and Its Method" and to "The Philosophy of Education and Its Method." These complementary and supplementary aspects of philosophy and science as phases of problem solving or as steps in reflective

34 W. H. Burton, *Introduction to Education*, Part II. New York: D. Appleton-Century Co., 1934.

O. G. Brim, "Orientation of Educational Research to Present-day Science and Philosophy," *Educational Research Bulletin*, XIII (February 14, 1934), 29-38, 54.

H. A. Clugston and R. A. Davis, "Is a Scientific Method Possible for Philosophical Research in Education?" *Educational Administration and Supervision*, XVI (April, 1930), 293-99.

———, "Suggested Criteria for the Philosophical Method of Research in Education," *Educational Administration and Supervision*, XVI (November, 1930), 575-80.

Michael Demiashkevich, *An Introduction to the Philosophy of Education*. New York: American Book Co., 1935. Chapter I deals with the science and the philosophy of education.

John Dewey, "The Need for a Philosophy of Education," *New Era*, XV (November, 1934), 211-7.

R. L. Finney, "Philosophy versus Science Again," *Educational Administration and Supervision*, XVI (March, 1930), 161-73.

F. N. Freeman, "Scientific and Philosophical Methods in Education," *Science*, LXXIII (January 16, 1931), 54-9.

H. W. Holmes, "The Philosophic Element in Scientific Method," *School and Society*, XLI (January 12, 1935), 41-8.

H. G. Hullfish, "The Relation of Philosophy and Science in Education," *Journal of Educational Research*, XX (October, 1929), 159-65.

T. L. Kelley, "The Scientific versus the Philosophical Approach to the Novel Problem," *Science*, LXXI (March 21, 1930), 295-302.

W. H. Kilpatrick, "Philosophy and Research: The Relations of Philosophy and Science in the Study of Education," *School and Society*, XXX (July 13, 1929), 39-48.

———, "The Relation of Philosophy to Scientific Research," *Journal of Educational Research*, XXIV (September, 1931), 97-114.

M. A. May, "The Relative Value of Science and Philosophy in Appraisal," *The Direct Contribution of Educational Psychology to Teacher Training*, Chapter VIII, Yearbook XX of the National Society of College Teachers of Education, Chicago: University of Chicago Press, 1932.

R. B. Raup, "Limitations of the Scientific Method," *Teachers College Record*, XXX (December, 1928), 212-26.

R. E. Waitt, "A Plea for a More Appreciative Coöperation between Scientist and Philosopher in Education," *Education*, XLIX (May, 1929), 513-21.

Frederick L. Whitney, "Some Limitations of Scientific Method in Education," *Teachers Journal and Abstract*, IV (January, 1929), 59-62

thinking were pointed out near the end of Chapter I, and have been analyzed elsewhere in more detail by one of the present writers.[35]

Concluding statement. The reader is reminded again that no single classification of research methods is satisfactory for all purposes and certainly not for all investigators. However, the simple working classification adopted for purposes of discussion in this volume seems usable and will help the student to attack problems or collect data for the solution of problems, as well as show the steps of problem solving. It has been said in this chapter that in attacking most of our educational problems—the adaptation of instruction to varying needs, for example—there are probably four major approaches: (1) to examine the evidence and experience of the past as an aid in analyzing and interpreting the present situation (historical research); (2) to canvass present practice with respect to plans for dealing with such differences or to set up norms or central tendencies through testing and measurement against which the extent of differences may be checked (normative-survey research); (3) under controlled conditions, with only a single variable, to try out in classroom or laboratory different ways of dealing with or adjusting to individual differences in pupils in order to determine the effectiveness of a given plan or procedure (experimental research); (4) to determine relationships through statistical manipulation of data (correlational calculations for example) or through intensive case or genetic study or causal-comparative group analysis, to diagnose the origin or cause of differences and possibly to follow such analyses by remedial prescription and practice (types of research especially adapted to studying complex causal relationships). Likewise, devices for collecting data (such as the questionnaire), statistical techniques for analysis and interpretation of data, and so-called philosophical methods (useful in formulating and testing hypotheses, and in

[35] A. S. Barr, "Science and Philosophy in Supervision," *Education*, LIII (June, 1933), 587-93.

interpreting data), have been assigned appropriate places in the pattern or steps of problem solving and scientific method.

Problems and Exercises

1. Select some classification of research methods, and criticize it in terms of comprehensiveness, internal consistency, and possibilities for attack on educational problems.
2. Show how the classification chosen in connection with the preceding assignment may be reorganized so as to agree reasonably well with the pattern of research methods which this book represents.

Selected References †

* Abelson, H. H. *The Art of Educational Research: Its Problems and Procedures.* Yonkers-on-Hudson, N. Y.: World Book Co., 1933. Pp. xii + 332.

Alexander, Carter. *Educational Research.* (Third edition revised.) New York: Bureau of Publications, Teachers College, Columbia University, 1931. Pp. 115.

* Almack, J. C. *Research and Thesis Writing.* Boston: Houghton Mifflin Co., 1930. Pp. xviii + 310.

Barr, A. S. "The Integration of Scientific Techniques in Educational Research," *Journal of Educational Research,* XXVI (November, 1932), 219-21.

* ———, and Others. "A Symposium on the Classification of Educational Research," *Journal of Educational Research,* XXIII (May, 1931), 353-82; XXIV (June, 1931), 1-22.

* ———, and Rudisill, Mabel. *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education.* Bulletin of the Bureau of Educational Research, No. 13, June, 1931. Madison, Wis.: University of Wisconsin. Pp. 129.

Bernard, L. L. "An Interpretation of Sociological Research," *American Journal of Sociology,* XXXVII (September, 1931), 203-12.

* ———, and Others. *The Fields and Methods of Sociology.* New York: Long and Smith, 1934. Pp. xvi + 529. Deals with the fields, problems, sources, and methods of sociology, including educational sociology.

Bickham, M. H. "Making Social Analyses of College Communities," *Journal of Educational Sociology,* II (May, 1929), 514-9. Describes the techniques of social observation, life history, case work and interview, and social analysis.

* Bixler, H. H. *Check-Lists for Educational Research.* New York: Bureau of Publications, Teachers College, Columbia University, 1928. Pp. xiv + 118. Numbered lists of research principles or procedures gathered from the literature of educational research.

† Also see the bibliography at the end of Chapter I.

BOGARDUS, E. S. *Making Social Science Studies.* Los Angeles, Calif.: Jesse Ray Miller, 1925. Pp. 103.

——— *The New Social Research.* Los Angeles, Calif.: Jesse Ray Miller, 1926. Pp. 287.

BUCKINGHAM, B. R. *Research for Teachers.* New York: Silver, Burdett and Co., 1926. Pp. v + 386.

BURGESS, E. W., and Others. "Scientific Prediction and Social Work," *Social Forces,* VII (June, 1929), 533-63.

BURGESS, T. O. "The Technique of Research in Educational Sociology," *Journal of Educational Sociology,* IV (January, 1931), 272-8.

BUSWELL, G. T. "The Techniques of Educational Research," *Elementary School Journal,* XXXI (October, 1930), 147-9.

CARROLL, R. P. "Methods of Educational Research," *Journal of Educational Research,* XI (April, 1925), 309-11.

CAVAN, Ruth S. "Methods of Studying Personality," *Religious Education,* XXVII (January, 1932), 50-5.

CAWTHORNE, H. W. *Science in Education.* New York: Oxford University Press, 1931. Pp. vi + 110.

COCKING, W. D. *Administrative Procedures in Curriculum Making for Public Schools.* Teachers College Contributions to Education, No. 329. New York: Teachers College, Columbia University, 1928. Pp. vi + 120.

COHEN, M. R., and NAGEL, Ernest. *An Introduction to Logic and Scientific Method.* New York: Harcourt, Brace and Co., 1934. Pp. xii + 468.

COLLINGS, Ellsworth. "Review of Harap's 'The Technique of Curriculum Making,'" *Journal of Educational Research,* XVIII (September, 1928), 159-60. Lists the methods of research available for curriculum making: activity analysis, listing of objectives, frontier thinking, child activity, adult needs, median present practice, social statistics, and educational shortage procedures.

* CRAWFORD, C. C. *The Technique of Research in Education.* Los Angeles, Calif.: University of Southern California, 1928. Pp. 320. Based on an analysis of the difficulties of graduate students, as reported by students and professors, with suggested solutions gathered from various sources.

DAVIS, E. C. *Methods and Techniques Used in Surveying Health and Physical Education in City Schools.* Teachers College Contributions to Education, No. 515. New York: Teachers College, Columbia University, 1932. Pp. 162.

* DEWEY, John. *How We Think.* Boston: D. C. Heath and Co., 1910. Pp. vi + 224. (New edition, 1933.) Pp. x + 301.

* ——— *The Sources of a Science of Education.* New York: Horace Liveright, 1929. Pp. 77.

DOUGLASS, H. R. "Types and Fields of Curriculum Research in Secondary Education During 1929," *School Review,* XXXVIII (November, 1930), 656-62.

EATON, G. G. "Validating Methods of Educational Research." Unpublished Master's thesis, University of Colorado, 1933.

* ELLWOOD, C. A. *Methods in Sociology—A Critical Study.* Durham, N. C.: Duke University Press, 1933. Pp. xxxiv + 214.

ELLWOOD, C. A. "Scientific Method in Sociology," *Social Forces,* XI (October, 1932), 44-50.

ELMER, M. C. *Technique of Social Surveys.* (Third edition.) Los Angeles, Calif.: Jesse Ray Miller, 1927. Pp. 260.

FRANKE, P. R., and DAVIS, R. A. "Changing Tendencies in Educational Research," *Journal of Educational Research,* XXIII (February, 1931), 133-45.

* FREEMAN, F. N., and Others. "Methods and Techniques of Educational Research," *Review of Educational Research,* IV (February, 1934), 1-120. Analyzes the methods of research most appropriate in the various fields of education.

* GEE, W. P., and Others. *Research in the Social Sciences: Its Fundamental Methods and Objectives.* New York: The Macmillan Co., 1929. Pp. x + 306.

GIDDINGS, Franklin Henry. *The Scientific Study of Human Society.* Chapel Hill, N.C.: University of North Carolina Press, 1924. Pp. vii + 247. Methods of research in sociology.

GOOD, Carter V. "Fields and Types of Research in Education, 1918-1931," *Journal of Educational Research,* XXIV (June, 1931), 33-43. An analysis of Doctors' theses completed and under way.

——— *How to Do Research in Education.* Baltimore: Warwick and York, 1929. Pp. 298. A handbook of information for the graduate student, research worker, and public-school investigator and administrator.

HEGNER, Robert, and ANDREWS, Justin. *Problems and Methods of Research in Protozoology.* New York: The Macmillan Co., 1930. Pp. x + 532.

HOPKINS, L. T. *Curriculum Principles and Practices.* Chicago: Benjamin H. Sanborn and Co., 1929. Pp. xiv + 618.

HOUSE, F. N. "Measurement in Sociology," *American Journal of Sociology,* XL (July, 1934), 1-11.

HOWERTH, I. W. "Popular Indifference to Science?" *Phi Delta Kappan,* XVII (April, 1935), 191-6.

JACKSON, D. C., and JONES, W. P. *This Scientific Age.* New York: John Wiley and Sons, 1931. Pp. viii + 354.

JUDD, C. H. "The Place of Research in a Program of Curriculum Development," *Journal of Educational Research,* XVII (May, 1928), 313-23. Reviews current techniques in curriculum research and suggests modifications, refinements, and needed emphasis in curriculum investigation.

* KELLEY, T. L. *Scientific Method: Its Function in Research and in Education.* New York: The Macmillan Co., 1932. Pp. x + 234. Columbus, Ohio: Ohio State University Press, 1929. Pp. 204.

KINDER, Elaine F. "Scientific Method in Social Psychology," *Journal of Abnormal and Social Psychology,* XXIV (April-June, 1929), 63-73.

LECHATELIER, H. M. "The Methodology of Scientific Research," *Journal of Chemical Education,* VII (November, 1930), 2584-9.

LOWMAN, H. L. "The Work of the Curriculum Constructors," *Education,* XLIX (April, 1929), 473-8. Describes the conference, experimental, job-analysis, and philosophical methods of curriculum construction, as applied to the school program.

* LUNDBERG, G. A. *Social Research:* A Study in Methods of Gathering Data. New York: Longmans, Green and Co., 1929. Pp. x + 380.

* McCall, William A. *How to Experiment in Education.* New York: The Macmillan Co., 1923. Pp. xiv + 281.

McCloy, C. H. "Methods of Research in Physical Education," *American Physical Education Review,* XXXIV (January, 1929), 10-6. Discusses the following methods: bibliographical, historical, descriptive (observation, questionnaire, and case study), causal or correlative, philosophical, comparative, and research in methods of research, as applied to the field of physical education.

——— "Professional Progress through Research," *Research Quarterly of the American Physical Education Association,* I (May, 1930), 63-73. Deals with research methods in physical education.

Monroe, W. S. "Difficulties in Educational Research," *Educational Research Bulletin,* IX (January 8, 1930), 1-6. Emphasizes especially fallacies in statistical methods of research.

* ———, and Engelhart, M. D. *The Techniques of Educational Research.* University of Ilinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928. Pp. 84.

Murchison, Carl, and Others. *A Handbook of Child Psychology.* Worcester, Mass.: Clark University Press, 1931. Pp. 712. Second Edition, revised, 1933. Pp. 956.

———, and Others. *A History of Psychology in Autobiography,* Vols. I and II. Worcester, Mass.: Clark University Press, 1930, 1932. Pp. 516, 408.

Odum, H. W. "The 'Scientific-Human' in Social Research," *Social Forces,* VII (March, 1929), 350-62.

* ———, and Jocher, Katherine. *An Introduction to Social Research.* New York: Henry Holt and Co., 1929. Pp. xiv + 488. A detailed discussion of the techniques of social research.

Ogg, F. A. *Research in the Humanistic and Social Sciences.* New York: The Century Co., 1928. Pp. 454.

Palmer, Vivien M. *Field Studies in Sociology:* A Student's Manual. Chicago: University of Chicago Press, 1928. Pp. xix + 281.

Reckless, W. C., and Others. "Minimum Standards of Training in Research Techniques," *Sociology and Social Research,* XVIII (January-February, 1934), 203-22. Deals with procedure in social research, with special application to sociology.

Reuther, E. B. "An Evaluation of the Subjective Methods of Sociological Research," *Journal of Educational Sociology,* IX (October, 1935), 72-8.

Robinson, Daniel S. *Illustrations of the Methods of Reasoning:* A Source Book in Logic and Scientific Method. New York: D. Appleton and Company, 1927. Pp. xiii + 346.

——— *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method. New York: D. Appleton and Co., 1924. Pp. xviii + 390.

Rusk, R. R. *Research in Education:* An Introduction. London: University of London Press, Ltd., 1932. Pp. 108.

Saidla, L. E., and Gibbs, W. E. *Science and the Scientific Mind.* New York: McGraw-Hill Book Co., 1930. Pp. xiv + 506. A group of

twenty-four essays on the scientific mind, scientific method, and effects of science on culture.

* SCHLUTER, W. C. *How to Do Research Work.* New York: Prentice-Hall, 1927. Pp. vii + 137.

* SEYFRIED, J. E. *Principles and Mechanics of Research.* Albuquerque, N. M.: University of New Mexico, July, 1935. Pp. 240.

* SPAHR, W. E., and SWENSON, R. J. *Methods and Status of Scientific Research.* New York: Harper and Bros., 1930. Pp. xxii + 534. Principles of critical scholarship, technique, and status of research in the social sciences.

STRANG, Ruth. "Research on Techniques Used in the Study of Individuals," *Teachers College Record,* XXXVII (November, 1935), 100-10. Deals with tests and records, observation, rating, interviewing, and case study.

SULLINGER, T. E. "Research in Community Life," *Journal of Educational Sociology,* VIII (October, 1934), 94-97. Methods of research in this field.

SYMONDS, P. M. "Methods of Investigation of Study Habits," *School and Society,* XXIV (July 31, 1926), 145-52.

* ——— *Psychological Diagnosis in Social Adjustment.* New York: American Book Co., 1934. Pp. 362.

TOOPS, H. A. "Some Considerations Relative to the Standardization of Certain Procedures in Educational Research," *Journal of Experimental Education,* I (March, 1933), 229-38.

TROW, William Clark. *Scientific Method in Education.* Boston: Houghton Mifflin Co., 1925. Pp. xi + 159.

TYLER, R. W. "Techniques for Evaluating Behavior," *Educational Research Bulletin,* XIII (January 17, 1934), 1-11.

WALLER, Willard. "Insight and Scientific Method," *American Journal of Sociology,* XL (November, 1934), 285-97. States some methodological implications of the Gestalt principle of insight.

* WAPLES, Douglas, and TYLER, R. W. *Research Methods and Teachers' Problems.* New York: The Macmillan Co., 1930. Shows the teacher how to apply the most productive type of research technique to classroom situations.

WHEELER, R. H. "Postulates for a Theory of Education: II, a Methodology for Educational Research," *Journal of Educational Research,* XXIX (November, 1935), 187-95.

* WHITNEY, F. L. *Methods in Educational Research.* New York: D. Appleton and Co., 1931. Pp. xviii + 336.

WILLIAMS, L. A. *The Making of High-school Curricula.* Boston: Ginn and Co., 1928. Pp. x + 234.

* "Child Development and Sociological Research," *Journal of Educational Sociology,* IX (October, 1935), 67-118.

* Columbia Associates in Philosophy, *An Introduction to Reflective Thinking.* Boston: Houghton Mifflin Co., 1923. Pp. vii + 351.

* National Committee on Research in Secondary Education, *An Outline of Methods of Research with Suggestions for High-School Principals and Teachers.* Bureau of Education Bulletin, No. 24. Washington: Bureau of Education, 1926. Pp. vi + 32. Contains chapters devoted to the

conditions essential to research, the qualifications of the research worker, types of research problems (historical, experimental, philosophical, survey, case, questionnaire), the report, and research agencies available for the principal and teacher.

Scientific Method in Supervisory Programs. Seventh Yearbook of the Department of Supervisors and Directors of Instruction. New York: Bureau of Publications, Teachers College, Columbia University, 1934.

CHAPTER VI

THE HISTORICAL METHOD

Introduction. This chapter considers the contribution made by the historical method and by educational history, the scope and frequency of historical studies in education, collection of historical data, criticism of such data, and the writing of history. Special attention is given to legal and bibliographical or summary studies because of their current interest and significance in education.

In dealing with historical research and educational history in this chapter, no attempt is made to draw a sharp line between historical method as a research procedure and the history of education as a field of professional knowledge. The former provides a technique of investigation which makes possible the existence of a body of content in the history of education; for purposes of the present, or any similar, discussion there need be no divorce between method and content.

The purpose of the educational historian may be either to produce a faithful record of unique events that have happened in the past or to suggest through the survey of these events fruitful generalizations from past experiences that may act as controls for behavior in the present or future. The educational historian may choose either or both of these objectives as the guiding purpose in his research. In the survey of previous experiences, investigations, and critical thought with respect to some selected current problem or issue, one is engaged in historical research where the purpose is to profit by the experiences of the past in the solution of present-day problems. Unfortunately, this functional character of historical research is frequently overlooked.

The functional purposes of historical research in education

are stressed repeatedly in this chapter in showing how historical materials may explain major types of educational organization, activities, and problems of to-day. It is pointed out that: (1) a study of the evolution of nationalism and democracy, and of the thinking of great leaders, may contribute to an understanding of contemporary problems; (2) educational history aids in the detection of fads and frills, acts as a sovereign solvent for pedagogical prejudices, and reveals how education as a social institution has become centralized and complex, as contrasted to an earlier form of decentralized and local control of schools. A plan is described for making historical research function in schools through well-kept records of actual teaching procedures and case studies of the pedagogical growth of pupils. A detailed illustration shows how historical methods throw light on one of the most vigorously discussed current problems, the activity school or progressive education. The legal type of research in education is an especially concrete application of principles of historical research, dealing with such problems as the right of the teacher to control children going to and from school, the teacher's liability for injury to children while at school, the influence of the court on the curriculum, etc. Finally, the thorough bibliographical survey of earlier studies in a given field, accompanied in many instances by critical analysis and interpretation of the findings, is an especially appropriate area for functional application of the principles of historical research, as pointed out later in this chapter.

Since the fundamental procedures in historical investigation, with respect to collection of data, criticism of data, and interpretation, must be observed, whether one's purpose is merely a faithful record of unique events of the past or the solution of current problems through the experiences of the past, it seems wise to turn for guidance to major treatises on the historical method, prepared by the historians themselves. Although some of these historians stress the "record" aspects of their research, as is clear in succeeding paragraphs, the reader will find ap-

propriate emphasis placed on the functional elements of educational history in other parts of this chapter. The educational historian is not so much interested in the purely *unique* aspects of past experiences as in the elements which may serve as a basis for tentative generalizations in analyzing current issues and problems. The limitations of history as a basis for problem solving will be considered as a part of the subsequent discussions of collection of data, criticism of data, and interpretation.

NATURE, VALUE, AND SCOPE OF HISTORICAL RESEARCH

Nature of historical research. History denotes any effort to recount any aspect of the past life of mankind, such as war, diplomacy, art, institutions, travel, science, industry, biography, or thought. Therefore, the possible field of historical research and writing is as broad as life itself.[1] More specifically, one may be interested in the history of politics, school legislation, the family, science, intelligence testing, the school survey, the activity school, visual instruction, the project method, whole versus part methods of learning, or laboratory technique in experimental education.

Three major processes are involved in historical method: (1) collection of data, with consideration of documents and relics, of primary and secondary sources, of bibliographical procedure, and of organization of materials; (2) criticism of data collected, including the processes of external (or lower) criticism and internal (or higher) criticism; and (3) the presentation of the facts in readable form, involving problems of organization, composition, exposition, and interpretation.

History differs from the natural sciences because it is not based upon experimentation, but upon reports of observations which cannot be repeated, although similar events may occur. It is this interest in the unique which makes it impossible for

1 H. C. Hockett, *Introduction to Research in American History*, p. xi. New York: The Macmillan Co., 1931.

the historian to take advantage of experimentation; he cannot conjure up the figures of the past and cause them to reproduce the famous scenes of history.[2] The historian has rarely witnessed the original event, but from documents and remains he attempts to reconstruct the historical past. Of course, the user of the experimental method may study directly changes taking place and may repeat and verify as often as desired the conditions under investigation, controlling the factors involved. Normative-survey research emphasizes analysis and evaluation of current rather than past events, and predicts occurrence of such events as the height, weight, or achievement in reading of school children at a given age or time.

Value and use of historical research in education. It has been suggested that the prestige of the historical method has suffered in education because of the early availability of historical materials and, therefore, the requirement of history of education in the early teacher-training programs in this country. In most cases this work was given in a standard form, involving the rather mechanical study of a mass of comparatively unrelated historical facts, without application to the social situation or to the interests, activities, and problems of educational workers.

In outlining a history of education designed to take the place of this older form of training, Reisner shows how a study of the evolution of nationalism and democracy, as well as of the thinking of great leaders, may contribute to an understanding and evaluation of present-day educational problems and of significant factors in complicated modern society.[3]

It may be said that the historical study of education does not present us with ready-made and perfect conceptions which may enter

2 F. M. Fling, *The Writing of History*, pp. 23-4. New Haven, Conn.: Yale University Press, 1920.
Allen Johnson, *The Historian and Historical Evidence*, p. 45. New York: Charles Scribner's Sons, 1926.

3 Edward H. Reisner, "The History of Education as a Source of Fundamental Assumptions in Education," *Educational Administration and Supervision*, XIV (September, 1928), 378-84.
Also see R. H. Wheeler, "A Set of Postulates for Educational Theory, I: The Background," *Journal of Educational Research*, XXVIII (January, 1935), 321-35.

without modification into our educational thought. Neither is it claimed that the mere data of educational history fall of their own weight into thought patterns. It is submitted that, in so far as education is a social process, comprehensive and realistic thinking about education must depend upon a knowledge of the origins which influence its present state. It is submitted further that the serial approach makes easier the recognition and identification of significant factors in the bafflingly complicated present situation. It is submitted, finally, that a critical estimate of the partial viewpoints and the keen insights of educational thinkers who have written their names into the history of Western civilization not only may protect us against the too-easy acceptance of half-concepts which bid for our approval, but also may reveal to us the organic and comprehensive meaning of education which the future may make into a reality.

Knight's excellent statement of the possible contribution of historical research in education and, by the same token, of the history of education, is as follows:[4]

1. A knowledge of the history of schools and other educational agencies is an important part of the professional training of the teacher or the school administrator.
2. Much of the work of the school is traditional. The nature of the work of the teacher and the school administrator is restrictive and tends to foster prejudices in favor of familiar methods. The history of education is the "sovereign solvent" of educational prejudices.
3. The history of education enables the educational worker to detect fads and frills in whatever form they may appear, and it serves as a necessary preliminary to educational reform.
4. Only in the light of their origin and growth can the numerous educational problems of the present be viewed sympathetically and without bias by the teacher, the school administrator, or the public.
5. The history of education shows how the functions of social institutions shift and how the support and control of education have changed from very simple and local arrangements to those that are now somewhat centralized and complex.
6. The history of education is an ally in the scientific study of education rather than a competitor. It serves to present the educational ideals and standards of other times, and it enables social workers to avoid the mistakes of the past.
7. It inspires respect for sound scholarship and reverence for great teachers.

[4] E. W. Knight, *Education in the United States*, p. 38. Boston: Ginn and Co., 1934.

Other good analyses of the value of historical research have been made by Abelson [5] and Alexander.[6]

Attempts have been made to meet the previously mentioned criticisms of earlier courses in the history of education, in order that the historical method and the body of resulting materials may serve functional purposes and social needs. Tyler has developed an organization for a course in this field which preserves such merits as a sequential study of chronological periods may possess and at the same time makes possible the use of historical materials to explain major types of educational organization and teaching activities.[7]

The plan of teaching is graphically shown in Table XI, where it may be seen that the same content can be included both in the organization according to the horizontal units, largely chronological, named and lettered at the left of the table and in the organization named and numbered in the vertical columns. Although the historical material selected for the course was that which helped to explain the major types of educational structure and teaching activities, the material was first presented to the students in accordance with the units named at the left of the table. In the first nine weeks of the quarter these units were considered one at a time so that the students might get the sequence and story of educational development. Class exercises during this period involved the selection of forces which were noticeably influencing education in the past and which have potent influence to-day, as well as requiring students to organize the main points of the story of educational development. [This plan is more commonly followed than that described in the next paragraph.]

The last three weeks of the quarter were employed to provide an opportunity for the students to reorganize the material. In this period the specific items of educational structure, practice, and theory were grouped into the twelve units shown in Table XI, . . . and the class exercises called for an organization of historical material so as to explain these items. This required a reorganization of content already considered in the previous period and at times a collection of additional material by the student when his previous information failed to provide an adequate explanation.

5 H. H. Abelson, *The Art of Educational Research*, pp. 85-8. Yonkers-on-Hudson, N. Y.: World Book Co., 1933.

6 Carter Alexander, *How to Locate Educational Information and Data*, pp. 210-1. New York: Bureau of Publication, Teachers College, Columbia University, 1935.

7 R. W. Tyler, "A Course in History of Education," *Educational Research Bulletin*, IX (February 5 and March 5, 1930), 57-65, 133-5.

Scope and frequency of historical studies in education. In order to illustrate the range of historical problems in education investigated within the past few years by graduate students, many of whom are field workers, the titles of a number of theses may be mentioned. Fuller information concerning these studies may be found in the annual compilations of research published by the Office of Education, under the headings of educational history and educational biography.[8] Illustrative titles are:

1. "An Historical Study of Otterbein College at Westerville in the State of Ohio."
2. "History of the Founding of Educational Institutions by the Disciples of Christ in Virginia and West Virginia."
3. "The Development of the Arizona Public-School System."
4. "History of Catholic Education in Kansas, 1836-1932."
5. "Secondary Education in Georgia, 1732-1858."
6. "A History of Catholic Colleges for Women in the United States of America."
7. "The Educational Contributions of the United States Commissioners of Education, 1867-1928."
8. "The Public-School System and the Second Constitution of California."
9. "Dominant Factors in the Development of Public Education in Kansas."
10. "Analysis of Educational Studies Made under the Auspices of the Association of American Universities from 1910-1931."
11. "The Private-Academy Movement in Indiana from 1850 to 1900."
12. "Genesis and Growth of the Progressive Movement in Education."
13. "Education in Hawaii, 1820-1893."
14. "Legislation Affecting Secondary Education in Virginia from 1619 to 1845."
15. "A Critical Study of Certain Aspects of Infant and Common School Education, 1810-1840."
16. "An Historical Study of the Methods of Teaching as Used by Eminent University and College Teachers."
17. "State Constitutional Development in the United States, 1829-1851."

[8] For example, Ruth A. Gray, *Bibliography of Research Studies in Education, 1932-1933*. Office of Education Bulletin, No. 7, 1934. Washington: Office of Education, 1934. Pp. xiv + 350.

———, *Bibliography of Research Studies in Education, 1933-1934*. Office of Education Bulletin, No. 5, 1935. Washington: Office of Education, 1935. Pp. xiv + 328.

18. "Mother Seton—Foundress of the American Catholic Parochial School System."
19. "The Life and Work of Johann Bernhard Basedow."

TABLE XI

TWO METHODS FOR ORGANIZING CONTENT IN HISTORY OF EDUCATION

By Units Which Are Largely Chronological Periods	By the Major Types of Educational Structure and Teaching Activities Which the Historical Material Helps to Explain											
	1	2	3	4	5	6	7	8	9	10	11	12
	The Organization of Schools	The Control and Support of Education	The Training of Teachers	The Teacher's Relation to the School Curriculum	The Techniques of Instruction	Pupils' Activities in Learning	Motivation and Pupil Discipline	Tests and Provisions for Individual Differences	Physical Education and Health	Care of the School Physical Plant	The Teacher's Responsibility for Extracurricular Activities	The Home and Community Activities of Teachers
A. The Background of the Renaissance about 1100-1300												
B. Classicism about 1300-1500												
C. The Reformation about 1500-1750												
D. Inductive thinking and realism about 1550-1750												
E. Social changes and the development of educational theory and practice about 1750-1900												
F. Education as an expression of national consciousness about 1750-1900												
G. Education in America about 1620-1900												
H. Modern conceptions and tendencies in education 1900-1929												

It will be noted that the last two of the foregoing titles represent biographical studies while a number are investigations of constitutional or legal aspects of education, to which extended discussion is devoted later in this chapter. The methods of historical research, however, are fundamentally the same, whatever the type of problem studied.

The historical method of research was employed with greater relative frequency in education twenty or more years ago than at present. It was to be expected, with the development of experimental, survey, testing, and statistical procedures in education, that educational history and philosophy would

have to surrender a large part of the field which they had monopolized for some time. However, if the use of the historical method has decreased, legal research in education, which resembles historical investigation very closely and may be considered a phase of historical research, has shown a corresponding increase in popularity over the same period of time. In fact, the attention of some workers who formerly gave their time to research in the history of education has been diverted to a study of the specialized problems of educational legislation and court decisions affecting the school, as witnessed by the thesis titles quoted above. This development seems to justify a discussion of historical and legal research in education under the same chapter heading; both procedures involve painstaking documentary study of sources, criticism of data, and interpretation.

Concrete evidence concerning the frequency of the historical and legal methods is available.[9] Table XII reveals, in so far as can be determined from an examination of the titles of theses, to what extent historical or legal techniques of research have been used. The facts reported show that approximately one-ninth of all Doctors' theses completed and under way, 1918-1931, involve either the historical or legal technique of investigation. The fields which seem, on the basis of frequency, most in need of historical studies are psychology and measurement, and elementary education, although it is recognized that infrequency may not always be a valid criterion of needed research in a given area.

Loomis suggests two important types of historical research in the curriculum area, utilizing sources other than textbooks and courses of study, namely, well-kept records of actual teaching procedures and case studies of the pedagogical growth of pupils. The University of Chicago Laboratory Schools have been keeping such detailed records over a number of years, and at intervals reports on teaching procedures in given school

[9] Carter V. Good, "Fields and Types of Research in Education, 1918-1931," *Journal of Educational Research*, XXIV (June, 1931), 33-43.

TABLE XII

CLASSIFICATION OF 151 DOCTORS' THESES IN EDUCATION COMPLETED, 1918-1929, AND OF SEVENTY-TWO DOCTORS' THESES UNDER WAY, 1930-1931, EMPLOYING HISTORICAL OR LEGAL TECHNIQUES

Field	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1918-29 Total	Under Way '30-'31	Grand Total
Administration and supervision	2	2	1	1	1	4	2	5	4	7	6	6	41	19	60
Psychology and measurement (general)	0	0	1	0	0	0	1	0	0	1	0	0	3	1	4
General method and theory	1	2	1	0	0	1	1	2	3	7	0	0	18	9	27
History of education and foreign education	13	8	7	3	7	12	10	14	15	22	17	19	147	53	200
Preschool and elementary education	0	0	0	1	0	0	0	1	1	0	1	1	5	1	6
Secondary education	3	1	0	0	1	1	1	2	1	3	2	2	17	10	27
Higher education and adult education	1	1	1	0	1	2	2	0	3	4	3	0	18	11	29
School subjects	1	0	1	2	2	2	2	3	6	3	3	4	29	3	32
Total theses	13	8	6	4	8	13	10	16	21	23	18	11	151*	72*	223*

*This, the total number of historical theses, is less than the total times the various fields are represented, since a given thesis may be classified under more than one subdivision of education.

subjects are appearing, the plan being to cover each field once in three years.[10]

In the appendix is a selected list of problems considered worthy of investigation in the history of education, although they are rather large in scope for the beginner in historical research, who may do better by selecting a smaller topic such as the history of the local high school.[11] Criteria for the selection of a problem have been discussed in Chapter II, and the training of the research worker is considered in Chapter XV.

Although no supporting data in terms of frequencies are immediately available at this writing, the authors have observed that many competent scholars sense the futility of many of the superficial surveys and questionnaire studies and are turning again to educational history, as well as to experimentation, for aid in solving their problems. However, this statement must not be interpreted to mean that different types of research compete with each other. Selection and evaluation of a method of investigation should be determined by purpose. Obviously, educational history cannot tell a superintendent how other school systems are making adaptations to a period of economic depression and social disturbance, although it can show how such cycles of stress have been weathered in the past. As a practical pursuit, with functional purposes and social need to be served, the history of education seeks to answer three rather different types of questions:[12]

1. The question of evolution. How did progressive education arise and develop? We seek to establish trends.

2. The question of resemblance. How is education in Denmark like that of Italy, and how unlike? We institute comparisons.

3. The question of value. Why should the chief state school officer be chosen by a lay board rather than by popular election? We find causes and reasons.

10 A. K. Loomis, "Needed Research in the Curriculum," *Journal of Educational Research*, XXIX (October, 1935), 126-30.

11 H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, XXIX (October, 1935), 148-53.

12 *Ibid.*, p. 149.

COLLECTION OF DATA

No matter what the type of research, after the problem has been selected, defined, and delimited, the next step is to collect data pertinent to the solution of the problem. In historical research the classification of source materials is important, although most existing classifications are open to criticism.

Historical sources. Vincent divides historical materials into: (1) consciously transmitted information, including (*a*) written sources (chronicles, annals, biographies, memoirs, diaries, genealogies, and certain classes of inscriptions), (*b*) oral tradition (ballads, anecdotes, tales, and saga), and (*c*) artistic productions (historical paintings, portraits, scenic sculpture, and coin types); (2) relics or unconscious testimony (human remains, language, institutions, products of the hand, implements, fine arts, literature, etc.); and (3) inscriptions, monuments, and public documents of certain types, all of which may possess characteristics belonging to the first two types of sources.[13] This third group has sometimes been labeled "memorials."

Ordinarily it is not difficult to distinguish between the written records or documents, which man has prepared with the deliberate purpose of transmitting information, and relics or remains of man's activity (written or otherwise), which have been handed down from the past without the conscious intention of imparting information. However, even in difficult cases, it is essential to classify historical materials in terms of conscious intent to leave recorded information or of unconscious testimony in the form of relics or remains.

Vincent stresses the fact that differences between "memorials" and transmitted testimony are not always immediately apparent, but must be determined as a vital part of historical research.[14] He suggests that a tombstone containing only the name of a man is a relic of the past, but that when dates are

13 J. M. Vincent, *Historical Research*, p. 18. New York: Henry Holt and Co., 1911.
14 *Ibid.*, Chapter II.
F. M. Fling, *op. cit.*, pp. 44-6.

included, the historical record begins, and when the epitaph recounts the deeds and virtues of the deceased, the relic becomes a memorial with the characteristics of a document or consciously transmitted information.

Another writer (Fling, see footnote 14) uses the term "tradition" to cover all materials containing the impressions made upon individual minds by man's past activities, whether in written, oral, or pictorial form, which includes the same area as Vincent's first major division cited earlier.

Certain difficulties have been encountered in seeking to learn from recorded experience.[15]

> The record is incomplete and otherwise defective from several causes. The making of records requires time, money, and wisdom. So does their preservation. The records of one of the most illustrious of all our state school officials were taken out of the State House by a successor in the office and burned—perhaps, because they were out of date! And records must be made available if they are to be useful. Other factors are involved. Each age records: (1) what it considers to be of interest or value, (2) what it has the eye to see, and (3) the will to make known. No age is able to anticipate very completely the questions to which following ages will seek the answers. We cannot make new records of past events and conditions, and therefore we must learn from such records as we have.

Sources in educational history. Probably the most useful and pertinent classification of historical sources in education is twofold: reports of events (called documents) and physical objects of historical value (called remains or relics).

In an excellent article H. G. Good points out that "remains" in the history of education are numerous, but have never received adequate attention.[16] He considers as remains: school buildings and their furnishings; photographs of buildings or furnishings, or of children, teachers, and parents engaged in educational activities; forms of diplomas, attendance, and certificates, and record blanks; various physical devices of the

15 H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, XXIX (October, 1935), 148.

16 H. G. Good, "Historical Research in Education," *Educational Research Bulletin*, IX (January 8 and 22, and February 5, 1930), 7-18, 39-47, 74-8. The authors are much indebted to these articles in the present discussion.

school for teaching, punishment, exercise, or health; textbooks, manuscript exercise-books made by pupils, and pupils' maps and drawings; and under certain conditions all kinds of written materials, if the problem is to observe what people unconsciously reveal about themselves rather than to determine what they consciously or deliberately say about themselves.

If one were studying correspondence during the days before Noah Webster, to determine variations in spelling, rather than the messages deliberately recorded in the letters in question, such sources would properly be classified as remains. On the other hand, if these same letters are analyzed to secure information concerning attitudes toward public education, they are considered as documents. Obviously a diploma in blank is a remain, but when filled in with the name of "John Jones" and with testimony concerning his character and scholastic attainments, it becomes a document. Textbooks and exercise-books are not deliberately or consciously recorded descriptions of school practice and procedure during a given period, despite the light they throw on such problems, and therefore must be considered remains. However, the annual report or written account by a person such as Horace Mann, or the oral testimony of an eye-witness, who observed these books in use and even quoted sections from them would be a document.

In the case of a document, the brain of one human being and the attempt of the observer to record his impression of what happened have come between the original event and the user of the source materials—for example, the opinion of a judge, minutes prepared by the secretary of a board of education, a superintendent's annual report, a school-survey report, a college catalogue, or a course of study. Thus, historical documents, when used to learn what has been deliberately recorded in them, include everything that has been written about the past. The previously mentioned article by Professor Good contains a helpful classification of documents, prepared for workers in the history of education.[17]

[17] *Ibid.*, p. 12.

I. Legislative acts such as constitutions, laws, charters
II. Court decisions
III. Executive and other official records
  A. Proceedings of administrative officers and bodies
    1. Minutes of boards of education
    2. Reports and orders of principals, superintendents, presidents
    3. Reports of committees including recommendations for executive action
    4. Systems of student records, salary lists, etc.
  B. Proceedings of deliberative bodies, such as the National Education Association, the North Central Association, etc.
  C. Reports of commissions; for example, "School Inquiry"
  D. Reports of school surveys and of official observers; for example, the report of Cousin
  E. Courses of study
  F. Catalogues, prospectuses, advertisements
IV. Newspapers and periodicals
  A. Articles
  B. News notices
  C. Advertisements
V. Personal materials
  A. Autobiographies, memoirs, reminiscences and biographies
  B. Annals and histories written by actors in the events narrated
  C. Letters
  D. Legal instruments executed by individuals in a personal capacity, contracts, wills, and deeds
  E. Legal instruments conferring powers upon individuals; for example, certificates
  F. Lecture notes
VI. Literary materials, as the novels of Charles Dickens or Edward Eggleston (All literature has a potential use in the history of education. A great amount of such material is found in the publications of the Early English Text Society and similar bodies.)

Primary and secondary sources. In attempting to solve a definite, answerable, and significant problem in the history of education, it must be remembered that primary sources are the only solid bases of historical work. Primary sources are the original documents or remains, the first witnesses to a fact. Reference to the preceding lists of documents and remains provides illustrations of primary sources. The court stenographer's record and the newspaper reporter's account of a trial

are primary sources (records of what the writers saw and heard), while an account of the trial (an editorial for example), by one not present, even though based on a stenographic report, tends to lose its primary character.[18] In other words, only one mind, that of the observer of the event, should come between the original happening and the user of the sources.

However, in one instance a source may be primary and in another secondary. Ordinarily textbooks in the history of education are secondary sources, usually many times removed from the original event, but for the worker who wishes to study the organization used by writers in this field these books become primary.

It is necessary in some historical studies to begin with secondary sources and to work back to the primary sources when the latter are not known in the beginning. For example, in making up a list of old arithmetic textbooks, it may be necessary to begin with encyclopedias, available articles and bibliographies on the subject, histories of arithmetic, etc., which are secondary sources, and from these work back to the arithmetic texts, the primary sources, in this instance.[19]

In spite of insistence on the use of primary sources, members of graduate departments of instruction are able to cite extreme instances of apparently immature graduate students who seem totally unable or unwilling to go beyond a few secondary sources on a given educational topic. In a purported study of the educational history of a junior high school in a large city, the local newspapers and the reports of the school board were scarcely touched, the former being used only twice. In treating the development of art education in the same school system, a candidate for the Master's degree devoted 122 of a total of 188 citations to five secondary sources. A student, who had previously mishandled a study involving a battery of standard tests, in turning to the educational development of a state school system over a given period of time, never seemed

18 *Ibid.*, p. 43.
19 *Ibid.*, pp. 43-7, 74-6.

to get beyond a state history or two (secondary sources), except for the reminiscences of a minister and the notes of a federal officer. An historical investigation, in its preliminary form, of higher education in another state utilized almost entirely existing state histories, seemingly unaware of the materials to be found in college catalogues, presidential reports, and other official records. As a matter of fact, the bibliography included only three college catalogues, one volume of statistics, two handbooks, one letter, and one annual state report.

Bibliographical and library procedure. It will be recognized that historical research involves more intensive bibliographical work and library usage than either the experimental or survey types of research. The method of canvassing educational literature and evidence was outlined rather fully in Chapter III. Form for bibliography and footnotes will be illustrated in Chapter XIII. Although the problem of documentation is associated with the writing of the narrative, in the collection of data the beginning worker should be cautioned to assemble full bibliographical information in his note system to facilitate proper documentation. Valuable assistance in the compilation of the bibliography and in the use of available library facilities may be secured from Hockett's detailed outline,[20] and from Alexander's briefer treatment.[21]

Note-taking and note systems. It is not desirable or necessary that the bibliography be completed before note-taking begins; the compilation of the bibliography, the study of subject-matter, and note-taking may well progress simultaneously throughout the course of the investigation. Since excellent and detailed discussions of this phase of historical research are available,[22] it seems adequate to present a brief summary statement of the procedures involved.[23]

20 H. C. Hockett, *op. cit.*, pp. 7-45.
21 Carter Alexander, *op. cit.*, pp. 212-5.
22 E. W. Dow, *Principles of a Note-System for Historical Studies.* New York: The Century Co., 1924. Pp. 124.
H. C. Hockett, *op. cit.*, pp. 10-25 46-55.
Carter Alexander, *op. cit.*, pp. 80-90.
23 H. G. Good, "Historical Research in Education," *op. cit.*, pp. 77-8.

To make good progress in answering historical questions the student should collect the material systematically. For this purpose he will need a well-arranged plan of note-taking. W. H. Prescott because of his blindness deliberately acquired the ability to hold in mind and to place into an orderly sequence the details of long chapters of his works; but most people are not geniuses. If they want to have access to large quantities of detailed information they must write it down. This means a system of notes. Great historians like McMaster, James Ford Rhodes, and Edward Gibbon are known to have taken the notes for their extensive writings in bound note-books. Of this practice one can only say that they succeeded by means of a system that is not the best.

A note-system should be flexible, that is, it should be possible to add to it at any point without disarranging the older material; and it should be possible to rearrange the notes at will. This requires that the notes be taken on separate sheets, slips, or cards. Each piece should as far as possible contain a complete item, but when the matter to be noted is too extensive it may be continued on successive pieces and these numbered in series. Not more than one item should ever be placed upon a single piece. Each piece should have a subject-heading at the top and a margin for indexing, etc., at the left. For most kinds of historical note-taking two sizes of paper are desirable. What the sizes shall be will be determined by convenience in using and convenience in filing. Probably the most useful sizes are the 3 x 5 or 4 x 6 cards for small items and the ordinary lettersize paper for larger passages.

About three different kinds of notes are regularly made by historical workers. The first is the bibliographical note which always contains the standard data, author, title, pages, place and date of publication, and other formal facts about a document. It should usually have in addition a brief analysis of the contents and some account indicating the uses and the defects of the document. The second kind is the subject note which contains one item of information about a particular topic, with the source whence it was obtained. The great body of notes collected by any student will usually come under this head. One caution may be given here. Do not copy out long passages in readily accessible works but rather abbreviate and summarize. A third kind may be called the method notes. In collecting such material one constantly comes across suggestions or thinks of ideas which seem useful in interpreting the facts. Such suggestions or interpretative ideas do not fit into either subject or bibliographical entries, but they must be noted or they will be forgotten. Finally, when any extensive body of information is collected, an index and a more or less elaborate system of cross references become useful. Each card or sheet will indeed have, at the top, a title which gives in a word or two the particular

contents of that piece. These titles themselves form a sort of index. But the cards are constantly being rearranged for special purposes. A separate index, modified from time to time, will help in the final organization and discussion of the materials.

CRITICISM OF DATA [24]

After the appropriate records of the past have been located, the historian must learn to read them correctly as a basis for developing sound ideas of the past, which in turn may aid in intepreting present trends and possibly in predicting more accurately what may happen in the future.[25]

He gathers data industriously, of course, but also resourcefully, noting particularly any facts which might tend to controvert his preformed views, all unpleasant and unwelcome evidence, scrutinizing any discrepancies and disagreements, and keeping a sharp eye for circumstances previously unnoticed or neglected. He looks not only for facts but for clues. Facts must lead to ideas. He must respect the facts, but in themselves they are blind. He must draw conclusions, because he aims not at knowledge merely, but wisdom.

The historian subjects his sources to external and internal criticism. External criticism is concerned with the genuineness of the document itself, whether it really is what it purports or seems to be and whether it reads true to the original. Internal criticism deals with the meaning and trustworthiness of *statements* that remain within the document after any spu-

24 The present writers are greatly indebted to the following authors in this brief summary of principles of historical criticism:

F. M. Fling, *The Writing of History: An Introduction to Historical Method.* New Haven, Conn.: Yale University Press, 1920. Pp. 196.

H. C. Hockett, *Introduction to Research in American History.* New York: The Macmillan Co., 1931. Pp. 168.

Allen Johnson, *The Historian and Historical Evidence.* New York: Charles Scribner's Sons, 1926. Pp. 180.

J. J. Jusserand and Others, *The Writing of History.* New York: Charles Scribner's Sons, 1926. Pp. vii + 143.

C. V. Langlois and C. Seignobos, *Introduction to the Study of History.* New York: Henry Holt and Co., 1898. Pp. xxvii + 350.

W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research.* New York: Harper and Bros., 1930. Pp. xii + 534.

J. M. Vincent, *Historical Research: An Outline of Theory and Practice.* New York: Henry Holt and Co., 1911. Pp. 350.

25 H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research,* XXIX (October, 1935). 149.

rious or interpolated matter has been removed from the text. External criticism sometimes is called lower criticism, since it is a preliminary and preparatory step, providing the data to be used in the second phase known as internal or higher criticism. However, there is no sharp line of demarcation between these two phases of historical criticism; both progress simultaneously in many instances, with a great deal of overlapping. In fact, external criticism employs internal evidence from the document (through a study of its contents), and internal criticism uses external evidence concerning authorship, time and place of writing, etc. These terms, *external* and *internal*, refer to *purpose* and not to *method* or procedure, or whether one looks within or without the document to accomplish the desired purpose. Both external and internal criticism may examine the contents of the document. Any differentiation between the two is in terms of the statements to be proved rather than the means employed to establish such proof. External criticism deals with data relating to form and appearance rather than meaning of contents, while internal criticism weighs the testimony of the document in relation to the truth. However, despite the fact that external and internal procedures may not be differentiated sharply in the thinking of the mature historical worker, it is helpful for the beginner to discuss these two phases of historical criticism separately.

External criticism. The first test which the historian applies to a document or remain is that of genuineness, called external criticism. Specifically, the problems of external criticism involve the questions of authorship and textual criticism to determine all the conditions which may have influenced the production of the document (time, place, purpose, and circumstances of composition), and what part of the document is true to the original. Such questions as the following involve problems of external criticism, and are also useful in the process of internal criticism, that is, in determining the truth and value of the statements made in the document.[26]

[26] H. G. Good, "Historical Research in Education," *op. cit.*, pp. 17-18.

1. Who was the author, not merely what was his name but what were his personality, character, position, and so forth?

2. What were his general qualifications as a reporter—alertness, character, bias?

3. What were his special qualifications and disqualifications as a reporter of the matters here treated?

(*a*) How was he interested in the events related?

(*b*) How was he situated for observation of the events?

(*c*) Had he the necessary general and technical knowledge for learning and reporting the events?

4. How soon after the events was the document written? For one purpose the century of composition may be sufficient; for another the very hour may be essential.

5. How was the document written, from memory, after consultation with others, after checking the facts, or by combining earlier trial drafts?

6. How is the document related to other documents?

(*a*) Is it an original source; wholly or in part?

(*b*) If the latter, what parts are original; what borrowed; whence? How credible are the borrowed materials?

(*c*) How and how accurately is the borrowing done?

(*d*) How is the borrowed material changed; how used?

The question of authorship is involved in discovering which numbers of *The Federalist* were written respectively by Madison, Hamilton, and Jay. The study of Washington's "Farewell Address" raises the problem of determining what contribution each of three men made to it, since Madison drafted a portion of it, embodying the President's suggestions, and Hamilton later extended and completed the draft, incorporating additional suggestions made by Washington. It is thought that some of the presidential messages of Andrew Johnson were written by George Bancroft.[27]

Although there may be no great temptation to perpetrate hoaxes, frauds, and forgeries in the field of education, such trickery has been rather common in the fields of history, literature, art, relics, antiques, business documents, natural science, and exploration. Various motives operate in the case of deception: (1) the use of a well-known name may increase the sale and prestige of a manuscript; (2) the reputation of promi-

[27] H. C. Hockett, *op. cit.*, pp. 63-64.

nent persons, who are too busy or who lack the necessary training to write effectively, may be increased through employment of "ghost" writers; and (3) pseudonyms may be used to mystify or to stimulate the curiosity of the public. Among the numerous types of invention or forgery which appear are: (1) proverbs, epigrams, or witty sayings of famous people, who somehow always seem to have had at tongue's end a brilliant phrase or retort at the right moment; (2) invented speeches placed in the mouths of famous personages by the older historians, after the fashion of novelists; (3) insertion of applause in Congressional addresses which never were delivered; (4) genealogies and family trees; (5) interpolations or insertions for deceptive purposes by copyists or others; and (6) business documents, works of art, relics, and antiques.

The problems of genuineness are so varied and intricate that frequently separate auxiliary sciences are employed by the historian.[28]

Epigraphy is the study of inscriptions and the art of deciphering them. Diplomatics is the science of charters and diplomas and includes a knowledge of the practices of chanceries and of the forms used in them. Paleography is the study of writing, which has a history all its own. The handwriting of a given scriptorium is usually quite characteristic. Besides, handwriting varies from age to age so that it alone is often quite competent to locate a manuscript in time. Philology in all its branches is of the greatest use in determining date and authenticity. To give some very elementary examples, the word "choose" was in the eighteenth century frequently spelled "chuse"; "clothes" was spelled "cloathes"; "entire," "intire"; and so on. The young poet, Chatterton, it seems, first wrote out his verses in the English of his own day; but wishing to represent them as a "historical find," he then proceeded to give them an antique air by substituting ancient words for modern ones. Not knowing the older language at first hand he resorted to Kersey's dictionary for these older words. Kersey, however, had made numerous mistakes, and when Chatterton ignorantly copied these, he betrayed both the source

28 H. G. Good, "Historical Research in Education," *op. cit.*, pp. 13-4.
Also see J. M. Vincent, "History and Auxiliary Sciences," in *A Guide to Historical Literature*, pp. 1-45. New York: The Macmillan Co., 1931.

of his archaic vocabulary and the fact of his forgery.[29] Archaeology, anthropology, and prehistory in general have had the greatest influence upon the study of history; and the first of these might almost be called the science of remains. Chemistry and the paper-maker's art may be able to say, and have often said, that a given document, written on woodpulp, for example, and with a particular ink, cannot be older than the definite date when these materials were first manufactured. Coins and medals are often of great historical value. Indeed, there is no field or item of human knowledge that may not be called upon to give evidence for or against the genuineness of some particular document or remain.

Certain letters attributed to Lincoln contain errors of which he could hardly have been guilty.[30] In a letter dated May 9, 1834, is the phrase, "that North East quarter of Section 40." Since Lincoln was an experienced surveyor, he must have known full well that a Congressional township contained only thirty-six sections, and could not have made such a blunder. The same letter states that a family named Bixby was "leaving this week for Kansas," when the territory of Kansas was not organized and opened for settlement until 1854; this name in all probability was not even in use as early as 1834.

It is true that since the invention and use of printing, as well as photography, in the reproduction and transmission of documents, the opportunities for error are greatly decreased. Before the time of these two inventions, when manuscripts and books were copied by hand, it was relatively easy for errors of omission and commission to creep into the author's original work, which in the course of the centuries passed through the hands of many different copyists.

Internal criticism. After questions of authorship and genuineness have been answered, and the actual language or text of the original document has been determined as nearly as possible, it remains for internal or higher criticism to determine the accuracy and value of the statements made. The shift of

29 R. L. Marshall, *The Historical Criticism of Documents*, p. 26. London: Society for Promoting Christian Knowledge, 1920.

30 H. C. Hockett, *op. cit.*, p. 66.

P. M. Angle, "The Minor Collection: A Criticism," *Atlantic Monthly*, CXLIII (April, 1929), 516-25.

emphasis is from the *document* as such to *statements* within the document. Obviously, proof of genuineness of a document by external criticism does not guarantee that it tells the truth. Although much of internal criticism is textual criticism, it also involves such factors as the competence, good faith, position, and bias of the author. Internal criticism is positive in nature when it seeks to discover the literal meaning and the real meaning of the text. It is negative when every possible reason is sought for disbelieving the statements made, questioning critically the good faith and accuracy of the author. Of course, both positive and negative criticism are essential in historical research, although the student should not go so far as to be cynical and hyper-critical.

The literal meaning and the real meaning are usually the same in modern documents, although such is not the case for many of the older sources. Actually to determine even the literal meaning of Chaucer, Spenser, and Shakespeare is no small task for the young student, due to the presence of unfamiliar or obsolete terms and reference to strange institutions and customs. The student of history must know the language of the author and of the time and locality in which he wrote. The example of Chatterton's poetry shows how language changes with time. The Jewish child who recited the line from Hiawatha, "Rose the firs with cones upon them," as "Rose the Cohens with furs upon them," simply did not know the language of Longfellow and of the forest. Even in modern documents the real meaning may not be clear due to allegory, symbolism, irony, satire, jests, hoaxes, allusions, implications, metaphors, hyperboles, and other rhetorical figures and literary artifices. Certain political speeches and platforms are notorious examples of documents containing ambiguous meanings, intended as a rule to catch votes.

Criticism directed toward questioning of the good faith, competence, and accuracy of the author is considered negative in character. It is reported that the deception of the man who pretended to be in touch at sea with the kidnappers of the

Lindbergh child was discovered partly through a too accurate, too detailed, neatly typed record covering the purported contacts with the kidnappers. Ordinarily one does not keep such a record under conditions of stress and strain involving loss of sleep, meetings at night on the ocean, nervous tension, etc. In other words, a document may be too perfect.

The author's motive for writing the document should be examined. Too profuse protestations of impartiality may be looked upon with suspicion, since, as Shakespeare had Hamlet's mother say, "The lady doth protest too much, methinks."[31] Accident or circumstance sometimes forces the writer to conceal the truth or to report only a half-truth; the relation between military reports and propaganda is well known; lists of persons who are to be present at social functions are frequently in type before the hour of the event, without any later check on actual attendance.

Distortion of fact may also result from personal vanity, a desire to flatter one's superiors, bias, an attempt to please the public, or from literary artifice. John Smith's vanity is assigned by critics as the reason for doubting the story of his rescue by Pocahontas, since it was not until after she had become a celebrity (and after her death) that Smith published his statement.[32] The work of historians, artists, and poets subsidized by kings must be examined with great care, if the actual facts are to be sifted from the flattery which may be included. Desire to assign to an already great character the traits of extraordinary nobility may explain the Parson Weems story of "George Washington and the Cherry Tree."[33]

Bias is associated with such factors as religion, politics, class, exaggerated patriotism, and racial antipathy. Certain current books in psychology and biology reveal the influence of very definite religious dogmas. Histories have varied remarkably with the political, racial, national, or regional affiliations of the authors—for example, the treatment accorded

[31] *Hamlet*, Act III, Scene 2, line 240.
[32] H. C. Hockett, *op. cit.*, p. 94.
[33] *Ibid.*, p. 95.

the various wars in which the United States has participated, especially the Civil War and Revolutionary War. The utterances of certain contemporaries on public education and the curriculum must be evaluated in terms of the social and economic status represented and the vested interests involved. Frequently sentiments are expressed in political speeches and ceremonial addresses to please the public without strict adherence to the actual truth.

When more than one statement concerning a given event is available, those which survive the processes of external and internal criticism are subjected to additional tests in terms of whether they are: (1) independent observations, (2) made by different workers, (3) belonging to different groups with varying affiliations, (4) operating under different conditions.[34] In general, statements made by alleged eye-witnesses are discredited, if opposed to the known body of science and of historical knowledge. Psychology provides sufficient explanation of the way in which so-called miracles are reported due to ignorance, illusion, hallucination, or extreme stimulation through the emotions or drugs.

THE WRITING OF HISTORY

After the data have been collected and criticized, there remains what is in many respects a much more difficult problem, namely the synthetic and constructive process, or what may be called historical composition.[35]

Having collected some information upon a subject the student will desire to arrange it and present it in such form that others may get the benefit of his studies. This is partly a mechanical problem, the problem of documentation. It is partly a logical problem also, because it involves the question of the relative importance of the several items and topics. Finally, it is a philosophical and an artistic problem, because every historian, deliberately or in spite of himself, interprets what he presents.

[34] *Ibid.*, p. 101.
[35] H. G. Good, "Historical Research in Education," *op. cit.*, p. 78.

The mechanical problem of documentation is discussed in Chapter XIII. Other examples of forms for footnotes and bibliography, especially adapted to the field of history, are available,[36] and need not be reproduced here.

Although the classification and analysis of data are treated in Chapter XI, brief comment may be made at this time, with special application to historical data. Earlier practice in historical writing advocated a strictly chronological type of organization involving a series of events broken up into short time-units, with virtually no recognition of the possibilities of the topical or thematic grouping of materials. An appropriate combination of the chronological and topical organization of historical data seems best, involving consideration of such influences or forces as political institutions, law, economics, geography, natural resources, social conditions, war, national culture, race, education, art, literature, religion, great leaders, etc. A good example of the topical or functional organization of the history of education, combined with a definite time sequence, is cited earlier in this chapter.[37]

The successful writer must know the historical value and significance of each topic; in other words, he must possess historical perspective. Though many data, painstakingly gathered, may have to be discarded to promote condensation, concentration, and precision, there should be left no opportunity for too many details to crowd out the main actors or events of the historical narrative. Too many of the older historians have departed from the main theme on side excursions which involved anecdotes or the subjective impressions of the given author. Herodotus in telling the story of Greece often inserted an anecdote concerning some other country, which probably led to another similar tale, and by the time the author had returned to Greece, the reader had taken an imaginary trip to Babylon or Africa.[38]

Problems of interpretation such as formulation of hy-

[36] H. C. Hockett, *op. cit.*, pp. 116-30.
[37] R. W. Tyler, *op. cit.*
[38] J. M. Vincent, *op. cit.*, pp. 290-1.

potheses, constructive reasoning, inference, use of analogy, cause and effect, generalization, and prediction are not peculiar to history, and Chapters IV, XI, and XII are concerned with such topics. Concerning one of the most important and difficult of these problems, causation, early history differed materially from modern history in that trivial causes were associated with important happenings and great social events.[39] Thus, the rebuilding of Jerusalem was attributed to a dream of Darius, king of Persia. The cackling of a flock of geese saved Rome; and Cleopatra at the height of her career ended her life by the bite of an asp, leaving Rome free to develop further its great power. Therefore, the older historian would have it that the world was profoundly influenced by the cackling of geese and the bite of an asp. Even recent writers have attributed great events or movements to divine providence, political causation, or some "great man." Obviously, any adequate attempt to write the history of a people, which includes their institutions, must consider geography and physiography, the physical and mental characteristics of the people, cultural conditions (language, literature, customs, religion, art, commerce, science, etc.), and political or governmental institutions (constitutional provisions, legislation, and court decisions).[40] However, psycho-analysis of the minds and motives of actors who played on the stage of history many years ago must be attempted, if at all, with great caution.

The literary style of effective historians has conformed to the age in which they lived, for example, the work of Gibbon and Macaulay. Of course it is not expected that modern students will imitate the early American historians (Prescott, Motley, and Bancroft) who were patriots as well as literary artists in their fields; one, Bancroft, is even oratorical in his first editions.[41] To-day, writing can be, and is, effective with greater simplicity, with less appeal to the emotions. However, it must be admitted that certain historical problems lend

39 *Ibid.*, pp. 263-4.
40 *Ibid.*, p. 287.
41 *Ibid.*, pp. 305-12.

themselves with considerable difficulty to a graceful and interesting style, for example, the constitutional and legal basis of a state school system. Finally, certain reservations must be maintained in considering history as an art, in particular a literary art. The details of the picture or of the novel are filled in through the sheer play of the painter's or author's imagination. This, the historian will not do, if he is interested in the objectivity and detachment of science. For this reason certain gaps may be present in authentic history.

Before undertaking research in educational history, the beginning student should study carefully the available literature dealing with the problems of historical composition,[42] problems which have been presented here only in outline. In the chapter bibliography are numerous other discussions of the several problems of historical research.

THE HISTORICAL METHOD APPLIED TO A SPECIFIC EDUCATIONAL PROBLEM (AN ILLUSTRATION)

Now that the various aspects of historical method have been analyzed at some length, it should be profitable to the reader to cite an extended illustration of the manner in which this method is applied to a definite educational problem of current interest. To use a single problem, to which the various steps in historical research are applied, seems preferable to a different topic for each stage, since this represents a functional approach similar to work on a graduate thesis. Fortunately for present purposes, an admirable example is available.[43]

42 F. M. Fling, *op. cit.*, Chapters VII, VIII.
H. C. Hockett, *op. cit.*, pp. 112-41.
Allen Johnson, *op. cit.*, Chapter VII.
C. V. Langlois and C. Seignobos, *op. cit.*, Book III.
W. E. Spahr and R. J. Swenson, *op. cit.*, Chapter XI.
J. M. Vincent, *op. cit.*, Chapters XXII-XXVI.

43 H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, XXIX (October, 1935), 148-53. For a different illustration dealing with compilation of a list of arithmetic textbooks published within the present limits of the United States during the eighteenth century, see H. G. Good, "Historical Research in Education," *op. cit.*, pp. 41-7, 74-6.

Before we can examine the record intelligently we must come to it with a problem. What problem? . . . How did progressive education arise and develop? Any selection, and therefore this one, immediately involves us in a definition. What is progressive education? More than likely we do not exactly know; but we must begin and therefore we shall assume, tentatively and for the present, that progressive education is that complex of theories and practices which sets a child, that is an inquiring learner, in the midst of society and the world and says, "Whatever ye do, do for him"; which says that the school, if there is a school, exists for the child as he now is; which says that education is growth and life and that learning is involved in these; which demands for growth and life a rich and well-organized material and social environment in which teachers and children learn with and from each other by inquiring, discovering, making, sharing, and enjoying. That is progressive education for us, just now. Where did it come from?

A little examination will show that there are at least four elements in this definition. There is the element of general educational theory. We might start with "the mother school" of Comenius. Many ideas also come proximately from Rousseau through Pestalozzi, who in turn furnished the starting-point for two great complementary writers, Herbart and Froebel. All these, and especially the last two, have been criticized and partially caught up in the current restatements of Dewey who is, however, strongly influenced by a pragmatic philosophy and by his interest in social institutions, especially industrial and democratic institutions. In so far as progressive education is to be studied in the writers, we must go first to these and then to others more remote from the main line. Everywhere we must select the pertinent elements and reject those which do not belong to the tradition which we are studying.

And there is the psychology of childhood which discloses a child who is not a blank of paper for teachers to write upon, as Locke had it, or the empty pitcher to be filled, of Dickens' satire, but an organism with impulses, appetites, a thirst for knowledge and life, and purposes. Childhood implies capacity for growth; maturity, a corresponding social deficiency, for it often connotes an unwillingness to make new adjustments. When, not so long ago, the small child began to come into the school and his social and mental immaturity became apparent, the problem of education was presented in more extreme terms than ever before. Here again Comenius made a beginning; and perhaps the wisest of all Rousseau's words was the phrase: "Begin by making a careful study of your children for it is clear that you know nothing about them." It is equally clear that child study and genetic psychology are important elements in the development of progressive education.

In the third place progressive education demands a rich environment of gardens, shops, school theaters, studios, printing presses, laboratories, and equipment of every kind. It is a fascinating task to trace how invention has made possible an educational environment which, as Dewey says, is not only for listening but also for doing. How society has furnished the materials to enrich the school and how the school has gone out into the world is all a part of the story.

And there are the progressive schools and their practices. Perhaps we should begin with Vittorino who decorated the walls of "La Casa Giocosa," the Joyful House, with frescoes of children at play and who played with his children. The infant school movement of the last century, Keilhau, whose famous pupil, Georg Ebers, has left an invaluable record of Froebel's first school, the Kindergarten, the English Hazelwood of Thomas Wright Hill and his famous sons, must be considered. The Abbotsholme of Cecil Reddie was founded in 1889. Its lineage can be clearly traced; and its descendants are Bedales, the *Landerziehungsheime* of Germany and the *Ecole des Roches* of France, all of which, if not modelled on Abbotsholme, were certainly inspired by it. Dewey's small school in Chicago (1896), the Francis W. Parker School in the same city (1901), Meriam's Elementary School at Columbia, Missouri (1904) are American examples; but Felix Adler's Workingmen's School in New York (1880) and the resulting Ethical Culture School had many progressive features from the beginning.

These four elements must certainly be studied if we wish to know how progressive education has come to be. Nor should we omit the influence upon education of science, of the humanitarian impulse, of democracy as an ethical ideal, of industry, and the influence upon the education of normal children of the study and education of mental and sensory defectives. All have made contributions to progressive education. Beyond these contributing factors there is an extensive criticism of progressive education which is a part of the movement and the record.

Some of the sources for a study of the development of progressive education are evidently accessible in books and magazines. That much has been indicated by the titles and names already given. Use the *Readers' Guide, Education Index,* biographical dictionaries, general reference works, and files of the magazine, *Progressive Education.* Use the most general sources first, even textbooks, summary as they are, to get leads; but turn away from them as rapidly as possible to special and original sources. Make your bibliography as you go on, including both titles you have examined and those you will examine later. Much can be done by wise browsing in likely areas in a university library. That is how we secure the previously neglected and unnoticed facts. Recent institutional developments and current

practices may be obtained from those actively participating in the movement.

It is not the best plan in most subjects to attempt a large, certainly not an exhaustive, bibliography at the start. We should begin with a few sources, take notes from them, providing carefully for adequate documentation, and gather new sources as we proceed. The notes should contain at least three kinds of materials: information on the subject with the references, leads for further information, and ideas, the things suggested by your investigation. Do not trust to memory. Nobody has a good memory in historical investigation.

Having found some sources and gathered some materials, how shall we read and evaluate them? That demands two kinds of qualifications, technical and philosophical. By technical qualifications we mean ability to judge the accuracy of a report from internal and external evidence, ability to detect bias and to criticize it, to find corrective and amplifying sources. Every teacher knows how difficult it is to develop sound critical sense in students. How they love to repeat what they have read or have been told, just as they have read and heard it. There is, of course, not only credulity but also occasional hypercriticism. Both are to be avoided. Sound criticism demands open-mindedness, intelligence, information, and patient thought and investigation. By philosophical qualifications is meant that every investigator must have a position of his own, a considered view of education on the basis of which he judges. In progressive education there are several varieties: the lunatic fringe which showed itself, to take a distant example for safety's sake, in Hamburg, Germany, after the World War; the merely diplomatic, half-unwilling kind; and the enthusiastic but critical and well-informed variety. Every historical writer on this or any other subject must interpret; and his interpretation will have more value if he has a conscious and deliberately formulated standpoint and philosophy.

LEGAL RESEARCH IN EDUCATION

Study of legal materials pertaining to educational problems is clearly a type of historical research, as illustrated in the list of doctoral dissertations and in the outline of source materials presented earlier in this chapter. The same problems of collecting data, of criticism, and of interpretation, are present in legal research, and since these topics have been discussed earlier in this chapter they do not require emphasis here.

Although the concern of the school administrator and board member with school law is apparent, the interest of the class-

room teacher in such problems can be justified without much difficulty. The right of the teacher to control children going to and from school, the teacher's liability for injury to children while at school, and the court's influence on the curriculum are all legal problems. There seems no logical reason why teachers and field workers should feel limited in their investigations to studies of present-day teaching methodology and curriculum reorganization. Much worth-while work can, and should, be done in the field of historical and legal research in education by way of providing a sound foundation for the evaluation and testing of current materials, methods, and types of school organization. It is true that the worker in legal research must have access to a law library, and this necessity has limited most investigations in this field to students on a university campus working toward graduate degrees.

For purposes of research in education, the law may be classified into: (1) statutory law (constitutional provisions and legislative or statutory enactments), and (2) case or common law (principles applied by the courts in deciding issues not covered by statutory law). Edwards urges the desirability of distinguishing between these two classes of law in order to prevent erroneous conclusions of a serious nature.[44]

> Suppose that the constitution or the statutes of a state provide that school districts shall be liable for accidents to pupils while under the jurisdiction of the school authorities. A case comes into the court involving the liability of a school district for injuries sustained by a pupil while attending school. The court has no choice in the matter; it merely applies a clearly expressed rule of the statutes and holds the district liable. But suppose there is nothing in the statutes governing the case. Then the court bases its decision on what it deems to be sound principles of public policy. The principle adopted by the court constitutes a common-law principle for that jurisdiction.

A number of studies have been made of legislative enactments and constitutional provisions for the school, and of the history of educational legislation, but the organization of case law (decisions of the courts) concerning school issues has been

[44] Newton Edwards, "Methods and Materials of Legal Research," *Review of Educational Research*, IV (February, 1934), 85-91.

rather neglected until the past few years. Much of the law in which school people are interested is found in court decisions.

Edwards cautions the student of school law concerning principles to be observed in the evaluation of a case:[45]

In determining the authority of a case, one must keep clearly in mind the controlling facts. When the facts in different cases are similar in some respects but unlike in others, it is important to make certain that the differences are not of such a character as to distinguish the one case from the other. Those who have had little experience in evaluating court decisions are very likely to regard cases as identical when in reality they should be distinguished. For example, suppose that one is interested in the law governing the right of a school board to require vaccination as a condition of school attendance. A case is found in which a school board, on the outbreak of an epidemic of smallpox in the community, passed a rule excluding from school all children who had not been vaccinated. In another case, a school board made the same rule, but there was no smallpox in the school district. The two cases are not identical, for the facts are materially different. The existence of smallpox in the community is the distinguishing element. Before a case can be considered as an authority for another state of facts, the facts in the two situations must be sufficiently similar to warrant the application of the same legal principles.

It is more difficult, however, to identify than to distinguish cases. Facts may be widely different and yet be governed by the same principles of law. One should seek, therefore, not so much to establish identity of fact as to establish identity of principle. As an illustration, a school board may wish to know whether it has authority to permit the use of a school-house as a social center. The fundamental issue is: May school property be used for purposes other than conducting a public school? All cases, therefore, having to do with such uses of school property should be examined. Again, a pupil publishes in the local newspaper a poem which is a "take-off" on the faculty. He is suspended until he apologizes. In another case a pupil is suspended because he attends a moving-picture show in violation of a school-board regulation. The facts in the two cases may seem widely different, but they have one important element in common: The school board in each instance is attempting to control the acts of pupils off the school grounds after school hours. Success in interpreting judicial decisions depends very largely on ability to distinguish cases in which the facts are very similar and to relate cases in which the facts seem to have little in common.

[45] Newton Edwards, "Where and How to Find the Law Relating to Public-School Administration," *Elementary School Journal*, XXVII (September, 1926), 14-24.

Care, moreover, must be exercised in distinguishing that portion of a decision which is authoritative and that which is only *dicta*. Not infrequently, a judge, in rendering an opinion, makes statements with regard to matters not before the court for settlement. These remarks may be merely illustrative. For example, if a court is reviewing a case testing the authority of a school board to prohibit membership in high-school fraternities and the statement is made that a school board would have the authority to exclude unvaccinated children, such a statement is only *dicta* and can have little, if any, authority. Only those portions of an opinion which deal with the issues before the court are authoritative.

A helpful outline of primary sources of the law and of guides to primary sources is as follows:[46]

PRIMARY SOURCES OF THE LAW

I. Constitutions
  1. Constitution of the United States
    A. Found in United States Revised Statutes, Federal Statutes Annotated, United States Compiled Statutes, and United States Statutes Annotated
    B. Found also in revised statutes, annotated statutes, compiled statutes, or codes of the various states
  2. State constitutions
    A. Found in revised statutes, annotated statutes, compiled statutes, or codes of the various states

II. Acts of Congress and state legislatures
  1. Acts of Congress
    A. Acts recently passed (advance edition)
      (1) Official
        (*a*) Slip laws issued by Superintendent of Documents, Government Printing Office, Washington, D. C.
        (*b*) Statutes of the United States, published at the end of each session of Congress, commonly known as "Pamphlet Laws"
      (2) Unofficial
        (*a*) Federal Reporter Supplement
        (*b*) Federal Statutes Annotated Supplement—issued quarterly in pamphlet form
        (*c*) United States Compiled Statutes Annotated
          (i) Pamphlet supplements issued at short intervals

[46] *Ibid.*, pp. 15-20. Also see Carter Alexander, *op. cit.*, pp. 208-9.

B. Acts in force
(1) Official
(a) United States Revised Statutes, 2d ed., 1878. Contains statutes in force December 1, 1873
(i) Supplement, Vol. 1, 1874-91
(ii) Supplement, Vol. 2, 1892-1901
(b) United States Statutes at Large, 1901 to date
(2) Unofficial
(a) Federal Statutes Annotated, 2d ed. Contains all general laws of the United States in force January 1, 1916
(i) Annual supplements, 1918 to date
(ii) Quarterly pamphlet supplements
(b) United States Compiled Statutes Annotated, 1916
(i) Annual supplements
(ii) Pamphlet supplements issued at short intervals
(iii) Advance sheets published in Federal Reporter

2. Acts of state legislatures
A. Session laws. At the end of each session of the legislature each state publishes in one or more volumes all the laws passed at that session. These are commonly known as "session laws."
B. Revisions. Called: Compiled Statutes, Consolidated Statutes, Revised Statutes, or Codes.

III. Court decisions
1. United States Supreme Court Reports
A. Official
(1) United States Reports. (These reports are cited as follows: 1 Dall. 56, 10 Cranch 67, 92 U.S. 98.) The first ninety volumes are cited by the name of the reporter.
(a) Dallas (1-4 U.S.)
(b) Cranch (5-13 U.S.)
(c) Wheaton (14-25 U.S.)
(d) Peters (26-41 U.S.)
(e) Howard (42-65 U.S.)
(f) Black (66-67 U.S.)
(g) Wallace (68-90 U.S.)
(h) United States, 91 to date
B. Unofficial
(1) Supreme Court Reporter. (Cited as follows: 185 S. Ct. 45.) Contains cases from 1882 to date. Current

opinions may be found in advance sheets issued during term time of court.

(2) United States Supreme Court Reports, Lawyers' Edition. (Cited as follows: 24 L. Ed. 231.) Contains all opinions of Supreme Court to date. Current opinions may be found in advance sheets issued during term time of court.

2. State court reports

A. Official

(1) State reports. Each state publishes reports of its courts of final jurisdiction. (Cited as follows: 142 Ill. 75, 95 Ga. 68.)

B. Unofficial

(1) National Reporter System. Decisions of all courts of authority, state and federal. (Cited as follows: 18 Atl. 58, 24 N.E. 70, 10 Pac. 100.)

(*a*) Atlantic Reporter, 1885 to date: Connecticut, Delaware, Maine, Maryland, New Hampshire, New Jersey, Pennsylvania, Rhode Island, Vermont

(*b*) Northeastern Reporter, 1885 to date: Illinois, Indiana, Massachusetts, New York, Ohio

(*c*) Northwestern Reporter, 1879 to date: Dakota Territory, Iowa, Michigan, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin

(*d*) Pacific Reporter, 1883 to date: Arizona, California, Colorado, Idaho, Kansas, Montana, Nevada, New Mexico, Oklahoma, Oregon, Utah, Washington, Wyoming

(*e*) Southeastern Reporter, 1887 to date: Georgia, North Carolina, South Carolina, Virginia, West Virginia

(*f*) Southern Reporter, 1887 to date: Alabama, Florida, Louisiana, Mississippi

(*g*) Southwestern Reporter, 1886 to date: Arkansas, Indian Territory, Kentucky, Missouri, Tennessee, Texas

(2) Selected cases

(*a*) Lawyers' Reports Annotated, 1888-1905. (Cited as follows: 10 L. R. A. 57.)

(i) Lawyers' Report Annotated, New Series, 1906-14. (Cited as follows: 42 L. R. A. (N.S.) 90.)

(ii) Lawyers' Report Annotated, 1915A, 1916A, etc., to 1918E. (Cited as follows: L. R. A. 1915A 21.)

(*b*) American and English Annotated Cases, 1909-16. Continued by Annotated Cases to 1918. (Cited as follows: Ann. Cas. 1913E 1324.)

(*c*) American Law Reports, 1919 to date. A continuation of Lawyers' Reports Annotated and Annotated Cases. (Cited as follows: 33 A. L. R. 59.)

(*d*) American Decisions, 1760-1869. (Cited as follows: Am. Dec. 45.)

(*e*) American Reports, 1870-87. (Cited as follows: 15 Am. Rep. 90.)

(*f*) American State Reports, 1882-1912. (Cited as follows: 20 Am. St. Rep. 56.)

GUIDES TO PRIMARY SOURCES OF THE CASE LAW

I. Digests

1. American Digest System, 1658 to date: a digest of all decisions of American courts of last resort

(*a*) Century Edition, known as the Century Digest: a digest of all decisions of American courts of last resort, 1658-1896, Volume 43, topic, "Schools and School Districts"

(*b*) Decennial Edition, known as First Decennial Digest: a digest of all decisions of American courts of last resort, 1897-1906, Volume 17, topic, "Schools and School Districts"

(*c*) Second Decennial Edition, known as Second Decennial Digest: a digest of all decisions of American courts of last resort, 1907-16, Volume 20, topic, "Schools and School Districts"

(*d*) Third Decennial Edition, known as Third Decennial Digest: a digest of all decisions of American courts of last resort, 1916-26, Volume 24, topic, "Schools and School Districts"

(*e*) American Digest, Current Digest: a digest of all decisions of American courts of last resort, 1926 to date, topic, "Schools and School Districts"

(*f*) American Digest, Monthly Edition: advance sheet pamphlets giving digest of current decisions

(*g*) Descriptive Word Index to Decennial and all Key-number Digests, with supplements to date

2. State digests (As a rule, it is better to rely on the American Digest System), digest of the decisions of the courts of authority of a particular state (Examples: Massachusetts Digest, Kansas Digest, Maryland Digest)

II. Encyclopedias
1. Cyclopedia of Law and Procedure (1912), Supplements to 1921, Volume 35, extensive treatment of school law under topic, "Schools and School Districts" (Cited as follows: 35 Cyc. 1042)
2. Ruling Case Law, completed in 1920 with supplements to date, Volume 24, topic, "Schools," a treatise on school law based on leading cases, extremely helpful (Cited as follows: 24 R. C. L. 550)
3. Corpus Juris, Volume 56, topic, "Schools and School Districts"

III. Indexes to annotated cases
1. Index to Notes in Lawyers' Reports Annotated, 1888-1918
2. Index to Notes in Annotated Cases, 1908-1918
3. American Law Reports, cumulative Index-Digest, 1919 to date

IV. Citations
1. Shepard's Citations: separate volumes for the courts of the United States and for the courts of each state issued at frequent intervals; indicates where a case has been cited by other courts and enables one to trace the history of a case and to evaluate it as of the present date

V. Indexes to legal periodicals
1. Jones' Index to Legal Periodicals, to 1899
2. Chipman's Index to Legal Periodical Literature, 1898-1908
3. Index to Legal Periodicals, 1908 to date: Quarterly with annual cumulations

The student of school law will find Edwards' detailed analysis of the legal basis of school organization and administration the most comprehensive treatment available, covering the topics of: the school and the state, district organization and control, school districts and municipalities, school officers, legal authority of boards of education, school-board procedure and records, contractual authority and liability of school boards, the school money, the school debt, acquisition and use of school property, the contractor's bond, tort liability of school districts, personal liability of school officers, employ-

ment of teachers, dismissal of teachers, pensions and minimum wages, school attendance, rules and regulations of boards of education, and discipline and punishment of pupils.[47] Two other useful surveys of similar legal problems should be mentioned.[48]

A valuable bibliographical and summary review of the literature in this field includes 398 references which cover the topics of: federal and state relations to education, the constitutional basis of public education, state administrative organization, district organization and control, administration of local school systems, school finance, school property, tort liability of school districts, officers, and teachers, the legal status of teachers, the legal status of pupils, textbooks and curriculum, and legal aspects of higher education.[49] Suggestive discussions of a more general type, without specific reference to legal problems in education, deal with jurisprudence as a field for research,[50] the politico-juristic approach to problems in social science,[51] and the use of the law library.[52]

Numerous studies and theses of a legal character are listed annually under the headings of "educational laws and legislation" or "educational legislation" in the bibliography of educational research issued by the Office of Education.[53] The scope of the problems in this field may be illustrated by the following titles of Doctors' dissertations:

1. "Constitutional Limitations on Legislation for the Common School."

2. "A Study of the Control of Education through Freeholders Charters of California Cities and Counties."

47 Newton Edwards, *The Courts and the Public Schools.* Chicago: University of Chicago Press, 1933. Pp. xvi + 582.

48 H. R. Trusler, *Essentials of School Law.* Milwaukee, Wis.: Bruce Publishing Co., 1927. Pp. xlvi + 478.

Frederick Weltzin, *The Legal Authority of the American Public School.* Grand Forks, N. D.: Mid-West Book Concern, 1931. Pp. 286.

49 "The Legal Basis of Education," *Review of Educational Research,* III (December, 1933), 369-468.

50 Roscoe Pound, "Jurisprudence," *Research in the Social Sciences,* Chapter VI. Edited by Wilson Gee. New York: The Macmillan Co., 1929.

51 H. W. Odum and Katherine Jocher, *op. cit.,* Chapter XI.

52 W. E. Spahr and R. J. Swenson, *op. cit.,* Chapter IX.

53 Ruth A. Gray, *op. cit.,* and other annual bibliographies of the Office of Education.

3. "Education in Recent Constitutions and Concordats."
4. "The Influence of Court Decisions in Shaping School Policies in Mississippi."
5. "Legislation and Legal Status in the Tax Supported High Schools of the State of New York."
6. "Legal Basis of Educational Control: A Study of Centralization."
7. "The Administration of the Local Budget Law in Iowa."
8. "The Legal Liability of the School District for Damages."
9. "The Legal Implications of the Concept of Education as a Function of the State."
10. "The Constitutional and Legal Basis of Education in New Jersey."
11. "Legal Aspects in the Administration and Control of Public-School Property."
12. "Legal Rights and Obligations of Public-School Students."
13. "The Constitutional and Legal Basis of Public-School Administration in Virginia."
14. "The Constitutional and Legal Bases of Public-School Administration in Oklahoma."
15. "A Legal Study of the Centralization of State Control of Education in Indiana (as Revealed by Constitutional Provisions, Legislative Enactments, and Supreme and Appellate Court Decisions)." [These legal studies of state school systems have become numerous.]
16. "State Constitutional Provisions for Education: Fundamental Attitude of the American People Regarding Education as Revealed by State Constitutional Provisions."
17. "Legal Status of the County Superintendent."
18. "The Contractual Status of California City School Superintendents."
19. "The Legal Authority of the American Public School as Developed by a Study of Liability to Damages."

BIBLIOGRAPHICAL AND SUMMARIZING STUDIES

A type of exhaustive bibliographical survey, and of critical analysis and interpretation of results, found in certain of the summaries of educational research in given fields, approaches in character the technique of historical investigation, especially where a time span of some length is involved. The same processes of collection of data, criticism, and interpretative writing are involved. The first-hand reports of the various investiga-

tions are the primary sources. In the process of criticism questions concerning the good faith, competence, accuracy, bias, and position of the author must be answered, and the study under consideration must be compared with other investigations in the same field. The writing of the report, involving the interpretative, synthetic, and constructive processes, requires no less skill and insight than biography, legal research, and other types of historical investigation. In many instances it should be possible through a comparison and synthesis of results from a number of related studies to reach sounder generalizations or to make more definite the conclusions previously formulated in somewhat tentative fashion. A careful survey of the existing literature relating to a given problem, discussed in Chapter III, should observe the principles enumerated in the present chapter, dealing with collection, criticism, and interpretation of data.

In most graduate schools this type of work is not encouraged as a thesis problem, since it is not generally considered as adding new truth to the accumulated store of educational knowledge. Yet, viewed in another light, a critical, analytical synthesis and interpretation of studies in the field of reading from 1880 to 1925 does add definitely to knowledge by way of indicating major generalizations, trends, and needed research not clearly discernible as long as several hundred investigations were viewed separately rather than in relationship to each other and to a pattern representing the entire field of research in reading. Possibly one reason for reluctance to encourage this type of study as a thesis problem is the existence of many superficial so-called summaries of the running-bibliography or term-paper variety. However, there can be no question about the practical value of such contributions to educational literature, and as sufficient studies accumulate, appropriate summaries should be worked out in each of the subdivisions of education. It is true that the *Review of Educational Research* does this work in part, although less completely and analytically than in the case of available digests

of investigations in such fields as reading;[54] arithmetic;[55] science teaching;[56] language, grammar, and composition;[57] and the appreciation aspects of English.[58]

Concluding statement. This chapter has discussed the nature, value, scope, and frequency of historical studies in education. In connection with the collection of data, documents and remains have been illustrated and emphasized as the primary sources, the only solid bases for historical research. In this chapter and elsewhere, stress has been placed on appropriate library procedure and an adequate system of taking and organizing notes. The processes of external and internal criticism of the data collected have been analyzed, at least in terms of the major principles involved. Problems pertaining to the actual writing of educational history have been outlined briefly. Attention has been directed in particular to the significance of the legal and summary types of investigation in education.

In presenting the systematically organized discussion of this chapter and in differentiating between primary and secondary sources, documents and relics, internal and external criticism, etc., the authors are aware that the trained historical worker pays little conscious attention to such classifications. The experienced educational historian has developed his imagination and insight with respect to sources and criticism to such an extent that any formal organization of the procedures is unnecessary. Since such investigators are relatively

54 W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementary Educational Monographs, No. 28. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 276.

55 G. T. Buswell and C. H. Judd, *Summary of Educational Investigations Relating to Arithmetic*. Supplementary Educational Monographs, No. 27. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 212.

56 F. D. Curtis, *A Digest of Investigations in the Teaching of Science in the Elementary and Secondary Schools*. Philadelphia: P. Blakiston's Son and Co., 1926. Pp. x + 342.

———, *Second Digest of Investigations in the Teaching of Science*. Philadelphia: P. Blakiston's Son and Co., 1931. Pp. xx + 424.

57 R. L. Lyman, *Summary of Investigations Relating to Grammar, Language, and Composition*. Supplementary Educational Monographs, No. 36. Chicago: Department of Education, University of Chicago, 1929. Pp. viii + 302.

58 R. L. Lyman, *The Enrichment of the English Curriculum*. Supplementary Educational Monographs, No. 39. Chicago: Department of Education, University of Chicago, 1932. Pp. viii + 252.

few, it has seemed wise to present the foregoing analysis of the principles of historical research, even at the risk of seeming academic and formal, and of representing the historical method as more complicated than it actually is. Obviously, it is not to be assumed that mere reading of this chapter will take the place of needed additional training which comes through actual participation in historical investigation.

Not long ago the three hundredth anniversary of the establishment of secondary schools in this country was celebrated in educational literature and at national professional meetings with appropriate historical resumés of various phases and trends in secondary education. During the years of the recent economic and social disturbance, students of social science have examined more carefully than for a long time the foundations of society's institutions and the cycles of change through which organized society has passed, seeking to evaluate present conditions and to discern possible future trends. In the field of education there is every indication of returning to historical method as an ally of the scientific movement rather than to depend so largely for the solution of educational problems upon a questionnaire canvass of practice, a battery of standardized tests, a survey program, majority opinion, or statistical calculations.

Problems and Exercises

1. Select a completed historical study, and analyze it in terms of the principles of research developed in this chapter, for example:
   (*a*) A list of the sources used—documents and remains, primary and secondary
   (*b*) Illustrations of the type of criticism employed—internal and external
   (*c*) Type of writing and of historical interpretation represented, and effectiveness of organization
   (*d*) Adequacy of documentation and bibliography
2. Choose an historical study which might well be made (if desired, some aspect of the way in which the instructional program has been adapted to pupil or social needs), and outline it in terms of:
   (*a*) Initial library procedure

(*b*) Possible sources of data
(*c*) Tentative sub-topics
(*d*) Brief bibliography (See Chapter XIII for form)

SELECTED REFERENCES

* ABELSON, H. H. *The Art of Educational Research:* Its Problems and Procedures, Chapter VI. Yonkers-on-Hudson, N. Y.: World Book Co., 1933.

* ALMACK, J. C. *Research and Thesis Writing,* Chapter VII. Boston: Houghton Mifflin Co., 1930.

BARNES, H. E. *The New History and the Social Studies.* New York: The Century Co., 1925. Pp. xvii + 605.

BLACK, J. B. *The Art of History.* London: Methuen and Co., 1926. Pp. viii + 188.

BOGARDUS, E. S. *Making Social Science Studies.* Los Angeles, Calif.: Jesse Ray Miller, 1925. Pp. 103.

——— *The New Social Research.* Los Angeles, Calif.: Jesse Ray Miller, 1926. Chapters VI and VII deal with the life history and life-history types respectively.

CRAWFORD, C. C. *The Technique of Research in Education,* Chapter III. Los Angeles: University of Southern California, 1928.

CRUMP, C. G. *History and Historical Research.* London: George Routledge and Sons, 1928. Pp. ix + 178.

* DOW, E. W. *Principles of a Note-System for Historical Studies.* New York: The Century Co., 1924. Pp. vi + 124.

DUTCHER, G. M. "Directions and Suggestions for the Writing of Essays or Theses in History," *Historical Outlook,* XXII (November, 1931), 329-38.

* DUTCHER, G. M., ALLISON, W. H., FAY, S. B., SHEARER, A. H., and SHIPMAN, H. R., Editors. *A Guide to Historical Literature.* New York: The Macmillan Co., 1931. Pp. xxx + 1222.

* EDWARDS, Newton. *The Courts and the Public Schools.* Chicago: University of Chicago Press, 1933. Pp. xvi + 582.

* FLING, F. M. *The Writing of History: An Introduction to Historical Method.* New Haven, Conn.: Yale University Press, 1923. Pp. 196.

FORTESCUE, John. *The Writing of History.* London: Williams and Norgate, 1926. Pp. 74.

FRY, C. L. *The Technique of Social Investigation.* New York: Harper and Bros., 1934. Pp. 316.

GAY, E. F. "Historical Records," *Scientific Monthly,* XXX (April, 1930), 289-94.

GEE, W. P. *Research Barriers in the South.* New York: The Century Co., 1932. Pp. 192.

——— *Social Science Research Organization in American Universities and Colleges.* New York: D. Appleton-Century Co., 1934. Pp. x + 276.

———, and Others. *Research in the Social Sciences: Its Fundamental Methods and Objectives.* New York: The Macmillan Co., 1929. Pp. x + 306.

GEORGE, H. B. *Historical Evidence.* Oxford: Clarendon Press, 1909. Pp. 224.

GIDDINGS, F. H. *The Scientific Study of Human Society.* Chapel Hill, N. C.: University of North Carolina Press, 1924. Pp. vi + 247.

GOBLE, G. W. "Law as a Science," *Scientific Monthly,* XXXVII (September, 1933), 229-40.

* GOOD, H. G. "Historical Research in Education," *Educational Research Bulletin,* IX (January 8 and 22, and February 5, 1930), 7-18, 39-47, 74-8. An exposition of principles to be observed in the use of the historical technique of educational research.

* ——— "Relations between Historical and Scientific Research in Education," *Education,* LII (September, 1931), 4-7.

* ——— "The Possibilities of Historical Research," *Journal of Educational Research,* XXIX (October, 1935), 148-53.

* HOCKETT, H. C. *Introduction to Research in American History.* New York: The Macmillan Co., 1931. Pp. 168.

HUNT, E. M. "Scholars' History Versus School History," *Social Studies,* XXVI (December, 1935), 513-8.

* JOHNSON, Allen. *The Historian and Historical Evidence.* New York: Charles Scribner's Sons, 1926. Pp. 180.

* JUSSERAND, J. J., and Others. *The Writing of History.* New York: Charles Scribner's Sons, 1926. Pp. vii + 143.

* LANGLOIS, C. V., and SEIGNOBOS, C. *Introduction to the Study of History.* New York: Henry Holt and Co., 1898. Pp. xxvii + 350.

LAPRADE, W. T. "The Function of the Historian," *Social Studies,* XXV (February, 1934), 74-9.

LUNDBERG, G. A. *Social Research: A Study in Methods of Gathering Data.* New York: Longmans, Green and Co., 1929. Pp. x + 380.

MACDONALD, A. F. *Elements of Political Science Research.* New York: Prentice-Hall, 1928. Pp. vi + 94.

MARSHALL, R. L. *The Historical Criticism of Documents.* New York: The Macmillan Co., 1920.

NEVINS, Allan. *Masters' Essays in History:* A Manual of Instructions and Suggestions. New York: Columbia University Press, 1930. Pp. 24.

NICHOLS, R. F. "Historical Research in Colleges," *Historical Outlook,* XX (October, 1929), 280-2. Urges the adoption of an organized plan for historical research in colleges.

ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research.* New York: Henry Holt and Co., 1929. Pp. xiv + 448.

OGG, F. A. *Research in the Humanistic and Social Sciences.* New York: The Century Co., 1928. Pp. 454.

* REISNER, E. H. "The History of Education as a Source of Fundamental Assumptions in Education," *Educational Administration and Supervision,* XXIV (September, 1928), 378-84. Points out the values accruing from use of the historical method and historical materials in the solution of educational problems.

* RICE, S. A., and Others. *Methods in Social Science.* Chicago: University of Chicago Press, 1931. Pp. xiv + 822.

SCHLUTER, W. C. *How to Do Research Work.* New York: Prentice-Hall, 1926. Pp. viii + 138.

SELIGMAN, E. R. A. *The Economic Interpretation of History*. New York: Columbia University Press, 1924. Pp. ix + 166.

SHOTWELL, J. T. *Introduction to the Study of History*. New York: Columbia University Press, 1922. Pp. xii + 339.

* SPAHR, W. E., and SWENSON, R. J. *Methods and Status of Scientific Research*. New York: Harper and Bros., 1930. Pp. xxii + 534.

TEGGART, F. J. *Theory of History*. New Haven, Conn.: Yale University Press, 1925. Pp. xix + 231.

* VINCENT, J. M. *Historical Research: An Outline of Theory and Practice*. New York: Henry Holt and Co., 1929 (reprinted). Pp. 350.

WOODBRIDGE, F. J. E. "Contrasts in Education, III: Education and History," *Teachers College Record*, XXXI (January, 1930), 339-56.

CHAPTER VII

THE NORMATIVE-SURVEY METHOD: SURVEY TESTING, QUESTIONNAIRE INQUIRIES, DOCUMENTARY FREQUENCY STUDIES

Introduction. This chapter deals with the second major type of research discussed in this volume. It is concerned with ascertaining the conditions which prevail in a group of cases chosen for study, and is essentially a method of quantitative description of the general characteristics of the group. Because of the breadth of the subject and the necessity for describing data-gathering instruments, the treatment is given in two chapters. The present chapter deals with studies employing survey-testing, questionnaire, and documentary-frequency procedures. Interview, observational, and survey-appraisal procedures are treated in Chapter VIII.

The nature and the common uses of each procedure are given, methods of preparing data-gathering schedules are discussed, and certain cautions for interpretation of the findings are included.

APPRAISAL OF THE NORMATIVE-SURVEY METHOD

Much research has as its object the ascertaining of laws which govern relationships; but such is not the sole purpose of research. People are interested also in other kinds of knowledge. For example, the preceding chapter has dealt with methods used by workers who wish to find out what used to be the situation in the world, or in some particular section of it, before the present generation came upon it. This historical interest is often generalized and may be extended down to the very recent past. By methods which are appropriate to

such a field of inquiry, workers are enabled to piece together bits of evidence to prepare a description of conditions at an earlier time, or to form a story of the succession of events, and thus tell how one condition led to another.

In the present chapter we are primarily concerned with history in the making. Having become interested in the study of large social problems, people wish to make and record pictures of these problems as they are developing, instead of waiting till the events are long past and scholars must ferret their story out of musty records. We do not mean to suggest that history will not be written so as to cover the present period, as it has the past, but certainly historians will not find it as difficult to gather many of the facts for the present era. The main point, however, is that society is taking a more scientific interest in the control of its affairs. Having seen what lessons can be learned from studying past conditions and events, people now demand information about present activities while that information can still be used to guide them in formulating policies and working out plans for development in the immediate future.

Normative-survey research is directed toward ascertaining the prevailing conditions. It seeks to answer the question, "What are the real facts with regard to the existing conditions?" For example, a superintendent may want to know how many of the teachers in his system have college degrees. How many hold life certificates? How do these figures compare with the tendency throughout the state, or the nation? How many minutes per week are normally devoted to the teaching of spelling? What is a reasonable cost for the education of a kindergarten child? What proportion of a school budget is it reasonable to set aside for night school, or for adult education? What kind of a curriculum do people really want their children to have? At what age and grade level do pupils leave school? What happens to children after they leave school—what occupations do they choose, or what higher institutions do they enter? These will suggest the countless

questions that arise concerning current conditions in the educational world.

It will be apparent that this type of information is particularly important for the administrator. What is more natural than that one should want to know how other school systems are being run, so that he can compare his practices with theirs? By this means he can take courage in noting that certain of his procedures and standards appear to be superior to those of certain other schools; he will also have his attention called to the superiority of other systems in certain points to which he should give more attention; and perhaps, hopefully, he will get suggestions as to how to meet some of his pressing problems. Even if he does not secure any helpful suggestions, it is at least comforting to learn that other administrators are also grappling with problems similar to his own.

Interest in general conditions and practices is not limited to the administrator, though it is perhaps more characteristic of his work than of the work of others. Teachers, however, are concerned with the conditions obtaining in their classrooms and give frequent tests of one kind or another to keep informed of these conditions. They will also read widely about methods of instruction which others are using, and they will visit other classrooms to see what practices are employed. Although such activities will not ordinarily be classed as research, they serve to illustrate the interests for which normative-survey research is appropriate. Information-getting activities may be regarded as research only when they are relatively formal and carefully planned, as was pointed out earlier, in the first chapter.

It should not be thought that research of the normative-survey type is peculiar to education, or to the social sciences. It is, for example, a significant mode of attack in any field of knowledge where geographic distribution is involved, such as the ecology of flora and fauna. The climatic conditions of various parts of the world at any particular time are the subject of considerable investigation and reporting. The distribu-

tion of natural resources, such as forests, minerals, coal, petroleum, natural gas, water power, etc., is the subject of extensive and important surveys. The normative-survey approach is appropriate wherever the objects of any class vary among themselves and one is interested in knowing the extent to which different conditions obtain among these objects.

The compound adjective "normative-survey" is applied to this method in order to suggest the two closely related aspects of this kind of study. The word "survey" indicates the gathering of data regarding current conditions. The word "normative" is used because surveys are frequently made for the purpose of ascertaining what is the normal or typical condition, or practice.

Historical perspective may be secured. This direction of attention toward existing conditions does not, however, mean that the significance of normative-survey research is limited to the present. A study of the status of conditions at any given time may be repeated later, thus affording descriptions at different periods of time so that comparisons can be made, the direction of change noted and evaluated, and future growth guided. This is of no small importance in a society that is as complex and rapidly changing as ours. And it hardly requires mention that such studies furnish an increasingly valuable source of information for the historian. Therefore, although the survey approach may at first appear superficial, in that it gathers data only for the present and does not immediately give the perspective of a long historical sweep, such perspective is ultimately made possible through a series of cross-section pictures of conditions at different times.

A study of current status should, wherever possible, make use of similar information secured by earlier studies, so as to interpret present findings in the light of changes and trends. For example, a recent study of the status of city school superintendents [1] derived increased significance from the fact that

1 "The Progress and Status of the City Superintendent of Schools," Chapter VI, pp. 99-149, in *Educational Leadership*. Eleventh Yearbook of the Department of Superintendence. Washington, D. C.: National Education Association, 1933. Pp. 528.

a similar study had been made ten years previously,[2] and comparisons could be drawn on many different points, such as amount of training, length of experience before becoming a superintendent, etc. The recent investigation therefore shows not only the present situation, but when compared with the earlier study, indicates the direction in which changes are taking place. A study of the holding power of public schools was made several years ago by Kline[3] which purposely repeated as closely as possible an investigation made by Thorndike[4] about twenty-five years earlier. This duplication enabled Kline to report that the proportion of students staying in school long enough to enter high school had increased four times. When the workers in the National Survey of Secondary Education (1929-1931) wanted a definite test of whether the high schools of the country were becoming more democratic,[5] they compared their findings with earlier studies by Counts[6] and others.

The fact that we do not have more instances of such perspective in present normative studies is primarily because students in the past have not produced a large number of such investigations. It might fairly be said that only during the present generation has any widespread recognition of the importance of normative surveys developed. At the present time many people in all fields of social inquiry are recognizing that, by making numerous, carefully executed status studies, they are rendering a much needed service not only to the contemporary generation but to generations for many years to come.

2 *The Status of the Superintendent.* First Yearbook of the Department of Superintendence. Washington: National Education Association, 1923. Pp. 206.

3 Elias J. Kline, "Significant Changes in the Curve of Elimination since 1900," *Journal of Educational Research*, XXVI (April, 1933), 608-16.

4 Edward L. Thorndike, *The Elimination of Pupils from School.* U. S. Bureau of Education Bulletin, 1907, No. 4. Washington, 1907. Pp. 63.

5 Grayson N. Kefauver, Victor H. Noll, and C. Elwood Drake, *The Secondary-School Population*, Chapter I, "Changes in the Secondary-School Population," pp. 1-26. U. S. Office of Education Bulletin, 1932, No. 17; National Survey of Secondary Education Monograph No. 4. Washington, 1933. Pp. 58.

6 George S. Counts, *The Selective Character of American Secondary Education.* Supplementary Educational Monographs, No. 19. Chicago: University of Chicago, 1933. Pp. 162.

Relation of normative-survey research to practical needs. One may be prompted to ask whether normative-survey data solve problems. To this it must be replied at once that problems of a practical nature are not solved directly by data of any kind. The solving of problems is a distinctly psychological process. Solutions do not lie in data; they result from thinking, with the help of the increased insight which grows out of a study of data. It is important to know the psychological side of research, and to distinguish between facts and inferences. As for the value of normative-survey data in affording a basis for inferences that may aid in solving practical problems, it may be said that this kind of data will probably be more highly regarded by the administrator in helping him solve practical problems than are the principles and laws growing out of experimentation in the laboratory. The reason is this: the data coming direct from the field represent field conditions; they tend to be practical because they grow out of practical situations; and they generally answer the questions of the man in the field because they are likely to be cast in the terms in which he thinks.

There, is, of course, another aspect to the practical situation: radical changes, or adaptations involving great shifts, are not commonly contemplated in practice. For this reason a theoretical, scientific principle discovered by carefully controlled experimentation would not be immediately acceptable as a standard for practice if it required a very sharp departure from current usages. This condition is not a reflection on school administration; it is characteristic of administration in all fields and is simply an expresson of the fact that the administrator is expected to take many factors into consideration rather than to make great concessions to any one factor at the expense of others. In the manufacture of automobiles, for example, the engineers keep years ahead in their inventions and designs; the board of directors studies carefully the problem of introducing these new developments so that their effect on sales will be beneficial. In fact, a group of directors may be

more influenced in their decision by what other manufacturers are planning to do (normative data) than by the new ideas their engineers have recently evolved. Such practices emphasize the fact that running a large enterprise necessitates the consideration of many different things, of which technical considerations form only one group. These practices also suggest the importance of normative data in many walks of life.

Bureaus of research in city school systems, in state departments of education, in teachers organizations, and in other field situations are likely to give a predominant portion of their time to studies of the normative-survey type. This is indicated by several surveys of the work of field research bureaus, but it is stressed most pointedly in a bulletin of the National Survey of Secondary Education.[7] Perhaps the clearest indication of this tendency is found in the kinds of statistical analysis which are employed by these bureaus. In one of his tables (p. 65) Zeigel shows that such measures as per cent, median, mean, range, rank, etc., are employed generally in field studies, whereas correlation is used in less than 5 per cent of the studies which were analyzed. The former measures are those which typify the survey type of investigation, and thus indicate that research bureaus devote the greater portion of their time to this type of study. This tendency of research bureaus throws further light on the general usefulness of survey procedures and data. Other details of Zeigel's study are reported in Chapter XV, on the training and supervision of research workers.

The normative-survey method is not notably forward-looking, but it may be of service in this direction. It may reveal practices or conditions which are well above the average, representing advanced thinking and administration; the worker should always be alert to discover such. The method is also helpful because it tends to focus attention on needs that might otherwise remain unobserved; many a city does not realize

7 W. H. Zeigel, Jr., *Research in Secondary Education*. U. S. Office of Education Bulletin, 1932, No. 17; National Survey of Secondary Education Monograph, No. 15. Washington, 1933. Pp. 72.

the unsatisfactory conditions in some of its school buildings until a building survey reveals them. Again, the normative method may call attention to current trends [8] and permit people to evaluate and direct these new tendencies which are taking shape. The normative attack is not essentially forward-looking in itself, but it may well perform an important function in giving pertinent data to persons who *are* forward-looking.

The normative-survey method is not suited to the testing of various principles under laboratory conditions; it may, however, afford evidence of the results of certain tests under practical conditions. It offers limited opportunity for the revelation of fundamental laws in anything like a pure form, but may provide an invaluable check upon laws that have been discovered in isolation from the normal complex of social forces. On certain laws of distribution, field study may yield direct evidence, which cannot be obtained from any other source. Social scientists are beginning to regard various areas of habitation as essentially natural laboratories for their purposes, and they are directing techniques to the analysis of these phenomena. The normative-survey attack does not, however, characteristically penetrate deeply into interrelationships. It stops with the disclosure of facts and a suggestion of relatively prominent connections between these and apparent causes. The full analysis of complex interrelationships in natural situations is discussed in Chapter X which deals with certain methods especially adapted to a study of causal relationships.

The foregoing remarks on the value of survey studies will assure the research student that the type of information which the normative-survey method produces is in wide demand and is capable of rendering important service. They do not mean that the method is either a superior or an inferior type of re-

[8] For example, see Clara W. H. Gould, "Recent Biography: An Analytical Study with a View to Determining the Essential Similarities and Differences in Subject Material and Treatment in Modern Biographical Writing for Adults, Young People in the Ninth Grade, and Children Below the Ninth Grade." Master's thesis. Cleveland: Western Reserve University, 1932. Pp. 86.

search. It is true that scientists do not generally regard it as a very high order of research, but that is of little consequence. Research is not necessarily carried on as an intellectual pastime of scientists; it frequently has important practical questions to answer, and it must be appraised in the light of its effectiveness in answering these questions. There is no "best" type of research in general; each kind may be "best" for a particular purpose, and the survey type has its own field of particular usefulness. In this field, as in any other, all degrees of quality are possible. On the one hand, survey studies may be so trivial, so poorly conceived or narrowly carried out, or so lacking in penetrating analysis, that they fail to rise above the level of clerical routine and can make no claim upon the name "research." On the other hand, one may exercise great ingenuity, skill, and insight in planning and prosecuting his study so that it not only serves its immediate purpose but may also serve to set new standards for research in the area involved.

The normative-survey attack fits into the total research scheme in several ways. It may represent the reconnaissance stage of research which is entering a new area, or it may represent a specific interest in current conditions within an area that has long since been thoroughly explored and developed by research. If one watches the development of research in some new field through a series of stages, he will note that the early attacks represent a sort of general "getting acquainted" with the field—How far does it extend? What are the phenomena like? What are the classes or kinds into which the phenomena can be put? How many cases are there of each class? etc. Later on, as the worker gains familiarity with the characteristics of the field, he will attack the more detailed aspects of the area and make more refined studies, usually involving cross-classification, association, and cause and effect. The early investigations bear a genetic relation to these later studies just as the early efforts of the infant to talk bear to his later mastery of the intricate possibilities of purposive

speech. Although the exploratory studies in a new field may take the form of survey attacks and may be followed by research of a different sort that sheds additional light on the facts and relationships of the field, this does not indicate that such a rôle represents the complete sphere of service of the survey techniques. On the contrary, the survey attack is always appropriate when information concerning current conditions is desired in any field, however well explored, in which there are changes of condition or changes of population frequency from time to time.

Kinds of normative-survey research. The normative-survey method of research finds expression through a variety of techniques. Just as there are different kinds of facts which one may wish to gather and different kinds of sources for these facts, so there are many procedures which have been developed to meet the needs of these different purposes and conditions. Thus, when one desires facts from people about themselves, he may interview them, or he may ask them to fill out an information card, to supply answers to a questionnaire, to submit to a test or examination, or to produce something evidencing their skill or interest. For other purposes or other fields of work, appropriate methods and techniques are available.

In all, six different types of normative-survey research are recognized in the present treatise, namely, (1) survey testing, (2) questionnaire inquiries, (3) documentary frequency studies, (4) interview studies, (5) observational studies, and (6) appraisal procedures. Because of the amount of material only the first three of these types are treated in the present chapter, the other three being discussed in the following chapter.

In treating these types of normative-survey research, four general purposes will be maintained: (1) to show the different educational fields which may be studied by this method; (2) to illustrate data-gathering techniques which are applicable to these different fields; (3) to bring out the characteristics of the different types of normative-survey procedures, especially of the instruments which are used; and (4) to introduce typi-

cal studies which will acquaint the student with actual research in each field and provide suggestions for further work of his own. The discussions of the various types of survey research are followed by directions and suggestions for applying the procedures in one's own study, and where special instruments or schedules are called for, the preparation of these is treated.

Such purposes cannot be realized fully within the compass of a single volume, when entire books are devoted to several of the individual attacks. It will therefore be the purpose of this treatise to furnish the student with an overview of the field and to introduce in the footnotes enough references to the best literature on the subject so that he can become conversant with each type of attack. This general purpose will be especially evident in the descriptions of preparing instruments, which are relatively brief. Thus, although the discussion should provide all students with a general orientation and background in normative-survey investigation, those students who expect to use any particular procedure must plan to make a more intensive study of that procedure by following up the wealth of literature given in the footnotes.

The reader should remember that the types of data-gathering procedures which are characteristic of the normative-survey method are also employed in studies which depend chiefly on other research procedures. For example, experimental work, which is the third research method to be treated in this book, ordinarily calls for the measurement of groups of persons by tests, unless it belongs strictly to the laboratory type; questionnaires, check-lists, direct observation, and other procedures may also be involved. Case work and genetic studies depend largely on measurements and interviews, and so on. The description of these techniques of gathering data will, therefore, be of interest, not only to those who are contemplating use of the normative-survey method, but to those who are expecting to engage in any kind of quantitative research.

It may be appropriate to point out once more that there is a difference between research and the routine use of a tech-

nique. Research embodies considerable care in the formulation of the problem, and in the determination of the best procedures for attacking the problem. It always involves a considerable element of novelty. It will be borne in mind that such a distinction does not imply that research is necessarily superior to any other level of fact finding. The complexity of one's work should be dictated by the purpose for making the study and by the conditions of work. Immediate needs may often be met more expeditiously and sometimes more accurately by a routine study than by an elaborate special study. The distinction between research and less exacting levels of work is made in order that the meaning of the term *research* may be kept definite, and this is done without any intention of derogating from the value of less formal undertakings when they are appropriate to the needs and the conditions of work. In fact, some of the illustrations used in connection with the six types of normative-survey research which follow are not research in the full sense, but they serve nevertheless to bring out particularly well the characteristics of the technique under discussion. When such studies find their place as a step in a large pattern of problem solving, they become a legitimate part of research.

I. STUDIES EMPLOYING SURVEY-TESTING PROCEDURES

Perhaps the commonest example of normative-survey research in education is survey testing. By survey testing is meant simply the testing of a group of children (or adults) to ascertain the prevailing condition with respect to the traits measured by the test. A teacher may give tests to the pupils in her class to discover the general level of the class performance. Similarly, tests may be given to the pupils in a school building, in a city, county, state, group of states, or larger area, and some testing surveys have been international.[9]

[9] See for example, V. A. C. Henmon, *Achievement Tests in the Modern Foreign Languages*. Publications of the American and Canadian Committees on Modern Languages, Vol. V. New York: The Macmillan Co., 1929. Pp. 363.

The primary purpose of such testing is not to reveal detailed facts about any particular person individually, as in the case study, but rather to indicate the prevailing conditions throughout the group.[10] It is true that diagnostic and prognostic uses of tests (in connection with the causal-comparative, correlation, and case methods of research, described in Chapter X) emphasize study of the performances of individuals. To be considered research, survey testing, of course, must be conducted with reference to some clearly defined problem, such as the common errors of pupils in a particular school subject at a given grade level.

In discussing survey testing, various uses will be described without thought of suggesting that these are normally undertaken as research projects. These uses are mentioned to bring out the breadth of the applications of survey testing, and to suggest the wide field in which research may be undertaken. The student who is contemplating research in this area may choose any suitable aspect of the field for investigation, including practical use as a data-collecting instrument in seeking an answer to some significant question, or actual study of the tests themselves (characteristics, construction, or methods of administering). In addition to these uses of survey testing, one may employ tests to furnish measurements for some other method of research, such as experimental research. There is no sharp dividing line between normative-survey research and historical or experimental or causal-comparative research, and the treatment of survey testing—and of the other techniques in this and the following chapter—is written with the thought that the technique described may be of service in other forms of research as well as in normative-survey research. The particular manner in which such a technique will fit into a research study depends upon the particular problem that is chosen and the way in which it is to be treated.

10 See further notes on the purpose of survey testing, p. 460 of the *Review of Educational Research*, V (December, 1935), No. 5.

judgment must therefore be exercised in adapting the various techniques to the research problem that is undertaken. An examination of the studies cited should be helpful in suggesting ways of making this adaptation.

Achievement testing. It is now somewhat common for achievement tests [11] to be given to entire school systems by some central agency, such as a bureau of research [12] in the superintendent's office. Intelligence tests are frequently given by the same agency. A number of the larger school systems are constructing achievement tests of their own, based upon the courses of study which have been adopted for that particular

11 Gertrude H. Hildreth, *A Bibliography of Mental Tests and Rating Scales.* New York: The Psychological Corporation, 1933. Pp. 242. This is the most comprehensive bibliography at the time of the present writing, for both scholastic achievement tests and intelligence tests. It should be supplemented for later tests by use of the following sources, (*a*) to (*e*). References (*f*) and (*g*) are included for those who desire earlier bibliographies.

(*a*) Oscar K. Buros, *Educational, Psychological, and Personality Tests.* Published annually by the School of Education, Rutgers University, New Brunswick, New Jersey. This is a list of new tests that have appeared during the year, classified by subject, and indexed by title and by author. Information is given on grade range, number of forms, cost, time required, etc. References to articles on the tests are also given. This bibliography is designed as an annual supplement to Hildreth's basic work, referred to above. The first issue of this publication appeared in 1935, covering tests for 1933 and 1934. Pp. 44. 50¢. It was Number Seven in the Studies in Education series of Rutgers University.

(*b*) *The Education Index.* A current record of new tests of all kinds will be found under the caption, "Tests and Scales," in the Check-List; this Check-List is printed in the front of the *monthly* paper-bound issues. To find a particular test when the author or title is known, look for that name in the main alphabet of the *Education Index*, in either the monthly or cumulative issues. To find tests in a certain subject, look under that subject for the subhead, "Tests and Scales." For a suggestion of other subjects which may be related, consult the cross reference list at the end of the main topic, "Tests and Scales." For literature discussing the characteristics and use of various tests, see the main topic, "Tests and Scales."

(*c*) *Educational Research Bulletin*, of the Bureau of Educational Research, Ohio State University. This periodical reviews new tests which appear, somewhat after the fashion of book reviews.

(*d*) Watch the subhead, "Bibliography," under the topic "Tests and Scales" in the *Education Index* for the appearance of any new bibliographies of tests.

(*e*) For references to articles which evaluate and discuss the uses of various achievement tests, see footnote 32.

(*f*) Henry Lester Smith and Wendell William Wright, *Second Revision of the Bibliography of Educational Measurements.* Bulletin of the School of Education, Indiana University, IV (November, 1927), No. 2. Bloomington, Ind.: Bureau of Coöperative Research, 1927. Pp. 251.

(*g*) B. R. Buckingham, Margaret Doherty, and Josephine MacLatchy, *Bibliography of Educational and Psychological Tests and Measurements.* U. S. Bureau of Education Bulletin, 1923, No. 55. Washington, 1924. Pp. 233.

12 See for example H. B. Chapman, *Organized Research in Education with Special Reference to the Bureau of Educational Research.* Bureau of Educational Research Monograph, No. 7. Columbus, Ohio: Ohio State University, 1927. Pp. 221.

system. The achievement-testing program [13] of a central bureau may cover the same subjects and the same grades year after year, or variation from year to year may be provided in subjects, grades, or tests.

The results of such programs enable the superintendent to know whether the pupil performance throughout the school system is, on the average, comparable with the average level of performance of other years, or of other school systems, with reference to the particular aspects of performance which are tested. If the results do not indicate a satisfactory level of work, the superintendent will make various other analyses designed to reveal the factors that are responsible for the unsatisfactory performance. The routine administration of tests is not to be regarded as research, but the employing of tests in the thorough analysis of a problem may constitute research of an important kind. Achievement testing is called for in many different kinds of research.

Testing for appraisal. In the earlier testing literature, and even in that of more recent date, it has been stated that achievement tests could be used to appraise the work of teachers, of principals, and even of supervisors. Achievement test results are not to be ignored in judging the work of a teacher,[14] but it must be realized that the teacher's influence is only one factor among many conditions which determine the level of the child's performance.[15] For example, there are such additional sources of influence as native brightness, physical vigor, home background, recreational habits and environment, and previous training and experience—all contributing factors of great potency in determining the present performance of pu-

13 Clifford Woody and Paul V. Sangren, *Administration of the Testing Program.* Yonkers-on-Hudson, N. Y.: World Book Co., 1932. Pp. 397. "Designed to serve as a manual of instruction for those having the responsibility of directing a testing program."

14 Charles W. Knudsen, *Evaluation and Improvement of Teaching,* Chapter VIII, "Evaluation of Instruction by Means of Standardized Tests," pp. 285-320. Garden City, New York: Doubleday, Doran and Co., Inc., 1932. Includes a bibliography.

15 A. S. Barr, "Measurement in the Supervision and Improvement of Teaching," *Twenty-second Conference on Educational Measurement,* pp. 25-31, Bulletin of the School of Education, Indiana University, XII (December, 1935), No. 1. Bloomington, Ind.: Bureau of Coöperative Research.

pils.[16] Unless one secures reliable and comprehensive evidence on these other sources of influence, he has little right to attribute test results to the superiority or inferiority of a particular teacher or group of teachers. Test results from a class may be taken as suggestive evidence of the quality of teaching, to be confirmed or refuted by other lines of evidence, but never to be used as the sole or even the principal criterion. One should, therefore, be careful in choosing research problems in this area, with the intent of relying upon test results alone.

Some may consider the possibility of using test results as a means of rating different educational institutions. For example, the administrative officers of a city school system might desire to know the relative standing of the various schools in the city on the basis of their educational effectiveness, so that their practices could be examined and the best ones established in other schools that were doing less effective work. Attention will be given to this problem of rating different educational institutions in connection with the topic of "Appraisal" in the following chapter. It may be pointed out in advance of that discussion that the abilities which we measure by tests constitute only one of many sets of desirable educational products; furthermore, we cannot be certain how large a part the school has played in the production of even these outcomes. As in the case of judging the work of teachers, test results have a certain significance, but without a knowledge of the many selective factors which affect the pupil group in any school and without an appraisal of many dynamic influences in their daily lives, one will hesitate to say that test results are even presumptive evidence of the quality of work being done in any particular school. Research in this area must therefore consider more than test results.

Not infrequently the results of city-wide survey testing are made available to principals and teachers for an analysis of their schools and classes. One must be cautious not to put

[16] J. B. Maller, "Economic and Social Correlatives of School Progress in New York City," *Teachers College Record*, XXXIV (May, 1933), 655-70.

survey tests to a more refined use than is appropriate. Although test makers have in general endeavored to construct tests that will yield reasonably accurate scores for an individual child, it must be understood that not every test—and particularly not every survey test—provides for a sufficient sampling of performance so that a single individual is reliably described. A survey test may afford an average for a large group, which is highly dependable,[17] and thus serve the superintendent's and principal's interests without giving the teacher anything that is more than suggestive for her class or for an individual pupil. Further, it must be recognized that the purposes and interests of a teacher and an administrator frequently differ, and that the satisfaction of the teacher's interests may require a very different kind of test. Survey testing may easily be abused through putting interpretations on the results that the tests do not warrant. Here, as in all research, one must be careful to distinguish between what his results actually show, and what they appear to indicate at first glance. Careful interpretation of "facts" is as important as careful work in gathering them.

State and regional achievement testing. There are a number of regular achievement testing projects that cover large areas, such as states, regions, or the country as a whole.[18] Although these undertakings normally contemplate considerable use of the results for individual pupils, the projects, nevertheless, have obvious survey characteristics, and they are referred to here for that reason. In certain of the states achievement tests are given more or less regularly by the state department of education to schools throughout the state. Such practices in six of the states have been described by the Research Division of the National Education Association.[19]

17 In any case care must be exercised in the interpretation of test scores. See the later discussion on this point.

18 Paul V. Sangren, "State and National Testing Programs," in "Educational Tests and Their Uses," *Review of Educational Research*, V (December, 1935), No. 5, 456-8.

19 "State-Wide Achievement Testing Programs," in "Estimating State School Efficiency," *Research Bulletin of the National Education Association*, X (May, 1932), No. 3, 97-103. Includes a bibliography of forty references on state-wide achievement testing.

State testing programs especially for high schools are described by Segel.[20] He lists eighteen states; South Carolina has recently joined the list, giving its first state-wide tests in May, 1936.[21] Some of these programs extend also to high-school pupils of other states. A number of states have testing programs for graduation from the eighth grade. These various state programs are usually conducted by bureaus of research or measurement in the state department of education, in the department of education of the state universities, or in some teacher-training institution. In some cases the programs are carried on by a voluntary organization.

Several agencies conduct achievement testing on a national scale. The Bureau of Educational Measurements of the Kansas State Teachers College at Emporia conducts a "Nation-Wide Every Pupil Scholarship Test" in January and April of each year, which may extend over some forty-two states and involve around a million tests. This enterprise has been going on since 1925. The stated purpose of the project is "the promotion of scholarship." The Bureau makes its own tests for these occasions and supplies them to elementary and high schools that desire them for 1½¢ and 2¢ apiece, respectively. Each school gives and scores its own tests and sends the results to the Bureau, which then calculates norms for the nation, and for many of the individual states, and returns these to the schools which participated so that they may compare their averages with the norms.

The Public School Publishing Co., of Bloomington, Ill., has also engaged in a nation-wide testing program annually since 1924, with possible follow-up tests later in the year; these programs embrace both elementary and high schools and are perhaps even more extensive than the Kansas project. In addition to these are three agencies which confine their attention

20 David Segel, *National and State Coöperative High-School Testing Programs.* U. S. Office of Education Bulletin, 1933, No. 9. Washington, D. C., 1933. Pp. 47.

21 "The South Carolina Every-Pupil Testing Program, Containing Announcement of the First Annual Testing Program, May 4-8, 1936." Issued by James H. Hope, State Superintendent of Education. Columbia, S. C., 1936. Mimeographed. Pp. 33.

to high-school pupils. College-entrance examinations have long been given on a national basis by the College Entrance Examination Board, but there are now other agencies, notably the Educational Records Bureau of New York City and the Coöperative Test Service, which are interested in testing pupils in any grade of the high school.[20]

It should be said that *routine* testing is not in itself research, whether it is on a national basis or in a single classroom. Reference has been made to these large testing programs because they represent procedures for gathering data which the normative-survey method employs; they may serve as a source of data for some one who desires to make use of their results for more analytical research purposes; and, finally, survey testing over considerable areas has become an important part of large-scale research undertakings which may include other kinds of investigation. Such surveys are often the inspiration for research studies. For example, H. A. Toops has made many researches from data gathered through the tests of the Ohio College Association. Numerous other similar examples can be found.

Achievement testing in school surveys. Survey testing of educational attainment has become a large and well-established part of school surveys. Caswell[22] traces briefly the history of the use of tests in surveys. Whereas in 1911 the appraisal of instruction was based on an inspection of the teaching by a surveyor, achievement tests were given some recognition in a 1913 survey, and considerably more use was made of them in 1914 in the Butte, Montana, survey. In the Cleveland, Grand Rapids, and the St. Louis surveys of 1916 and 1917, under the influence of Charles H. Judd, achievement testing was raised to a height that has set a standard for all subsequent surveys.

Achievement testing is now a regular part of school surveys.[23]

22 Hollis Leland Caswell, *City School Surveys.* Contributions to Education, No. 358. New York: Teachers College, Columbia University, 1929. Pp. 130.

23 For surveys which have employed standard achievement tests in various school subjects see the topic, "The Measurement of Instruction," *Topical Analysis of 234*

The testing in these cases is of the survey type,[24] in which emphasis is placed upon group results, and the value of the instruction is appraised accordingly. In some surveys an attempt is made to analyze the results in detail so that constructive suggestions for the improvement of the practices can be offered.[25]

Surveys of school systems have extended beyond the limits of cities, to include counties, states, and the entire country. Regardless of the territory included, testing plays an important part.[26] More will not be said about surveys at this point, as they are discussed in the next chapter under the topic, "Appraisal procedures."

It will be clear from what has already been stated that there is some question concerning the satisfactory use of the usual achievement tests as the sole basis for drawing conclusions about instruction.[27] The customary tests do not measure many of the objectives that the better teachers are striving to develop,[28] and, conversely, good results of the formal kind can be achieved by the use of teaching procedures which in many cases do much harm, such as an overemphasis upon drill, unenlightened rote memory, continual competition, etc., not to mention a corresponding lack of emphasis upon broader aspects of growth. The older idea, that the teacher who secures good

School Surveys, by Henry L. Smith, pp. 75-82. Bulletin of the School of Education, Indiana University, III (March, 1927), No. 4. Bloomington, Ind.: Bureau of Co-operative Research. Pp. 111.

24 Walter Crosby Eells, "Use of Standard Tests in 72 Published School Surveys," *School Life*, XIV (May, 1929), 168-9.

25 See for example the *Report of the Survey of the Schools of Chicago, Illinois*, especially Vol. II, "Fitting the School to the Pupil," pp. 3-141, by Paul R. Mort, Wendell W. Wright, and W. B. Featherstone. Or, the same topic, and other sections, in Vol. V, "Summary of Findings and Recommendations," pp. 72-86, by George D. Strayer. New York: Teachers College, Columbia University, 1932. 5 vols.

26 See the reference in footnote 19.

27 *Conclusions and Recommendations of the Commission*. Report of the Commission on the Social Studies of The American Historical Association, Investigation of the Social Studies in the Schools, pp. 96-101. New York: Charles Scribner's Sons, 1934. Pp. 168.

A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, Chapter III, "The Survey of the Products of Learning," pp. 62-115. New York: D. Appleton-Century Co., 1931. Pp. 399.

28 Ralph W. Tyler, "Evaluation: A Challenge and an Opportunity to Progressive Education," *Educational Record*, XVI (January, 1935), 122-31. The appraisal of educational outcomes other than the formal ones is treated in the next chapter of this book under the topic, "Observation of Behavior" and "Appraisal Procedures," as well as in the section on "Questionnaire Inquiries" which follows.

performance by her pupils on formal tests is likely to be a superior teacher in all respects, is giving way to a more discriminating insight which recognizes that good test results are sometimes secured at too high a price.

Survey testing in complex studies. Survey testing of achievement not infrequently forms a part of large studies which include many people and deal with a number of aspects of a complex problem. In such cases tests may be constructed especially for the occasion, or existing tests may be used with or without modification. The Modern Foreign Language Study [29] furnishes one example of such use. The Nation-Wide Study of English Usage [30] was based almost entirely on survey testing. The Payne Fund Studies of motion pictures used tests for important phases of the inquiry.[31] Such studies as these furnish additional examples of the way in which survey testing may be of importance.

Uses of survey tests in connection with experiments will be apparent in the treatment given in Chapter IX on the experimental method. Tests also form the basis of much individual and statistical work described in Chapter X.[32]

29 This study is published in seventeen volumes; see for example: Ben D. Wood, *New York Experiments with the New-Type Modern Language Tests.* Publications of the American and Canadian Committees on Modern Languages, Vol. I. New York: The Macmillan Co., 1927. Pp. 339. See also the summary volume by Robert H. Fife.

30 L. J. O'Rourke, *Rebuilding the English-Usage Curriculum to Insure Greater Mastery of Essentials.* Washington: The Psychological Institute, 1934. Pp. 98. See also Paul S. Achilles, "Nation-Wide Surveys in Reading, English Usage, and Vocabulary Launched by the Psychological Corporation," *School and Society,* XXXIV (August 15, 1931), 233-5.

31 P. W. Holaday and George D. Stoddard, *Getting Ideas from the Movies.* New York: The Macmillan Co., 1933. Pp. 202. Briefly described in W. W. Charters, *Motion Pictures and Youth,* pp. 7-11, 1933. (Note: The volume by Charters is published both separately and under the same cover as the volume by Holaday and Stoddard.)

32 For further uses and studies of achievement tests, see "Educational Tests and Their Uses," *Review of Educational Research,* V (December, 1935), No. 5; also the earlier number, III (February, 1933), No. 1, and later numbers as they appear in the three-year cycle.

A series of annual reviews of studies of educational tests has appeared in the *Psychological Bulletin,* beginning with the July, 1926, number (Vol. XXIII). These appeared in the July number of each succeeding year through 1929, then in June, 1930, (none in 1931), in February, 1932, and in July, 1933, 1934, and 1935. Presumably the policy will be continued.

For a bibliography of both tests and studies of tests, covering the earlier period of literature in this field, see: B. R. Buckingham, Margaret Doherty, and Josephine MacLatchy, *Bibliography of Educational and Psychological Tests and Measurements.* U. S. Bureau of Education Bulletin, 1923, No. 55. Washington: 1924. Pp. 233.

See also the topics, "Achievement Tests," "Educational Measurements," "Objective Ex-

Testing in foreign countries. European countries, especially those on the continent, do not share the American attitude toward testing to any large degree. In general they are actuated by a different basic philosophy, which expresses itself in other interests. Intelligence tests are likely to be used where we would use achievement tests. There has, however, been a limited amount of investigation using achievement tests, and there has been some survey testing. Educational testing in England, France, Germany, and China has been summarized in the *Review of Educational Research.*[33] The student who desires to get in touch with expressions of the European attitude at first hand will be interested in reading reports of international conferences on measurement.[34] These diverse attitudes towards measurement should suggest a number of problems for investigation.

References to the use of intelligence tests in foreign countries will be found in footnotes 33 and 43 of this chapter, and references to the use of personality tests in foreign countries are listed by Maller (footnote 45).

Intelligence testing. Intelligence tests purport to measure the factor of native brightness, or capacity for intellectual adaptation, as it varies from individual to individual. It is generally recognized that these tests are not free from the influence of formal training and general experience, so that scores represent a composite of native and experiential factors.[35] To-day

aminations," and "Tests and Scales," in the *Education Index*, and the topic, "Educational Tests," in the *Bibliography of Research Studies in Education*, issued annually by the United States Office of Education.

33 Charles C. Weidemann, W. J. Osburn, and Louise Mahone, "Educational Tests and Measurements in China, England, France, and Germany," pp. 443-54, in "Educational Tests and Their Uses," *Review of Educational Research*, V (December, 1935), No. 5. Bibliography of 204 references.

34 Paul Monroe, editor, *Conference on Examinations*, under the auspices of the Carnegie Corporation, the Carnegie Foundation, and the International Institute of Teachers College, Columbia University, at Eastbourne, England, May, 1931. New York: Teachers College, Columbia University, 1931. Pp. 316.

A second conference (London, July, 1933), and a third one (Folkestone, England, June, 1935), have been held. These conferences and their reports are described by I. L. Kandel, in "The International Examinations Inquiry," *Educational Record*, XVII (January, 1936, Supplement No. 9), 50-9. Also, more briefly, in the *Journal of Educational Research*, XXIX (December, 1935), 314-5.

35 For a pointed but comprehensive statement of various influences, see Frank N. Freeman, *Mental Tests*, Chapter XVII, "Interpretation of Intelligence Tests," pp. 444-75. Boston: Houghton Mifflin Co., 1926. Pp. 503.

good intelligence tests are, however, the best means available for reflecting, to as large a degree as possible, the factors of inherited capacity. In that rôle they are highly useful in many ways.[36]

In individual school systems, intelligence tests are largely employed as a basis for dividing large classes into relatively homogeneous sections,[37] as an aid in the diagnosis and adjustment of individual children, in educational and vocational

For more recent, technical discussions, see Harry J. Baker, "Intelligence and Its Measurement," Chapter I, pp. 187-98, in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3. Also, Katharine B. Greene, "General Intelligence and Its Measurement," Chapter I, pp. 274-83, in "Tests of Intelligence and Aptitude," *Review of Educational Research*, II (October, 1932), No. 4.

36 For illustrative treatments of various uses and studies of intelligence tests, see the following:

Gertrude Hildreth, "Applications of Intelligence Testing," Chapter II, pp. 199-214, in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

Paul R. Mort and W. B. Featherstone, "The General Uses of Psychological Tests," and "The Uses of Psychological Tests for Atypical Groups," Chapters V and VI, pp. 300-20, in "Tests of Intelligence and Aptitude," *Review of Educational Research*, II (October, 1932), No. 4.

Rudolph Pintner, "Intelligence Tests." A series of annual reviews of studies of intelligence tests and their uses, in the *Psychological Bulletin*. Parallels the series on educational tests; see footnote 32.

———, *Intelligence Testing*, Part III, pp. 225-541. New York: Henry Holt and Co., 2d ed., 1931. Pp. 555.

Paul L. Boynton, *Intelligence: Its Manifestations and Measurement*, Chapters IX and X, pp. 337-451. New York: D. Appleton-Century Co., 1933. Pp. 466.

Henry E. Garrett and Matthew R. Schneck, *Psychological Tests, Methods, and Results*, Part II, Chapter V, "Some Applications of Psychological Tests," pp. 185-224. New York: Harper and Bros., 1933. Parts I and II.

Frank N. Freeman, *Mental Tests*, Chapter XIV, "The Educational Uses of Tests," pp. 365-98. Boston: Houghton Mifflin Co., 1926. Pp. 503.

See the topics, "Intelligence Testing," and "Intelligence Tests," pp. 36-7 in the Subject Index of *The Personnel Bibliographical Index*, by W. H. Cowley. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

In the *Education Index*, see the topics: "Intelligence," "Intelligence Quotient," "Intelligence Tests," "Psychological Tests," and "Achievement Quotients." In the *Bibliography of Research Studies in Education*, issued annually by the United States Office of Education, see the topic (in the index), "Psychological Tests."

In the annual *Psychological Index*, see section XI, No. 2, "Mental Tests," which includes character and personality tests also.

37 Paul T. Rankin, "Pupil Classification and Grouping," Chapter III, pp. 200-20, in "School Organization," *Review of Educational Research*, I (June, 1931), No. 3.

"Bases of Grouping," pp. 384-5, in "School Organization," *Review of Educational Research*, IV (October, 1934), No. 4.

Robert T. Rock, Jr., *A Critical Study of Current Practices in Ability Grouping*, Chapter III, "Intelligence as a Basis of Classification," pp. 30-62. The Catholic University of America, Educational Research Bulletins, IV (May-June, 1929), Nos. 5 and 6. Washington: The Catholic Education Press, 1929. Pp. 132. Bibliography of 110 references.

Harl R. Douglass, "Certain Aspects of the Problem of Where We Stand with Reference to the Practicability of Grouping," *Journal of Educational Research*, XXVI (January, 1933), 344-53.

See also the references in the preceding footnote.

guidance,[38] and in other ways. Many of the larger cities have psychological laboratories or clinics for the study of children who are educationally or socially maladjusted.[39] The opportunity for research in these areas is almost unlimited, though one will recognize that intelligence tests furnish only one line of evidence.

Intelligence tests have received a great deal of use in the estimation of aptitude. Such prognosis is of course essential for guidance, both educational and vocational. Applications have been made to the estimation of general scholastic success, the probability of success in college, aptitude for particular high-school or college subjects, and future ability in various vocational fields.[38] In this connection it will be borne in mind that educational achievement tests are also of value for predictive purposes and are often used in this way. (Prediction, being based upon correlation, lies somewhat beyond the limits of normative-survey research. It is referred to in Chapter X.)

Perhaps the largest use of intelligence tests has taken place in the field of scientific experimentation and study. A review of the references cited will show that most of them represent

38 Edward L. Thorndike and Others, *Prediction of Vocational Success*. New York: Commonwealth Fund, 1934. Pp. 284.

Harry J. Baker, "Vocational Aptitudes Tests and Their Application," Chapter VII, pp. 321-4, in "Tests of Intelligence and Aptitude," *Review of Educational Research*, II (October, 1932), No. 4. See also "Psychological Tests as a Predictive Device," "Prediction of Academic Success in College," and "Prediction of Teaching Success," pp. 301-6, in this same isue.

Ruth Strang, *Personal Development and Guidance in College and Secondary School*. New York: Harper and Bros., 1934. Pp. 341. (Contains a comprehensive bibliography of tests for educational guidance.)

Herbert A. Toops, "Measures of Aptitude," Chapter III, pp. 215-28, in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

See the topics, "Aptitude Tests," "Vocational Guidance," and "Vocational Tests," in the *Education Index*, and the topics, "Tests and Scales: Aptitude," and "Educational and Vocational Guidance," in the *Bibliography of Research Studies in Education*, issued annually by the U. S. Office of Education.

The College Entrance Examination Board publishes annually a *Report of the Commission on Scholastic Aptitude Tests*, which reviews the performance of candidates on its aptitude tests, and reports an analytical statistical study of the tests. Published by the Board, 431 W. 117th St., New York, N. Y.

See the six topics beginning with "Aptitude," p. 16; "Techniques of Measuring Vocational Interests, and Vocational Success," p. 63; and "Techniques of Predicting Vocational Aptitudes and Vocational Success," p. 63; in the Subject Index of *The Personnel Bibliographical Index*, by W. H. Cowley. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

39 Gertrude Hildreth, *Psychological Service for School Problems*. Yonkers-on-Hudson, N. Y.: World Book Company, 1930. Pp. 317.

studies which have been made for research purposes. This is probably because intelligence testing lies primarily in the field of psychology, and psychologists are concerned chiefly with the development of their science rather than with immediately practical applications. This emphasis is somewhat in contrast to the stress in the field of educational or achievement testing, which has been almost entirely in the hands of educators, although probably in neither case can the emphasis be said to be disproportionate.

A number of large-scale studies utilizing intelligence tests have been made. For example, surveys of intelligence have been conducted to ascertain the average intellectual level of pupils who enter college, of pupils who graduate from high school but do not enter college, of pupils who succeed in school and of those who do not, etc.[40] Intelligence tests are among those given in state-wide testing programs,[41] particularly for the purpose of college entrance. Intelligence tests have also been used in school surveys,[42] although to a much less extent than have achievement tests. In foreign countries, intelligence tests have received a proportionally larger use than have achievement tests, being used often under circumstances for which achievement tests would be employed in America.[43] Needless to say, the tests used in large-group studies are almost invariably *group* intelligence tests.

40 William F. Book, *The Intelligence of High School Seniors as Revealed by a State-Wide Mental Survey of Indiana High Schools*. New York: The Macmillan Co., 1922. Pp. 371.

Joseph R. Gerberich, "Gifted Pupils of the Iowa High School Survey," *Journal of Applied Psychology*, XIV (December, 1930), 566-76.

Charles W. Odell, *Are College Students a Select Group?* Bureau of Educational Research Bulletin, No. 34. Urbana, Ill.: University of Illinois, 1927. Pp. 45.

See the topic, "Intelligence of," on p. 36 of the Subject Index of Cowley's *Personnel Bibliographical Index* (cited in footnote 39).

41 "State-wide Coöperative Testing Programs," pp. 219-21 in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

"The American Council on Education sponsors the construction of an annual edition of a psychological examination for use by colleges and universities in testing college entrants." (Segel, p. 8, cited in footnote 20.)

42 See the references listed on p. 79 of *Topical Analysis of 234 School Surveys*, cited in footnote 23.

43 A discussion of intelligence testing in foreign countries will be found in the reference given in footnote 33. Other references will be found scattered through "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

For a bibliography of intelligence tests which are available, see Hildreth and Buros and the other references given in footnote 11 of this chapter.

Personality testing. Personality constitutes the third large field, as the psychological aspects of human beings are commonly divided. It is somewhat commonly spoken of as "character and personality," though in a strictly psychological sense the term *personality* may cover all of the response tendencies of the individual that are not already included under achievement and intelligence—and it is clear that it must also embrace some or even all of the characteristics in those fields. The line of demarcation is simply one of convenience; it is impossible to draw a sharp dividing line between the different concepts.

In the field of practical education it has long been recognized that personality traits are among the most important outcomes to be hoped for. They are, however, difficult of definition, analysis, and quantitative evaluation. The modern measurement movement has naturally given its first efforts to those things which are relatively easy to deal with, and in the volume of tests which have been produced and commercially distributed in recent years there has been an emphasis that has tended to push the personality field into the background. The practical teacher and administrator have often taken a position in active opposition to the new testing movement for this reason.

Up to the present time, instruments for survey testing in the field of personality, character, and adjustment have been in the formative stage and have not enjoyed widespread use. Most of the work has been a problem of developmental and promotional tryout. In this connection, mention should be made of the monumental pioneering work of Hartshorne, May, Shuttleworth, and Maller, in the Character Education Inquiry.[44] Al-

[44] Hugh Hartshorne, Mark A. May, Frank K. Shuttleworth, and Julius B. Maller, *Studies in the Nature of Character.* Three volumes: Studies in Deceit, Studies in Service and Self-Control, and Studies in the Organization of Character. New York: The Macmillan Co., 1928-1930.

though much of this study was made with an emphasis on individuals and on correlation and employed other measures than tests, certain sections represent survey testing on a fairly large scale.

It appears, however, that at the present time enough successful experimentation has been done in this field so that tests or other appropriate devices for evaluation are now ready for extended use.[45] This does not mean that these procedures are perfect or "fool proof"; but neither are achievement and intelligence tests. The procedures which are appropriate are not confined to paper-and-pencil tests, but embrace a variety of techniques. For example, questionnaires, interviews, observation, check-lists, and rating scales, as well as carefully prearranged social situations, are all employed in addition to paper tests. Some of these procedures depend to a large extent upon the skill and judgment of the individual doing the appraising; this means that they are not so satisfactorily done by the average person. On the other hand, it must not be overlooked that the best tests of intelligence are the individual ones, which require the skill and judgment of an expert. Certain of the personality tests are as easily given as ordinary achievement tests, and are available for use in research studies as well as for regular purposes.

Symonds has prepared a very readable, comprehensive treatise on the procedures in this field.[46] After an introduction, he treats of observation, rating methods, various types of ques-

45 The bibliographies by Hildreth and Buros, listed in footnote 11, include tests of personality. The two books by Symonds, cited in footnotes 46 and 47, are also excellent sources. The references in footnote 48, dealing with studies of these tests, also contain lists, particularly the *Review of Educational Research*, II (June, 1932), No. 3, by Goodwin Watson. See also footnotes 156-160 in Chapter VIII.

J. B. Maller, "Bibliography of Character and Personality Tests." New York: Institute of School Experimentation, Teachers College, Columbia University, 1932. Mimeographed. Pp. 53. A descriptive bibliography of some 300 tests, with notes on tests developed in England, Germany, France, and Russia.

Henry E. Garrett and Matthew R. Schneck describe a number of representative personality tests, and discuss their characteristics. See *Psychological Tests, Methods, and Results*, Part II, pp. 151-62. New York: Harper and Bros., 1933.

For currently new tests, consult the annual bibliography by Buros cited in footnote 11, and see the heading, "Check-List: Tests and Scales," in the front of paper-bound monthly issues of the *Education Index*.

46 Percival M. Symonds, *Diagnosing Personality and Conduct*. New York: The Century Co., 1931. Pp. 602.

tionnaires for measuring adjustment, attitudes, and interests, tests of knowledge and judgment in social relationships, performance tests, physiological measures, interviewing, and measures of the environment. These discussions deal with the methods of carrying on the appraisal and report the results of various critical studies that have been made of the methods. In another book [47] Symonds lists various tests and other instruments that are available. He groups these under fifteen heads and gives information concerning the purpose, nature, reliability, and norms of each one, as well as references that deal with the use of the instruments. These two books are recommended as a readable, but thoroughly professional approach to this interesting field.

There is already an extensive literature in this area, and the reader is referred to it [48] for acquaintance with the develop-

47 Percival M. Symonds, *Psychological Diagnosis in Social Adjustment*. New York: American Book Co., 1934. Pp. 362. See the appendix, pp. 171-346.

48 Willard C. Olson, "General Survey of the Field of Character and Personality Measurement," Chap. V, pp. 242-44; "Measures of Character and Personality Through Conduct and Performance," Chapter VIII, pp. 273-90; and Goodwin Watson, "Mental Hygiene and Emotional Adjustment," Chapter VI, pp. 245-58; in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

Goodwin B. Watson, "Tests of Personality and Character," *Review of Educational Research*, II (June, 1932), No. 3.

Vernon Jones, "Character Education," Chapter III, pp. 31-6, in "Special Methods and Psychology of the Elementary School Subjects," *Review of Educational Research*, V (February, 1935), No. 1.

——— and Lester A. Kirkendall, "Moral and Character Education," Chapter XI, pp. 507-9, in "Psychology and Methods in the High School and College," *Review of Educational Research*, IV (December, 1934), No. 5.

H. J. Baker and Virginia Traphagen, *The Diagnosis and Treatment of Behavior-Problem Children*. New York: The Macmillan Co., 1935. Pp. 393.

Percival M. Symonds and C. E. Jackson, *Measurement of the Personality Adjustments of High School Pupils*. New York: Teachers College, Columbia University, 1935. Pp. 121.

See the studies in footnote 44, and those referred to by the books cited in footnotes 46 and 47.

A series of annual reviews of studies of character and personality measures was begun in the July, 1926, *Psychological Bulletin*. Reviews appeared in the July number each year through 1929, in June, 1930, (none in 1931), in February, 1932, and in the July numbers from 1933 on. These are comprehensive and valuable reviews.

The Classroom Teacher and Character Education, Chapter VI, "The Teacher and Individual Pupil Guidance," pp. 135-68. Includes a bibliography of problems. Seventh Yearbook, the Department of Classroom Teachers. Washington: National Education Association, June, 1932.

See the annual bulletins of the United States Office of Education entitled, *Bibliography of Research Studies in Education*, the section headed "Tests and Testing: Social Intelligence—Tests and Scales," or, "Tests of Social Adaptation."

Refer to the *Education Index*, for articles under "Character Analysis," "Character Tests," "Personality Tests," "Interest—Tests and Scales," "School Children—Adjust-

ments. Many studies have been made exploring the realm of personality and relating various degrees of adjustment or interest or other forms of adaptation to different factors in the environment or in the experience or nature of the individual. The relative newness of the field suggests that there are many opportunities for those who undertake research within this area.

It is common psychological practice to include attitudes in the field of personality. Attitudes represent one of the more intellectual aspects of personality, and attempts to measure them have therefore been of the paper-and-pencil variety.[49] Notable in this field has been the work of Thurstone and his students, who have prepared attitude scales on a number of social questions. These scales consist of a number of statements which have been assigned different scale values by a group of judges, and a person checks those statements with which he agrees. The basic theory of the method and the construction of the scales have been presented in a pamphlet [50] as well as in numerous articles.

Other instruments for indexing attitudes have been prepared. These are well described in the literature.[51] Scales and their

ment," "Orientation Tests," "Social Adjustment and Development," "Social Intelligence—Tests and Scales," and "Behavior—Tests and Scales."

See the topic, "Techniques of Measuring," p. 62, in the Subject Index of *The Personnel Bibliographical Index*, by W. H. Cowley. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

49 Tests and scales for the measurement of attitudes are listed on pp. 165-8 of Gertrude H. Hildreth, *A Bibliography of Mental Tests and Rating Scales*. New York: The Psychological Corporation, 1933. Pp. 242.

See also footnotes 51-54 for other sources of tests and scales.

For currently new tests, see the annual bibliography by Buros cited in footnote 11, and see the heading, "Check-List: Tests and Scales," in the front of paper-bound monthly issues of the *Education Index*.

50 L. L. Thurstone and E. J. Chave, *The Measurement of Attitude*. Chicago: University of Chicago Press, 1929. Pp. 97.

Henry E. Garrett and Matthew R. Schneck, *Psychological Tests, Methods, and Results*, Part II, pp. 139-41, and 148-9. New York: Harper and Bros., 1933. Parts I and II.

Ralph H. Ojemann and Others, *Researches in Parent Education, III*. Studies in Child Welfare, X (October 15, 1934). New Series, No. 285. Iowa City: University of Iowa, 1935. Pp. 391.

George A. Lundberg, *Social Research*, Chapter IX, "The Measurement of Attitudes," pp. 197-242. (References are given in Appendix A.) New York: Longmans, Green and Co., 1929. Pp. 380.

51 Percival M. Symonds, *Diagnosing Personality and Conduct*, Chapter VI, "Attitude Questionnaires," pp. 215-38. Bibliography of thirty-one references. See also the topic, "Attitudes," in the Index, for scattered references. New York: The Century Co., 1931. Pp. 602.

various uses are described in the *Review of Educational Research*,[52] and they are included in the annual reviews of character and personality tests which appear in the *Psychological Bulletin*.[53] Droba gives a review of measures of social attitude, including a bibliography of 104 titles.[54] Another source of references is the *Education Index* under the topic of "Attitudes." "Thurstone Attitude Scales" may also be consulted in the *Education Index* for references on his scales. The study of any one or more of these sources will quickly give the student an acquaintance with what has been done in this field and with the methods of work. Other studies will be found in the annual United States Office of Education *Bibliography of Research Studies in Education*, by looking for "Attitudes" and "Tests—Attitudes" in the index. Measurement of attitudes is a relatively new field, but the literature has grown rapidly.

The Payne Fund Studies of Motion Pictures and Youth afford several excellent illustrations of uses which can be made of attitude measures in scientific work. These uses are briefly reviewed in the summary volume by Charters,[55] and are treated in more detail in the volumes reporting the several studies[56] which were concerned with attitudes. Uhrbrock reports an interesting investigation of attitude of employees,[57] which may

———, *Psychological Diagnosis in Social Adjustment*, pp. 226-7, 229-30, 247-62, 305-6. New York: American Book Co., 1934. Pp. 362.

See the topics, "Attitudes, Techniques of Measuring," p. 18, and "Interests, Techniques of Measuring," p. 37, and related topics, in the Subject Index of *The Personnel Bibliographical Index*, by W. H. Cowley. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

52 Goodwin B. Watson, "Social Attitudes," Chapter VII, pp. 259-72, in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3; and "Opinions, Attitudes, and Prejudices," pp. 227-33, in "Tests of Personality and Character," *Review of Educational Research*, II (June, 1932), No. 3.

53 See footnote 48.

54 D. D. Droba, "Topical Summaries of Current Literature: Social Attitudes," *American Journal of Sociology*, XXXIX (January, 1934), 513-24.

55 W. W. Charters, *Motion Pictures and Youth*, pp. 11-25. New York: The Macmillan Co., 1935. Pp. 66.

56 Paul G. Cressey and Frederick M. Thrasher, *Boys, Movies, and City Streets*. New York: The Macmillan Co. In press.

Frank K. Shuttleworth and Mark A. May, *The Social Conduct and Attitudes of Movie Fans*. New York: The Macmillan Co., 1933. Pp. 142.

Ruth C. Peterson and L. L. Thurstone, *Motion Pictures and the Social Attitudes of Children*. New York: The Macmillan Co., 1933. Pp. 75.

57 Richard S. Uhrbrock, "Attitudes of 4,430 Employees," *Journal of Social Psychology*, V (August, 1934), 365-77.

prove suggestive for applications in the field of educational administration.

The measurement of attitudes as a part of regular school work is given a brief but pointed discussion in the measurement volume of the Social Studies Investigation.[58] For immediately practical educational purposes, use for classroom appraisal is the ultimate goal of such measurement. Not until personality, in its many different phases, can be appraised by the teacher with as much significance to her as measurements of academic achievement have, and also with reasonable accuracy, can research workers or practical educators feel that appraisal procedures have been brought to a satisfactory level.

Further treatment of procedures which are appropriate for the study of personality will be found in later sections which deal with questionnaires, interview, observation, and appraisal. Because this field must be approached from so many different angles, requiring a variety of techniques, it cannot be treated as a unit in any one place in a text which is organized around methods and techniques rather than around fields of application. The student who is interested in working in this area will, therefore, consult the appropriate sections of this and the next chapter.

Interpreting the results of survey testing. Before drawing conclusions from test results, one must consider the possible influence of a number of factors. The first question concerns the tests themselves. To what extent do they measure what they are supposed to, and to what extent do they measure something else? A careful analysis of any test will make clear that there are many factors which enter into each response, and the score consequently reflects many things in addition to what one desires. Sometimes these extraneous things become so numerous in proportion to the desired factors that the results are practically meaningless. This is a consideration that

58 Truman L. Kelley and A. C. Krey, *Tests and Measurements in the Social Sciences.* Report of the Commission on the Social Studies, Part IV. New York: Charles Scribner's Sons, 1934. Pp. 635. See especially pp. 75-95, and Chapter V, "Interests and Attitudes," pp. 340-471.

is more practical than theoretical, though it can be readily overlooked because it is not immediately obvious. Further discussion of this danger is given in the next section, on constructing tests.

In addition to spurious factors in the response of the individual that the test may call forth, there are various other chances for error or untrustworthiness in the results.[59] The test may not sample a particular area of responses thoroughly enough so that the reactions secured give a proper picture of that area in the individual child. The test may have been administered poorly, or with varying directions and time limits for different groups of children. So few children may be sampled out of a school or school system that the results are not typical of the entire group in the school or school system.

There may be still more serious discrepancies between what the results stand for and what one thinks they stand for. Various factors of a relatively fundamental nature may have entered into the training of the child, which are not at first suspected. Monroe estimates that children who are experienced in taking tests may do 10 per cent better than children who are not.[60] He also reports an instance in which the average mental age of a group of children showed a gain of four and one-half years within a period of six months, because they were receiving a special type of training that markedly affected the responses which the particular test called for.

In the interpretation of test results the assumption is commonly made, that the curriculum is the same in all of the schools or classes which have been tested. One makes this assumption when he uses test results to draw conclusions concerning the quality of the teaching, or the diligence of the pupils. This is relatively clear; but it is also true that this same assumption is made when the work in the different groups is

59 A brief, non-technical discussion of certain errors in measurement is given by Florence Goodenough and John E. Anderson, *Experimental Child Study*, pp. 406-11. New York: The Century Co., 1931. Pp. 546.

60 Walter S. Monroe, "Dependability and Value of Survey Types of Investigations," *School and Society*, XXXVIII (October 21, 1933), 517-22.

compared in any way, together with a suggestion as to the cause of its variation. In speaking of variation observed in the work of schools throughout a state, Monroe comments as follows:

> A large proportion of the variability of school averages in a statewide survey of pupil achievement is doubtless due to differences in the objectives towards which the instruction in the several schools is directed. It may well be that, when the objectives are considered, a school occupying a relatively low position in the distribution of average scores represents a higher degree of instructional efficiency than one occupying a relatively higher position.[61]

When one compares test results with a norm, other considerations enter. The norm is an average; it reflects all the factors which affected the performance of children who were used in establishing this norm. The first question one should raise therefore is, "Are the factors which have influenced the work of the pupils tested comparable to the factors which conditioned the work of the pupils by whom the norm was determined?" Many reasons exist in actual situations which invalidate such comparisons,[62] and one will therefore be cautious in interpreting his objective findings.

Ambitious teachers and principals sometimes raise the question, "Should one be satisfied just to have the average score of his class equal the norm?" The practical answer is that one should examine all of the factors conditioning the work of his pupils before he concludes that he is justified in making a comparison of any kind between their work and the norm. Perhaps his pupils should be well above the norm; perhaps they should be well below the norm. Such decisions cannot be reached merely on the basis of surface implications. In drawing conclusions from data, one will endeavor to keep in mind the possible influence of factors which he has not directly measured; they may be more important than the factor he has studied.

[61] *Ibid.*, p. 519.

[62] E. F. Lindquist, "Factors Determining Reliability of Test Norms," *Journal of Educational Psychology*, XXI (October, 1930), 512-20.

Test construction. In connection with the discussion of survey testing, a few comments will be made concerning the construction of tests. A similar section will follow each of the other types of normative-survey procedure. It should be made clear that these brief statements are only introductions, or "overviews," which aim to call attention to the principal considerations, rather than to go into complete detail. The technology of each specialized field is much too extensive to be included between the covers of one book and must be left for specialized treatises, of which there are many. The student will, therefore, be given definite reference to such treatises after a few paragraphs of general orientation which open up the subject.

The prime consideration in the construction and administration of tests is validity—that is, representation of the influence of factors that the test is supposed to reflect. Other considerations are largely of the administrative sort—the test must not require too long a time to give; it should be reasonably easy to administer, etc. A test that is highly valid (for a particular purpose) will represent variation (from individual to individual or from time to time) in the characters it is supposed to measure with great fidelity. A test which has a low degree of validity secures responses, or an evaluation of responses, which represent strongly the influence of a number of other factors, so that the character one desires to measure is somewhat lost among the many present.

One does not need a full understanding of psychology to recognize that many factors enter into every response of the human being; that is, one responds to many stimuli at once, and his response is "colored" by a host of associations in his nervous system, of which he may not be at all aware. To get a response that represents a "pure" reaction of a certain kind, assuredly uninfluenced by any contributing or conditioning factors, is practically an impossibility and may be set down as a theoretical concept which does not in actuality exist. What we do practically, therefore, is attempt to secure test items

which will stimulate responses of a given kind, and further, we try to get enough of these items of varying kinds so that the undesired factors will tend to neutralize each other and to "average out." Investigators have so far attained only moderate success in these efforts.

One may ask at once whether a test of knowledge of arithmetic is not a measure of this ability and nothing else. Wherein lies the difficulty of constructing such a test? Such a position, though common, can only grow out of an inadequate understanding of the complexity of human response. It will be immediately obvious that reading abilities, writing abilities, direction of attention, freedom from annoyances, and a normal supply of energy are required in responding to a simple arithmetic test of the usual kind. A person may fail to make his accustomed response because of a slight variation in attention, a slight cessation or diffusion of nervous energy, a slight variation in the form of the stimuli, a slight (perhaps chance) variation in the pathway followed by the nervous discharge, and other things. It is well known that a child may respond correctly with the sum of 5 and 3—to use a very narrow form of reaction as an illustration—under one set of circumstances and a few minutes later respond incorrectly when the circumstances are changed only moderately. Probably all of us have had the experience at times of unwittingly misspelling words that we knew perfectly well—or of not being able to think of the name of some person we knew well.

Such variations in response exist in all degrees and represent the intrusion of various undesired factors into the response which is secured. When one considers the complexity of human response, he marvels that we can be trained to respond as consistently as we do. It is the goal of tests to be so constructed and administered and evaluated that few spurious (undesired) factors will enter at any point along the line.

There are several methods of selecting test items and of validating them—i.e., checking them to see the extent to which they reflect the desired factors. One method is to select the

subject-matter (items) of the test as carefully as possible, taking precautions to see that only apparently crucial material is included, and that the items are presented in as clear a form as possible. Another method—perhaps the opposite extreme—is to select test material with little thought and then evaluate the test as a whole, and each item individually, by statistical methods. This evaluation may be made on the basis of several techniques which are treated in measurement books and in statistics books.

Suffice it to say here, that neither of the above approaches is to be regarded as satisfactory in itself; both should be used to supplement each other. Even the utmost care in the selection of material and in the formulation of items will not guarantee a satisfactory test (although they are certainly important elements), and the product must therefore be tried out by as many means of objective appraisal as possible. On the other hand, one cannot rely solely upon correlation because so many things can be found that have a high correlation which do not have any immediate causal relationship—such, for example, as the increasing number of deaths from auto accidents and the increasing proportion of people who live to be over forty. One ordinarily desires test material that has a reasonably close connection with what he is trying to measure, on account of its effects upon the children and the teachers.[63]

With these few comments, the reader will be directed to leading treatises on test construction, where he will find more detailed discussion. Most of this literature is technical and cannot be fully understood without training in statistics. One can, however, find sections of the material which are adapted to his understanding, whatever training he may have.

A very readable chapter will be found in Smith and Wright's book.[64] A rather brief, but helpful, treatment is given by

63 See "Educational Tests and Their Uses," pp. 482-3, 493-4, *Review of Educational Research*, V (December, 1935), No. 5.

64 Henry Lester Smith and Wendell William Wright, *Tests and Measurements*, Chapter XXII, "Construction of Achievement Tests," pp. 511-40. New York: Silver, Burdett and Co., 1928. Pp. 540.

Tiegs.[65] One of the older treatises, but one that contains much sound advice, is McCall's,[66] which also includes a brief discussion of making intelligence tests. Odell gives considerable space to the construction of essay and various kinds of objective tests in his older book on measurement.[67] A widely accepted treatise on test construction, with an avowed emphasis upon objective tests, is that of Ruch.[68] This reference also contains an excellent bibliography. A somewhat distinct note has been introduced into the measurement field by Tyler. His articles on test construction appear mainly in the *Educational Research Bulletin* (Ohio State University), beginning in 1930. Most of these can be obtained in a reprinted bound collection called *Constructing Achievement Tests*.[69] In more than a mechanical fashion, his emphasis upon validity is wholesome. Wright has prepared a very thorough discussion of the construction of an accomplishment-test battery for the State of Indiana.[70] The principles underlying measurement have been given by Monroe.[71] The construction of tests especially for the social studies is treated by Kelley and Krey.[72]

The Review of Educational Research on "Educational Tests and Their Uses"[73] contains very important discussions of this field and summarizes recent literature running into hundreds of references. The construction of educational and other

65 Ernest W. Tiegs, *Tests and Measurements for Teachers*, Chapter XIV, "The Construction of Informal Objective Tests," pp. 254-69. Boston: Houghton Mifflin Co., 1931. Pp. 470.

66 William A. McCall, *How to Measure in Education*, Part II, "How to Construct and Standardize Tests." New York: The Macmillan Co., 1922. Pp. 416.

67 C. W. Odell, *Traditional Examinations and New-Type Tests*. New York: The Century Co., 1928. Pp. 469.

68 G. M. Ruch, *The Objective or New-Type Examination*. Chicago: Scott, Foresman and Co., 1929. Pp. 478.

69 Ralph W. Tyler, *Constructing Achievement Tests*. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1934. Pp. 102.

70 Wendell William Wright, *The Development and Use of a Composite Achievement Test*. Bulletin of the School of Education, Indiana University, V (January, 1929), No. 3. Bloomington, Ind. Pp. 90.

71 Walter S. Monroe, *An Introduction to the Theory of Educational Measurements*. Boston: Houghton Mifflin Co., 1923. Pp. 364.

72 Truman L. Kelley and A. C. Krey, *op. cit.* (See footnote 58.)

73 W. J. Osburn, "The Selection of Test Items," and G. M. Ruch, "Recent Developments in Statistical Procedures," Chapters II and III, pp. 21-40, in "Educational Tests and Their Uses," *Review of Educational Research*, III (February, 1933), No. 1.

tests is reviewed also in the *Psychological Bulletin*.[74] For later periodical references, see "Tests and Scales," the many cross references, and "Tests and Scales—Construction" in the *Education Index*. Also see the topic, "Tests and Testing," in the annual *Bibliography of Research Studies in Education* of the United States Office of Education.

One can learn a great deal from studying tests that have been carefully made. Samples of the regular commercial tests may be purchased from the test publishers, and an excellent set of teacher-made tests is provided in a book by Ruch and Rice.[75]

There is practically no literature which is helpful in the construction of the essay test. In recent years this common and still useful instrument has been eclipsed by the emergence of the objective test; undoubtedly a large factor in this change has also been the fact that the objective test is much easier to study. There have been any number of investigations comparing the essay and objective tests,[76] but little that will help one make better tests of the essay or "old" type. Most of the suggestions offered are in the direction of trying to make the essay-type test take on as many of the characteristics of the new-type tests as possible. This attitude, carried out in practice, may result in a serious loss. The unique contributions of the essay test should be identified and preserved.

Probably the reader will not undertake to construct an intelligence test. He can, however, locate treatises on its construction in books by Terman,[77] Pintner,[78] and Freeman,[79] as

74 For example, see the *Psychological Bulletin*, XXXII (July, 1935), 487-90. This series of annual reviews began in 1926. See footnote 48 for details.

75 G. M. Ruch and G. A. Rice, *Specimen Objective Examinations*. Chicago: Scott, Foresman and Co., 1930. Pp. 324.

76 Charles C. Weidemann, "Recent Developments in the Written Essay Examination," Chapter IV, pp. 484-90, in "Educational Tests and Their Uses," *Review of Educational Research*, V (December, 1935), No. 5.

77 Lewis M. Terman, *The Measurement of Intelligence*, Chapters III-IV, pp. 36-64. Boston: Houghton Mifflin Co., 1916. Pp. 362.

78 Rudolph Pintner, *Intelligence Testing*, Chapter V, "Criteria and Construction of Intelligence Tests," pp. 103-32. New York: Henry Holt and Co. (New edition), 1931. Pp. 555.

79 Frank N. Freeman, *Mental Tests*, Chapters IX and X, pp. 226-62. Boston: Houghton Mifflin Co., 1926. Pp. 503.

well as in periodical literature. Consult the usual indexes and also the *Review of Educational Research*.[80]

For the construction of personality tests, it is recommended that one study the existing instruments and review the discussions and investigations of these tests. The principal references to the literature have already been given in the section where personality tests were discussed. One may find especial interest in May's general treatise on the problems of measurement in this field,[81] and in Hendrickson's review of the assumptions involved.[82] See also the references in footnotes 109-117 of Chapter VIII.

Bixler has prepared a check-list [83] covering various aspects of research. He mentions ninety-six items that should be given specific attention in the making and use of tests. The student who is contemplating constructing or using tests in his research would do well to consult this list.

2. STUDIES EMPLOYING QUESTIONNAIRE PROCEDURES

The second type of normative-survey technique to be discussed is the questionnaire inquiry. A questionnaire is a form which is prepared and distributed for the purpose of securing responses to certain questions. Generally these questions are factual, designed to secure information about conditions or practices of which the recipient is presumed to have knowledge. The questionnaire may, however, ask for opinions, and it may be used to afford an insight into the attitudes of a group. In fact there is no sharp dividing line between a questionnaire

80 Harry J. Baker, "The Construction and Statistical Interpretation of Psychological Tests," Chapter IV, pp. 295-9, in "Tests of Intelligence and Aptitude," *Review of Educational Research*, II (October, 1932), No. 4.

Herbert Toops and G. Frederic Kuder, "Test Construction and Statistical Interpretation," Chapter IV, pp. 229-41, in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3. See later issues on "Psychological Tests" as they appear.

81 Mark A. May, "Problems of Measuring Character and Personality," *Journal of Social Psychology*, III (May, 1932), 131-45.

82 Gordon Hendrickson, "Some Assumptions Involved in Personality Measurement," *Journal of Experimental Education*, II (March, 1934), 243-9.

83 H. H. Bixler, *Check Lists for Educational Research*, pp. 25-38. New York: Teachers College, Columbia University, 1928. Pp. 118.

and a test, though they differ significantly in their common forms.

The questionnaire is an important instrument in normative-survey research, being used to gather information from widely scattered sources. It is probably outranked in frequency of use only by the survey test. In fact, out of 581 printed studies representing research of all kinds, Koos found that in practically one-fourth of them the questionnaire was used.[84] A statement in the *American School Board Journal* sometime ago suggests that "the average school board in the city of 25,000 population receives at least one questionnaire each day of the school year." [85] If one considers all of the immediately practical studies which are made in educational field work (the operation of schools), it is reasonable to believe that testing and the use of questionnaires would together account for over half of the studies that are made. There is in these statements no thought of implying that all or most of these immediately practical studies are to be classed as research; but in normative-survey studies, whether of research character or not, tests and questionnaires rank high in frequency of use.

The questionnaire procedure normally comes into use where one cannot readily see personally all of the people from whom he desires responses or where there is no particular reason to see them personally. The questionnaire may be used over any range of territory. International questionnaires have been used.[86] In national studies questionnaires frequently occupy an important place. For example, in the recent National Survey of Secondary Education [87] extensive questionnaires were used to secure information about many different aspects of high schools.

[84] Leonard V. Koos, *The Questionnaire in Education*, pp. 6-13. New York: The Macmillan Co., 1928. Pp. 178.

[85] "Questionnaires and Questionnaires," *American School Board Journal*, LXXI (August, 1925), 74.

[86] See for example, *Part-Time Schools:* A Survey of Experience in the United States and Foreign Countries, with Recommendations. Bulletin, No. 73, Trade and Industrial Series, No. 22. Washington, D. C.: Federal Board for Vocational Education, April, 1922. Pp. 462.

[87] *The National Survey of Secondary Education*. Monographs Nos. 1-28, U. S. Office of Education Bulletin, 1932, No. 17. Washington, 1933-34.

Status studies. One of the favorite types of questionnaire study has been the determination of the status, including personal and professional characteristics, of various school officials and teachers. Such studies have been made on a national basis for the high-school principal,[88] the junior high-school principal,[89] the city superintendent of schools,[90] the business manager,[91] and rural school teachers, principals,[92] and superintendents.[93] Similar studies on a state-wide basis have been made in many states [94] and are favorite subjects for Masters' theses.[95] For other analyses of the status of various groups, see the topic, "Analyses of the Activities and Characteristics of Educators, Scientists, and Psychologists," in Chapter III, some of which are based on questionnaire data.

Questionnaires are rather commonly used even within single cities to secure information from the teaching staff about such problems as training, length of service, duties, etc., when a city school system is being surveyed. In fact, a superintendent of a large city school system might circulate an informal questionnaire among the members of the central office staff in order to find out certain things from them—for example, the number

88 Dan Harrison Eikenberry, *Status of the High-School Principal*. U. S. Bureau of Education Bulletin, 1925, No. 24. Washington; 1926. Pp. 71.

89 Frank Kale Foster, *Status of the Junior High-School Principal*. U. S. Office of Education Bulletin, 1930, No. 18. Washington, 1930. Pp. 75.

90 *Educational Leadership*, Chapter VI, "The Progress and Status of the City Superintendent of Schools," pp. 99-149. Eleventh Yearbook of the Department of Superintendence. Washington, D. C.: National Education Association, 1933. Pp. 528. Bibliography. Compares findings with a similar survey made ten years earlier and published in the First Yearbook of the Department.

91 Amos L. Heer, *The Present Status of Business Executives in the Public Schools of the United States in Cities of 25,000 and More Inhabitants*. Kent, Ohio: The Author (Director of Teacher Training, Kent State Normal College), 1928. Pp. 170.

92 Walter H. Gaumnitz, *Status of Teachers and Principals Employed in the Rural Schools of the United States*. U. S. Office of Education Bulletin, 1932, No. 3. Washington, 1932. Pp. 122.

93 "The Status of the Superintendent of Rural Schools," Chap. IX, pp. 187-223, in *Educational Leadership*. (See footnote 90.) Bibliography.

94 Orie M. Clem and James F. Murray, "The Status of the Pennsylvania High-School Principal," *Educational Administration and Supervision*, XIX (September, 1933), 442-50.

Omer Hibben Bennett, "The Status of County Superintendence in Ohio." Master's thesis, University of Cincinnati, 1929. Pp. 44. (Also published for private circulation.)

95 See such topics as "Teachers—Status," "Administration of Schools: Supervision and Supervisors," "School Administration: School Principals," etc., in the annual *Bibliography of Research Studies in Education*, published by the U. S. Office of Education. Also see "Status" in the *Education Index*.

who wanted to be absent from the office to attend the Department of Superintendence Meeting of the National Education Association.

Current practices. Questionnaire studies concerning current practices in school systems constitute a second group which is prominent. The Research Division of the National Education Association, which regularly prepares excellent questionnaires, has made a number of interesting questionnaire studies of current practices and current conditions.[96] The American Library Association makes an annual questionnaire study of the practices and conditions with reference to school libraries throughout the country; this is published in the *Bulletin of the A. L. A.* Reavis and Woellner[97] used the questionnaire to ascertain typical practices of high-school executives in equipping their offices, and in administering routine affairs. Replies were received from 522 principals. As a part of a national study of Boy Scout work, Wyland[98] sent a questionnaire to schools in selected cities to learn the degree of school coöperation with Scout work.

In the field of teacher personnel, "survey studies based on official records or questionnaire returns predominate."[99] These studies are concerned with current practices in the selection and placement of teachers, the teaching load (size of class, number of classes, number of subjects, etc.), the combinations of subjects taught, and the status of groups of teachers with

96 "The School Board Member," *Research Bulletin of the National Education Association*, XI (January, 1933), 1-41.
"Practices Affecting Teacher Personnel," *Research Bulletin of the National Education Association*, VI (September, 1928), 207-53.
"The Nation's School Building Needs," *Research Bulletin of the National Education Association*, XIII (January, 1935), 3-34.
"Teacher Demand and Supply," *Research Bulletin of the National Education Association*, IX (November, 1931), 307-405.

97 William Claude Reavis and Robert Carlton Woellner, *Office Practices in Secondary Schools*. Chicago: Laidlaw Bros., 1930. Pp. 239. See also the series of six articles on the same subject in the *School Review* for 1928 and 1929, Volumes XXXVI and XXXVII.

98 Ray O. Wyland, *Scouting in the Schools*. Teachers College Contributions to Education, No. 631. New York: Teachers College, Columbia University, 1934. Pp. 200.

99 Earl W. Anderson, "Technics of Research Used in the Field of Teacher Personnel," p. 15, in "Methods and Technics of Educational Research," *Review of Educational Research*, IV (February, 1934), No. 1.

regard to tenure, health, legal regulations, supply and demand, etc.[100] Reavis states that

> questionnaires and check-list inquiries, including the reports made to state departments of education and the United States Office of Education, have constituted the chief source of information regarding current practices in public-school organization and administration.[101]

Financial studies. Financial questions occur frequently in questionnaire studies. Financial problems have recently been pressing; indeed, they are always of large moment. The depression prompted all sorts of questionnaires, frequently circulated within a single state, to ascertain the tax rate that the local district levied for schools, the amount of extra levies, the amount of bonded indebtedness, the amount of current indebtedness, the average expenditure per pupil, the average teacher's salary, how much the average salary had been reduced, how much other expenditures had been reduced, etc. In this connection, the biennial salary questionnaires of the National Education Association are outstanding. These have been used for a number of years, and are published in the *Research Bulletin of the N. E. A.*[102] The importance of these studies is perhaps indicated by a statement in the Foreword of the 1935 publication: "A steady stream of letters has been received calling for these findings at the earliest possible moment."

Many other fields and subjects have been studied by means of the questionnaire. Koos [103] mentions the following in order of frequency in his sample: administration, curriculum, tests and measurements, psychology, methods of teaching, and

100 For illustrations of studies see "Teacher Personnel," *Review of Educational Research*, IV (June, 1934), No. 3, and I (April, 1931), No. 2.

101 William C. Reavis, "Methods of Research in School Organization," p. 26, Chap. III in "Methods and Technics of Educational Research," *Review of Educational Research*, IV (February, 1934), No. 1.

102 "Salaries of School Employees, 1934-35," *Research Bulletin of the National Education Association*, XIII (March, 1935), p. 30. This is the seventh biennial survey of salaries. In addition to this bulletin, detailed distributions are issued in five separate publications known as *Special Salary Tabulations*. These show distributions by the individual city, and are priced at $5.00 for each publication.

103 Leonard V. Koos, *The Questionnaire in Education*, p. 32. New York: The Macmillan Co., 1928. Pp. 178.

supervision. For further examples one should look over issues of educational magazines which report studies, or lists of Masters' and Doctors' theses (see Chapter III). The National Education Association issues an annual bibliography [104] of questionnaire studies completed and filed in their office by those who are coöperating in their "questionnaire service." A Master's thesis at the University of Colorado analyzes 500 questionnaire studies.[105] One should also consult "Questionnaires" in the *Education Index* for current discussion of them.

Many service studies do not find their way into print, especially since mimeographing is so prevalent and can frequently supply the needs for summaries of state-wide studies. For example, a recent study by Holy of the practices of Ohio schools with reference to carrying fire insurance [106] was issued in mimeographed form.

Check-lists. Questionnaires sometimes take the form of a check-list, which is simply a set of categories for the respondent to check. For example, Ayer [107] submitted a check-list containing 1,000 duties to principals and superintendents, asking them to check those duties which they performed and to indicate roughly the frequency (such as daily, weekly, etc.). Wickman [108] used a check-list with teachers to ascertain the frequency with which certain undesirable acts of pupil behavior occurred. Charters [109] submitted a check-list of duties to 2,000

104 "Questionnaire Studies Completed—Bibliography No. 5, 1933-34," and later issues as published. Washington: Department of Superintendence, National Education Association. Mimeographed. The first of these bibliographies was issued in 1930 as Educational Research Circular No. 9 for 1930.

105 Edwin Leslie Barrow, "The Questionnaire in Education." Master's thesis. Boulder, Colo.: University of Colorado, 1933. Pp. 58. Abstract published in *University of Colorado Studies:* Abstracts of Theses for Higher Degrees, 1933. University of Colorado Bulletin, Vol. XXXIII, No. 16.

106 Thomas C. Holy, "Information on School Plant Insurance Premiums and School Property Losses in Ohio for 1932 and 1933." Columbus, Ohio: Bureau of Educational Research, Ohio State University, January, 1935. Mimeographed. Pp. 10.

107 Fred C. Ayer, "The Duties of Public-School Administrators," *American School Board Journal,* LXXVIII (February-June, 1929); LXXIX (August, October, December, 1929); LXXX (February, March, May, 1930).

108 E. K. Wickman, *Children's Behavior and Teachers' Attitudes.* New York: Commonwealth Fund, 1928. Pp. 248.

109 W. W. Charters and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits.* Baltimore: Williams and Wilkins Co., 1924. Pp. 186. A brief report of this study is published as: *Summary of Report on Analysis of Secretarial Duties and Traits.* Service Bul-

secretaries to learn the frequency with which different duties were performed. In the *Commonwealth* Teacher-Training Study,[110] Charters and Waples distributed elaborate lists of duties to teachers all over the country to ascertain the frequency of performance of each activity.

Check-lists are also used for other purposes, which will be discussed later. For example, they may be employed as a form of recording when one is observing behavior, and they may also be used as an instrument for rating schools, textbooks, etc. These uses will be discussed in the following chapter under "Observation and Appraisal Procedures."

Studies of attitudes. Questionnaires are not necessarily confined to statistical data, or even to factual material. They may enter the field of attitudes, opinions, and judgments. It is in these areas that great care must be observed. One must be careful in preparing his questionnaire and in interpreting his returns, to recognize opinion as such. There is a legitimate field for the questionnaire in getting a cross section of thought. In this form the questionnaire may approach the test form so closely that one cannot draw a definite line between them and may not know whether to call his instrument a test or a questionnaire. There is a possibility that it is both.[111]

Two recent Doctors' theses may be mentioned in this connection. Ward reported on the *Philosophies of Administration Current in the Deanship of the Liberal Arts College.*[112] In making this study the author sent out three different questionnaires. The first one secured information on age, sex, race,

letin No. 1. New York: The National Junior Personnel Service, Inc., 70 Fifth Ave., 1924. Pp. 62.

110 W. W. Charters and Douglas Waples, *Commonwealth Teacher-Training Study*, pp. 19-27, 77-114, and 254-303. Chicago: University of Chicago Press, 1929. Pp. 666.

111 See for example the questionnaire surveys of personality and adjustment referred to by Goodwin B. Watson, in "Tests of Personality and Character," especially pp. 186-93, *Review of Educational Research*, II (June, 1932), No. 3.

Percival M. Symonds, *Diagnosing Personality and Conduct*, Chap. IV, "The Questionnaire," pp. 122-73. New York: The Century Co., 1931. Pp. 602. Bibliography of forty-one references.

Henry E. Garrett and Matthew R. Schneck, *Psychological Tests, Methods, and Results*, "The Questionnaire," Part II, pp. 122-50. New York: Harper and Bros., 1933.

112 Merle Scott Ward, Teachers College Contributions to Education, No. 632. New York: Teachers College, Columbia University, 1934. Pp. 128.

academic degrees held, honorary degrees held, foreign travel, foreign study, previous subject-matter field, kind of previous professional experience, tenure, and length of total educational experience, for the college deans. This questionnaire dealt with data of the more usual type (factual). The second questionnaire dealt with the attitude of the deans toward various problems in four areas of college administration—the purpose of a liberal arts college, the curriculum, the improvement of instruction, and student welfare. This questionnaire was a direct effort to sample the opinions of the deans; it was in the form of multiple-choice statements, the alternatives representing various possible attitudes toward each question that was asked. The questions were so prepared that they fitted into a pattern, and the writer could abstract from them certain large generalizations regarding the philosophic pattern of the individual responding. As an additional line of evidence, the author distributed Donald P. Cottrell's "Test on Controversial Issues in Higher Education" (revised edition).[113] Like the second questionnaire, this elicits opinions that enable one to draw certain conclusions about the general attitude of the respondent. Three hundred and thirty college deans responded to the entire set of questionnaires.

Another illustration of this general class will be given. Bair studied *The Social Understandings of the Superintendent of Schools*.[114] He likewise used three forms. The first gathered information about the racial and social origins of the superintendent, the conditions of his childhood, his education, experience, and social and professional relations with the community. The second form contained thirteen questions. These are interesting because of the type of response they called for. For example: (1) Will you indicate in a word or brief sentence three of the most fundamental questions in your opinion facing people in the United States to-day? (3) Do you

[113] First described in "Measurement of Conflicting Viewpoints in Higher Education," *Teachers College Record*, XXXIV (May, 1935), 635-54.

[114] Frederick Haig Bair, Teachers College Contributions to Education, No. 625. New York: Teachers College, Columbia University, 1934. Pp. 193.

think that the public schools ought to deal with such questions? (4) Do you consider that the social studies as taught in our public schools generally, now provide for a reasonably thorough study of these and similar critical questions? (7) Will you be good enough to . . . indicate groups likely to favor or to oppose the study?

The difficulty of tabulating responses to such questions as the foregoing is apparent. Nevertheless, the author was dealing with a fundamental problem, and he sought what he wanted. In addition to these two forms, the author sent out Manly Harper's "A Social Study," which consists of 71 multiple-choice propositions designed to reveal the degree to which one is conservative in his social attitudes. These three questionnaires elicited responses from about 850 superintendents—one-fifth of the number of inquiries sent out. This per cent of replies is lower than usual.

A distinction must be made between the type of subjective response represented in these two studies and that which is to be interpreted as an objective fact. The opinions and attitudes represented are facts in so far as the responses are typical responses of the individuals, but they are *facts of opinion.* They represent the leanings of the group—tendencies which may be either right or wrong, helpful or detrimental to society, generally good or generally bad. These facts of opinion are different from *opinions about facts,* which are normally untrustworthy. If, for example, one asks all the superintendents in the country, "What was the main cause of the 1929 depression?" the average opinion in the replies might be no nearer the truth than one's own. As the National Education Association Research Division says:[115]

> The hastily expressed opinions of a large number of judges of varying merit are probably of less value than the mature judgment of one or two experts who have the question clearly in mind, and who are able to qualify their answers appropriately.

[115] "The Questionnaire," p. 18, *Research Bulletin of the National Education Association,* VIII (January, 1930), No. 1.

Other aspects of personality besides opinions or attitudes are studied by means of questionnaires. Symonds [116] devotes a chapter each to the adjustment questionnaire, the attitude questionnaire, and the interest questionnaire. It is apparent that the questionnaire has an important rôle in this field as well as in the realm of securing objective facts.

Consideration for the respondent. The essentially co-operative nature of the questionnaire must not be overlooked. Probably most of the abuses of the instrument lie in this connection. Students and others are so close to their own study that they lose perspective concerning what it is reasonable to ask of another person—usually a complete stranger. One can be reasonably certain that his questionnaire goes to people who are already busy, and although they would like to help every person who is making a study, they have large obligations for the direction and prosecution of enterprises with which their positions are charged. One may also be reasonably sure that the regular duties of the person to whom he sends his questionnaire are at least equal in importance to the study which is being undertaken. This has two practical implications: first, do not undertake a questionnaire study unless the problem is really an important one—not to you as an individual, but to education; second, devise your questionnaire so that it will not make any more demands on the time of the respondent than necessary.

Relation to reports. It may be interesting to make a brief comparison of questionnaires and reports. Both are normally means of securing information from people at a distance. Reports, however, are typically required by some one with authority, and there may be penalties for not making them, for omitting some item of information, or for not

[116] Symonds, *op. cit.* (footnote 111), Chapters V-VII. See also Garrett and Schneck, *op. cit.* (footnote 111), pp. 131-144.

Percival M. Symonds, *Psychological Diagnosis in Social Adjustment.* New York: American Book Co., 1934. Pp. 362. Various types of questionnaires are treated in pp. 207-35, 241-6, 247-62, 263-76, 277-98, 333-41, and 342-6.

completing them by a certain date. Again, reports are usually periodical. This means that the procedures for securing the information called for are likely to be established and routine; at least, preparation can be made in advance to meet the situation of filling out the report at a given time. In the third place, reports usually deal largely with figures; they do not cover the variety of responses which are frequently contained in questionnaires. In the fourth place—and this concerns the use and interpretation of the results—because of the conditions mentioned the returns are likely to be from the entire group in the case of the reports, so that the sampling problem is not present to cast doubt upon one's interpretations.

Reports can often be used to supplement, or take the place of, certain types of questionnaire. It must be recognized on the other hand that the versatility of the questionnaire and the freshness of its returns—reports are somewhat slow in being assembled and summarized—tend to make it an indispensable instrument for current information and for research. Those who expect to employ this instrument successfully, however, must guard against the gross lack of judgment which not infrequently characterizes the preparation and use of the questionnaire.

Interpreting questionnaire returns. The questionnaire technique provides certain opportunities for special interpretation, as well as special difficulties. At the beginning of this chapter, the authors emphasized the fact that normative-survey studies should be valuable in broadening one's perspective and should serve to call attention to desirable ways of solving problems. The results should throw light on emergent practices and upon novel or unique situations. If such possibilities are to be realized, the returns must be analyzed carefully. The student must examine individual situations as such, seeking for elements of interest and significance in each. If he depends upon a mechanical (clerical) tabulation of questionnaire results concerning practices and conditions,

he will miss many of the opportunities for real insight into conditions. He will probably desire to secure the statistical aspects of his returns, but he will also bear in mind that figures tell but a small part of any story, and he will be alert for discovering other valuable aspects of data.

The interpretation of frequency studies solely in terms of the figures is not only inadequate but difficult. For example, if 75 per cent of the superintendents who reply to a questionnaire indicate that they solve a problem in a certain way, this may be as much as one needs to know for pure science, but for practical purposes one must go farther and attach a certain significance to this fact. What shall the conclusion be? Does this fact mean that this is a desirable way to solve the problem? Is it necessarily more desirable than another method that comes to light in the survey, of which the 75 per cent had not yet thought, or heard? Or, if 69 per cent of the principals indicate on a check-list that they perform a certain duty, on the average, less than once a month, can one tell whether the duty is important or not? Can cruciality be inferred from frequency? Or can the importance of an event for a single individual be inferred from the prevalence of the event in the whole group? Finally, will frequency of performance tell whether an activity should be taught in a training school or left to one's general culture and common sense?

It was in recognition of such problems that Charters and Waples [110] secured indices on four different aspects of the activities contained in their master-list of teachers' activities. From teachers they secured the frequency with which activities were performed, and from teachers and others they secured ratings on the desirability of these activities, on the difficulty of learning to perform the activities, and on the appropriateness of learning the skill in a teacher-training institution. With these four criteria, one is in a much better position to secure some guidance from the list than he would be if he had only frequency. Further discussion of this gen-

eral problem, and of the Charters-Waples study in particular, will be given in connection with the interpretation of documentary frequency studies and appraisal procedures.

In addition to counting, the full interpretation of questionnaire returns definitely involves evaluation. The exercise of judgment is necessary in deciding what practices are worthy of emulating. It is necessary in drawing practical conclusions of any kind from the data. We may illustrate this further by referring to another use that is sometimes made of such data. It is commonly assumed that if the conditions in one's own school system, or classroom, are about the same as the conditions revealed by the majority of the returns, one may be complacent. It is sometimes stated that the middle 50 per cent of the cases represent a safe zone—that is, between the limits which cut off the upper and the lower fourths of the group representing the more extreme divergencies from average or majority practice. One may feel comfortable, yes, and such facts are very telling in meeting public criticism of the schools; yet one knows that progress comes only through the practices of those who do diverge from the mode. The significance of the findings concerning majority practice will, therefore, vary widely just as one's philosophy varies from that of wanting his school system to be in the "safe" class or among those systems which are striving more actively to adapt themselves to changing conditions and needs.

Another source of difficulty arises from failure to respond to one's request for information. Questionnaires which are not returned and incompleted questionnaires present difficult problems of interpretation, particularly when the returns are expressed in per cent. One has always to consider the question, "If all of the blanks had been returned, would they have shown a significantly different picture?" This question is not a problem of simple sampling, for there may be a definite relationship between the response or lack of response and the existing conditions. Perhaps the recipient

did not respond because conditions were very good, and he saw no point to the study. Or, conditions may have been so unsatisfactory that he did not care to reveal them. Or, data may have been inaccessible to him, or his time too full. What is the probable reason for the absence of the response? The research worker must consider these possibilities before drawing his conclusions. The problem is indeed baffling and lies entirely outside of any statistical technique of allowing for sampling fluctuations or "unreliability. At best the interpretation is made with certain hazards.[117]

Consideration of biased or inaccurate responses, of ambiguous statements, of statements which do not furnish logical bases for the inferences drawn, and other technical questions do not fall within the scope of this treatise.

Questionnaire construction. In thinking of a questionnaire study, perhaps the first questions one should ask himself are, "Why would these people answer the questions I am framing to send them?" "Is there a good reason, from their point of view, for taking the trouble to give answers?" We have said that questionnaires are requests for information, usually sent to strangers who have their time more than filled. When framing his questionnaire, one will therefore bear in mind the demands which he is making upon another person's time.

This can be done in several ways. In the first place, one can scrupulously weed out every trivial question; in some cases the number of questions can be reduced by one-half. In the second place, one can make the responses simple—possibly involving only check marks after a variety of suggested answers. In the third place, one should study his questions assiduously to see that no unnecessary specifications or details are included in them. One can make a question much more difficult to answer by thoughtlessly specifying certain things. For example, if one wishes only to know how much the average of all teachers' salaries in a city has increased or decreased from one year to

117 Florence L. Goodenough and John E. Anderson, *Experimental Child Study*, "The Reliability of Questionnaire Data," pp. 381-90. New York: The Century Co., 1931. Pp. 546.

another, it *may* mean considerably less work for the respondent if this question is asked directly instead of requesting the average salaries for each of the years in question. In the fourth place, one should not ask for information which is obtainable from documentary sources available to the sender.

Another requirement for questions—important from the standpoint of the respondent—is that they apply to his situation. Often the maker limits his question unnecessarily and thus fails to secure a desired response, because the query as stated does not fit the conditions obtaining where it is sent. Discrepancies of this sort frequently occur when questionnaires are prepared for cities of a certain general size and are sent out to cities of a very different size. Not only do such ill-adapted questions often fail to secure a response that the maker desires, but they irritate the one filling out the questionnaire so that he may give hasty answers or fail to return the document at all. One must think of the psychology of the respondent.

Of course, many other considerations enter into the making of a questionnaire from the standpoint of the study which is being made. First, one must have a clear purpose, with definite limitations, so that he does not ask for everything in "blunderbuss" fashion; he must see how each item of information fits into a pattern of essential knowledge about his problem. Second, each question must be absolutely clear—not only to the maker but to the receiver. It is surprising how many questionnaires are sent out that are scarcely interpretable. Third, one should seek responses of such character that they can be summarized in some form. This does not necessarily mean that the responses must be quantitative, or yes-no, or check marks, although these are the easiest to summarize. It means that the step of summarization is one which should be considered when the questions are being prepared. Fourth, one will refrain from asking questions of opinion unless he is certain that opinion is what he is seeking, and that it will be worth getting. Fifth, one will consider the desirability of pre-coding his questionnaire. This is frequently done when the results are to be punched on

tabulating machine cards for summarization. The problem of coding and of operating tabulating machines is a separate study in itself; it is, however, essential in expeditiously handling a large number of returns.[118]

One should invariably get assistance from others in criticizing his questionnaire before it is sent out finally. The least one can do is to request some of his friends to look over the items critically with the thought of discovering possible misinterpretations. One should then send out a few copies of the questionnaire to some members of the group and examine the returns from these before the questionnaire is used on a large scale. Tests, questionnaires, classification schemes, check-lists, rating scales, score cards, and other such schedules, all need validation in terms of practical use, in addition to whatever theoretical and statistical precautions may have been taken in their initial preparation. An experienced worker will not hope to prepare such an instrument and to have it perfected through his thinking alone; he has learned long since that no one person can think in all of the ways that a group can, and that accordingly he cannot anticipate adequately the interpretations of others and the varying complexities of situations which are foreign to him. He will, therefore, seek the critical reactions of many persons, as well as secure the desired responses from others, in a preliminary way, before trusting his schedule to actual use.

The check-list form of questionnaire is particularly dependent upon completeness. Its purpose is to afford both a convenient and a suggestive list on which recipients may check. The respondent comes to depend upon the list for suggestiveness and for a classification of his responses, so that he is not so likely to write in additional items. In fact, items which he might intend to record, if there were no categories at all, may be omitted when a list that does not contain them is given him, either because he deems the given list to be inclusive of all

118 See the discussion and references on the tabulating machine technique given in Chapter XI.

that is desired, or because he assumes a mind-set of dependence on the list.

Various means are available for discovering items to incorporate into the check-list, and to test it for completeness. These means will vary somewhat with the problem. Two illustrations may be taken from Charters' work. In the study of secretarial traits,[109] 125 secretaries were interviewed to ascertain the various tasks which they performed. A list of 871 tasks was thus secured—obviously more than any one person would think of. In the case of the Commonwealth Teacher-Training Study [110] more elaborate precautions were taken. In preparing the check-list of teacher-activities for distribution to teachers to check against (for securing frequencies), the first step was to study activity lists prepared previously. The search for these earlier investigations yielded twenty studies with an aggregate of 6,000 activities. During one summer several thousand teachers were asked to list their activities, after being given careful directions. Experienced teachers added other activities through conference.

A classification was attempted at this point and worked out by means of a hierarchy consisting of divisions, subdivisions, sections, and subsections, together with occasional secondary subsections and many summary paragraphs. Twelve thousand of the activities submitted were classified under this scheme, after which the list was printed and submitted to over two thousand teachers to check for completeness. Books and articles were examined to see if new activities would be suggested; graduate students in twenty-five different summer classes wrote down activities they thought *should* be performed by teachers, and when no new activities appeared through these steps, the list was regarded as satisfactorily complete.

The preparation of a list of professional and personal traits of teachers, as another part of this same study, is perhaps even more unique. Two thousand eight hundred desirable "actions indicating the possession of traits" were secured by interviewing administrators, teachers, pupils, and others. Obviously,

such a list was too large for practical use. The first step in reducing it was "translating" the actions into traits; that is, twenty-one judges were used to name the traits represented by each of these actions. This step classified the actions under eighty-three traits. The meanings of the different traits had been determined by using the definitions agreed upon by three out of four dictionaries. The various actions were assembled under each trait, and the eighty-three traits were then "telescoped" by judges into a final list of twenty-five; that is, the judges were told to combine those traits which were practically the same. The resulting list of twenty-five traits was considered of usable length and was subsequently distributed for evaluation.[119]

One should try tabulating or summarizing the data which he receives from a preliminary trial of his blank, before sending the questionnaire out in quantity. This attempt to handle the data may lead to the revising of certain questions. One should carry the process of analysis forward, as though these data constituted his complete returns. He should ascertain whether the data warrant conclusions which are significant for his purpose. Even if it should not be practicable to secure an advance sample of returns, one should, nevertheless, draw up tables which will provide for summarizing the information that he expects to receive. He should then study these tables to see if they afford answers to his main questions, and to the subordinate questions which add interesting sidelights to his main study. If carefully done, such an analysis should aid in discovering any additional information that will be needed to round out the study properly. It may also serve to reveal certain useless questions that are in the blank.

Finally, one must not overlook the importance of selecting carefully the group to whom he sends his questionnaire. This selection involves a good reason for believing that the people receiving the questionnaire will be in a position to give the information desired; and, where all the members of any group

[119] Charters and Waples, *op. cit.* (footnote 110), pp. 14-7, 51-76, and 223-44.

do not receive questionnaires, the selection involves sampling problems. Further, if people have the information, or knowledge, are they free to respond? In some cases they are free but unwilling to do so; [120] in that case, a form of questionnaire which has the name detachable may be desired.[121] One should be ready with some plans for following up his questionnaire in order to secure a larger per cent of returns, in case the response does not reach expectations.[122]

There is an ample literature on the questionnaire, and the reader is referred to this for an adequate treatment of the many problems which arise. Probably Koos' book [123] should be consulted at the outset, especially Chapters III-VII. The National Education Association report on the questionnaire [124] should by all means be read. Goodenough and Anderson [125] discuss seven points to be watched in constructing a questionnaire. Symonds' four chapters on the questionnaire [126] contain an excellent digest of studies and many references to other sources of information. It is assumed that one will acquaint himself with the references given in the preceding discussion of the uses of the questionnaire, since many of them have an important bearing on questionnaire construction. Bixler [127] gives forty-six points to check against in the preparation and use of a questionnaire.

120 S. M. Stoke and H. C. Lehman, "The Influence of Self-Interest upon Questionnaire Replies," *School and Society*, XXXII (September 27, 1930), 435-8.

121 See, for example, the form used in the study of Cleveland teachers' salaries (pasted inside back cover). T. C. Holy and Others, *Cleveland Teachers' Salaries*. Bureau of Educational Research Monographs, No. 16. Columbus, Ohio: Ohio State University, 1932. Pp. 196. See also the questionnaire used in the study by the National Educational Association Committee on the Economic Status of the Teacher, B. R. Buckingham, Chairman, published as "The Teacher's Economic Status," *Research Bulletin of the National Education Association*, XIII (September, 1935), No. 4. See p. 171.

122 E. E. Lindsay, "Questionnaires and Follow-Up Letters," *Pedagogical Seminary*, XXVIII (September, 1921), 303-7.

Herbert A. Toops, "The Returns from Follow-Up Letters to Questionnaires," *Journal of Applied Psychology*, X (March, 1926), 92-101.

123 Leonard V. Koos, *The Questionnaire in Education*. New York: The Macmillan Co., 1928. Pp. 178. Includes twenty-one references in the bibliography.

124 "The Questionnaire," *Research Bulletin of the National Education Association*, VIII (January, 1930), No. 1. Pp. 51.

125 Goodenough and Anderson, *op. cit.* (footnote 117), "The Construction of a Questionnaire," pp. 390-402.

126 Symonds, *op. cit.* (footnote 111), Chapters IV to VII, pp. 122-259.

127 H. H. Bixler, *Check-Lists for Educational Research*, pp. 40-5. New York: Teachers College, Columbia University, 1928. Pp. 118.

Several additional references are cited for such assistance as they may offer.[128] Others can be located by consulting the topic, "Questionnaires," in the subject index of the annual *Bibliography of Research Studies in Education* published by the U. S. Office of Education and by referring to the same topic in *The Education Index.*

3. STUDIES EMPLOYING DOCUMENTARY-FREQUENCY PROCEDURES

This type of normative-survey research, like historical research, deals with records which already exist. The present type of research, however, is definitely quantitative; it is not concerned with the general import of the existing documents, but with certain characteristics which can be identified and counted. Determining what characteristics to count, and defining them, are important parts of this type of work; in fact, they may be the most crucial part.

The fact that one works directly from documents does not mean that he avoids all problems of collecting and selecting data. It is true that in some cases he needs only to procure a few books from a library, but it is also true that in other cases he may need to collect his documentary specimens from afar. In any case, problems of selection enter, both with respect to the specimens which are collected, and with respect to the aspects of these specimens which are noted. In dealing with

128 Ruth S. Cavan, "The Questionnaire in a Sociological Research Project," *American Journal of Sociology,* XXXVIII (March, 1933), 721-7.

W. H. Cowley, "Two Questionnaire Devices," *Educational Research Bulletin,* X (October 14, 1931), 374-6.

Margaret M. Gaines, "The Questionnaire: Technique and Its Preparation and Use." Master's thesis. Pittsburgh: University of Pittsburgh, 1926. Pp. 242.

Max Seham and Ole Schey, "The Reliability and Validity of the Questionnaire Method," *Research Quarterly of the American Physical Education Association,* V (May, 1934), 31-43.

F. K. Shuttleworth, "A Study of Questionnaire Technique," *Journal of Educational Psychology,* XXI (December, 1931), 652-8.

Mapheus Smith, "A Note on Stability in Questionnaire Response," *American Journal of Sociology,* XXXVIII (March, 1933), 713-20.

See references on "The Questionnaire," pp. 93-96, in *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education,* by A. S. Barr and Mabel Rudisill. Bulletin of the Bureau of Educational Research, No. 13. Madison: University of Wisconsin, June, 1931. Pp. 129.

such questions of selection, one must always remember the type of generalization he desires to make as a result of his study.

Textbook analyses. Among the simpler examples of documentary frequency studies may be mentioned textbook analyses. These have become a favorite subject for Masters' theses. A student may choose any set of objective characteristics which he thinks are significant in a book and note the extent to which they occur. For example, he may count the number of sentences of different lengths, the number of words which appear to be difficult,[129] the number of pictures,[130] the number of tables, the number of exercises at the ends of the chapters, the number of different topics taken up, the number of lines (or pages) devoted to each topic, etc. Other investigations may be concerned somewhat more broadly with the kind of content,[131] perhaps in relation to the objectives in that subject,[132] or to other criteria.[133] Some studies deal with the

129 Laura Margaret Elder, "A Determination of Vocabulary Grade-Placement of Certain Home Economics Textbooks." Master's thesis. Los Angeles: University of Southern California, 1933. Pp. 65. See also, *California Quarterly of Secondary Education*, IX (October, 1933), 83.

Grayson Newark, "An Investigation of the Vocabulary Burden of Dull's High-School Chemistry Text: *Modern Chemistry*." Master's thesis. Ann Arbor, Mich.: University of Michigan, 1933. Pp. 109.

Frances Summerell, "Relative Difficulty of the Vocabulary of the Ten Most Frequently Used High-School Biology Textbooks." Master's thesis. Pittsburgh: University of Pittsburgh, 1932. Pp. 171. Abstract printed in: *Abstracts of Theses, Researches in Progress, and Bibliography of Publications*, of the University of Pittsburgh, Vol. VIII, 373-4.

130 Helen A. Creese, "An Evaluation and Classification of Pictures Used in Geography Texts from 1880 to 1930." Master's thesis. Pittsburgh: University of Pittsburgh, 1933. Pp. 67.

Nelda Ruth Pokel, "Evaluation of Graphic Representation in Junior High-School Textbooks." Master's thesis. Greeley, Colo.: Colorado State Teachers College, 1932. Pp. 75.

131 Ray Albright, "The Development of Arithmetic Textbooks in the United States." Master's thesis. Indianapolis: Butler University, 1933. Pp. 53.

Carl E. Cole, "An Analysis of the War Content of Thirty Junior and Senior High-School American History Textbooks." Master's thesis. Minneapolis: University of Minnesota, 1933. Pp. 96.

Bessie Louise Pierce, *Civic Attitudes in American School Textbooks*. Chicago: University of Chicago Press, 1930. Pp. 297.

132 Dorothy R. Mohr, "The Contribution of Ninth-Year Mathematics Textbooks to the Attainment of the Objectives of Ninth-Year Mathematics." Master's thesis. Chicago: University of Chicago, 1933. Pp. 113.

Frank Forchtner, "The Adaptations of Recent High-School Biology Textbooks to Curriculum Needs." Master's thesis. Pierre: University of South Dakota, 1933. Pp. 48.

133 Frank B. Bennett, "A Comparative Analysis of Elementary Arithmetic Textbooks on the 10 Criteria Set up by the Oregon State Textbook Commission." Master's thesis. Eugene: University of Oregon, 1933. Pp. 101.

Mary Chriesman, "Discrepancies Between Criteria of the Classical Investigation and

grade placement or general difficulty of the material.[134] For numerous other examples, see the topic, "Textbooks," in the annual *Bibliography of Research Studies in Education* published by the U. S. Office of Education.

Some of these analyses are highly mechanical, but they have proved to be far from useless. In fact, studies of vocabulary burden have received considerable attention in recent years from textbook writers, and the other analyses have served to make authors more conscious of the quantitative aspects of their product. The appraisal of textbooks, which differs from textbook analysis, although it involves a certain amount of analysis, is discussed in the following chapter under the topic, "Appraisal Procedures."

Analysis of larger bodies of literature. In a study of "The Techniques of Research Employed in Arithmetic," Brownell [135] canvassed 532 reports of investigations in this field, classified them with respect to problem and type of technique used, and then counted the frequency with which the different techniques have been used in the study of each kind of problem. Sixty-seven different kinds of problems and nineteen types of investigational techniques were recognized. This study represents well several distinctive characteristics of documentary frequency studies. It was based on an extensive body of literature; it called for the making of categories appropriate to the study (*e.g.*, the classes of problems and of techniques); and it presented the frequency with which each technique had been used for each study. Further, by a classification of problems and techniques in a two-way frequency table, the relationships between problem and technique were clearly portrayed.

Third Semester Texts." Master's thesis. Nashville, Tenn.: George Peabody College for Teachers, 1933. Pp. 112.

Marion Esther Daltymple, "A Study of the Present Use of Decimals in Industries, Periodicals, and Textbooks." Master's thesis. Boston: Boston University, 1933. Pp. 77.

134 Jacob A. O. Lien, "The Grade Location and Drill Frequency of Certain Adjective Modifiers in Selected Language Texts." Master's thesis. Iowa City: Iowa State University, 1932. Pp. 225.

135 William A. Brownell, "The Techniques of Research Employed in Arithmetic," Chapter II, pp. 415-43, in *Report of the Society's Committee on Arithmetic*, Part II, Twenty-Ninth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1930.

Brownell makes the interesting comment:[186] "The blank spaces in these tables are fully as significant as are the spaces in which numbers have been entered." They show that certain classes of problems have not been attacked by certain techniques and stimulate one to consider whether a contribution could be made in those areas. This same author made another frequency study of investigations in arithmetic and reading[187] showing the historical trend and the number of investigations per author.

Documentary frequency studies have been employed to a considerable extent in basic curriculum work. In fact this field has received the most extensive application of the frequency technique. The underlying theory states that since not everything known can be taught in school, the things which are socially most useful should be selected and taught. These, according to the basic assumption, can be discovered by an appropriate interpretation of frequency analyses of social activities and interests.

An outstanding publication based on this point of view contains a number of studies made under the direction of Bobbitt.[188] One set of investigations was devoted to discovering the major fields of human concern and included an examination of the frequency with which topics in different fields were listed in the *Reader's Guide to Periodical Literature* for three years, a study of the column-inches of space devoted to various topics in a newspaper over a period of time, an analysis of the number of columns devoted to each topic in the *Encyclopaedia Britannica*, a classification of the topics apparently referred to by the ten thousand most frequently used English words, and a study of the topics treated in the *Literary Digest*. It will be observed that in each of these studies, the making of appropriate categories was incumbent upon the worker.

186 *Ibid.*, p. 442.

187 William A. Brownell, "Growth and Nature of Research Interest in Arithmetic and Reading," *Journal of Educational Research*, XXVI (February, 1933), 429-41.

188 Franklin Bobbitt and Others, *Curriculum Investigations*. Supplementary Educational Monographs. No. 31. Chicago: University of Chicago, 1926. Pp. 204.

The monograph contains a number of other documentary frequency studies, including the following: An effort was made to determine the duties and traits of a good citizen by analyzing newspaper editorials and magazine articles on citizenship, in addition to opinions secured through interviews with leading citizens. Civic and social shortcomings were studied by an examination of the editorials of newspapers and magazines. The social problems of the labor group were determined by an analysis of ten widely used books and seven labor periodicals. A study of essays aimed to discover the characteristics of human behavior that are approved and disapproved; a canvass of books, magazine articles, and books of etiquette sought to determine approved social behavior. Shortcomings in the written English of adults were discovered by an analysis of letters written for newspaper publication. The science articles in a random sampling of five general magazines and three books on popular science were studied to determine the mathematics used in popular science. The monograph suggests the wide range of opportunity for investigation in the field of general activity analysis as a guide to curriculum making.[139]

Charters is another leader in the field of analytical frequency studies, often referring to his technique as "activity analysis" or "job analysis." He discusses the principles of this technique in his early book, *Curriculum Construction*.[140] Much of his work has, however, involved the collection of statements ("unrecorded specifics") concerning details of what people do, so that basically it is more closely related to the questionnaire technique than to the present one. His work on the Commonwealth Teacher-Training Study[141] and on the analysis of

139 A publication representing Bobbitt's earlier work in this field is: *Curriculum-Making in Los Angeles*. Supplementary Educational Monographs, No. 20. Chicago: University of Chicago, 1922. Pp. 106.

140 W. W. Charters, *Curriculum Construction*. New York: The Macmillan Co., 1923. Pp. 352. See Chapter IV, pp. 34-40, and the topic, "Job Analysis," in the Index.

———, "The Use of Activity Analysis in Curriculum Construction," *Educational Research Bulletin*, VII (November 14, 1928), 339-42.

———, "A Technique for Trait Analysis," *Journal of Educational Research*, X (September, 1924), 95-100.

141 Charters and Waples, *op. cit.*, (footnote 110).

secretarial duties and traits [142] has already been mentioned. One of his significant contributions in this field was the development of a pharmaceutical curriculum.[143] Aside from the fact that most of the data for his studies were recorded *de novo* for that purpose, the studies are similar to the others discussed in this section and represent the same general type of analysis.

Analysis of assembled specimens. Not all of the material used in documentary frequency studies may be located in books and magazines. For certain studies one must collect his materials from sources other than the library. Such studies differ from the questionnaire investigations already discussed in that the materials have, in the present case, already been written for other purposes and are merely collected as specimens for the purpose of analysis. Three fields of study will be referred to as illustrations of this kind of research—vocabulary studies, error studies, and studies of record and report systems.

Vocabulary analyses. For many purposes it is useful to know the most common words and the most readily understood words. In 1921 Thorndike took the lead in this field with the publication of his well-known *Teacher's Word Book*,[144] which ranks (by groups) the 10,000 most common words in order of their frequency. This list has recently been revised and extended.[145] Frequency lists of the most common words in several foreign languages have also been prepared.[146] Such lists [147] are important in establishing a common basic vocabu-

142 Charters and Whitley, *op. cit.*, (footnote 109).

143 W. W. Charters, A. B. Lemon, and Leon M. Monell, *Basic Material for a Pharmaceutical Curriculum*. New York: McGraw-Hill Book Co., 1927. Pp. 366 .

144 E. L. Thorndike, *Teacher's Word Book*. New York: Columbia University, 1921. Pp. 134. (See also next footnote.)

145 E. L. Thorndike, *Teacher's Word Book*, of the Twenty Thousand Words Found Most Frequently and Widely in General Reading for Children and Young People. Revised Edition. New York: Teachers College, Columbia University, 1932. Pp. 182.

146 See for example, H. S. Eaton, "Comparative Frequency List Based on the First Thousand Words in English, French, German, and Spanish Frequency Lists," in *Experiments and Studies in Modern Language Teaching*, compiled by Algernon Coleman. Chicago: University of Chicago Press, 1934. Pp. 367.

147 For a bibliography, see "Modern Foreign Languages—Vocabulary Studies," pp. 156-8, in "The Curriculum," *Review of Educational Research*, IV (April, 1934). Another bibliography is contained in "Vocabulary Studies," pp. 691-702, of *The Modern Language Teacher's Handbook*, by Thomas Edward Oliver. Boston: D. C. Heath and Co., 1935. Pp. 706.

lary,[148] both in reading and writing, and in the construction of readers and language textbooks.[149] The words which are regarded as technical, or peculiar to a particular school subject, have been studied and compiled in mathematics,[150] geography,[151] history,[152] and other subjects. Such lists make possible an estimate of the difficulty of these words and of the textbooks which contain them or go beyond them in difficulty. A criticism of their value has, however, been raised by Wesley.[153]

These studies have been based partly on printed literature and partly on collected specimens. A group of studies which have depended more heavily on collected materials are those connected with the spelling curriculum. Such studies are typically concerned with the frequency with which words are used in different situations, such as reading, writing letters, speaking, etc. They have been made in large numbers as the basis for spelling curriculums and spelling textbooks.[154]

148 "The Commonest Words in the Spoken Vocabulary of Children up to and Including Six Years of Age," pp. 186-93, and also pp. 193-8, *Report of the National Committee on Reading*. Twenty-Fourth Yearbook of the National Society for the Study of Education, Part I. Bloomington, Ill.: Public School Publishing Co., 1925. Pp. 356.

Arthur I. Gates, *Reading Vocabulary for the Primary Grades*. New York: Teachers College, Columbia University, 1926. Pp. 23.

Clarence R. Stone, "The Second-Grade Reading Vocabulary," *Elementary School Journal*, XXXV (January, 1935), 359-67.

149 For suggested uses, see E. L. Thorndike, "Word Knowledge in the Elementary School," *Teachers College Record*, XXII (September, 1921), 334-70. See also more recent articles by Thorndike on reading and word knowledge, as given in the *Education Index*.

For a critical analysis of Thorndike's word list from the point of view of various uses, see Edgar Dale, "Evaluating Thorndike's Word List," *Educational Research Bulletin*, X (November 25, 1931), 451-7.

150 S. L. Pressey, L. C. Pressey, and R. C. Zook, "The Essential Technical Vocabulary of Plane Geometry," *School Science and Mathematics*, XXXII (May, 1932), 487-9.

Clifford Woody, "Nature and Amount of Arithmetic in Types of Reading Material for the Elementary Schools," *Educational Outlook*, VI (May, 1932), 199-217. Also published as a *Bulletin* of the Bureau of Educational Reference and Research, No. 145. Ann Arbor, Mich.: University of Michigan, 1932. Pp. 79.

151 L. C. Pressey, "Fundamental Vocabulary in Elementary School Geography," *Journal of Geography*, XXXII (February, 1933), 78-81.

152 A. S. Barr and C. W. Gifford, "The Vocabulary of American History," *Journal of Educational Research*, XX (September, 1929), 103-21.

153 Edgar B. Wesley, "Some Criticisms of Word Lists with Particular Reference to History," *Social Studies*, XXV (February, 1934), 79-82.

154 F. S. Breed, "Spelling," Chapter X, pp. 83-8, in "Special Methods and Psychology of the Elementary-School Subjects," *Review of Educational Research*, V (February, 1935), No. 1.

F. S. Breed, "Selected References on Elementary-School Instruction: Spelling," *Elementary School Journal*, XXXIV (October, 1933), 137-9, and again, XXXV (October, 1935), 139-40, and in subsequent annual issues in this series.

Horn [155] has compiled the 10,000 words most commonly used in writing and includes in his report a critical evaluation of the various investigations underlying his work, as well as a critical review of previous similar investigations. The methods of building spelling vocabularies have also been reviewed critically by Coleman.[156] Studies of the actual difficulty of words involve a different technique [157] and have not been so frequent. One who is interested in these fields should consult "Vocabularies," and "Vocabulary Studies," in the *Education Index* and also in the subject index of the annual *Bibliography of Research Studies in Education* of the U. S. Office of Education.

By way of interesting contrast to these frequency studies, mention may be made of Ogden's "Basic English." [158] This system consists of a vocabulary of only 850 words which have been found to possess great power of expression. These words were not selected on the basis of frequency at all, but were chosen because each of them constituted an essential elemental idea out of which complex ideas could be built. Although the list is not intended for the same uses as the lists based on frequency, it is a striking example of some of the considera-

See similar treatments in "Special Methods in the Elementary School," *Review of Educational Research*, I (October, 1931); No. 4, pp. 276-9, and in "Psychology of the School Subjects," *Review of Educational Research*, I (December, 1931), No. 5, pp. 341-2.

C. T. Wise, "Selection and Gradation of Words in Spelling," *Elementary School Journal*, XXXIV (June, 1934), 754-66.

155 Ernest Horn, *A Basic Writing Vocabulary:* 10,000 Words Most Commonly Used in Writing. University of Iowa Monographs in Education, First Series, No. 4, April 1, 1926. Iowa City: College of Education, University of Iowa. Pp. 225.

156 William H. Coleman, *A Critique of Spelling Vocabulary Investigation.* Education Series, No. 12. Greeley, Colo.: Colorado State Teachers College, 1931. Pp. 119.

157 V. H. Kelley, "Experimental Study of Certain Techniques for Testing Word Meanings," *Journal of Educational Research*, XXVII (December, 1933), 277-82.

Guy T. Buswell and Lenore John, *The Vocabulary of Arithmetic.* Supplementary Educational Monographs, No. 38. Chicago: University of Chicago, 1931. Pp. 146.

Edgar Dale, "Difficulties in Vocabulary Research," *Educational Research Bulletin*, X (March 4, 1931), 119-22.

Edward W. Dolch, "Testing Word Difficulty," *Journal of Educational Research*, XXVI (September, 1932), 22-27.

158 A series of books have been published in connection with Basic English. The two following works are cited as leading examples:

Charles K. Ogden, *The System of Basic English.* New York: Harcourt, Brace and Co., 1934. Pp. 320.

The Basic Dictionary: Being the 7,500 Most Useful Words with Their Equivalents in Basic English, for the Use of Translators, Teachers, and Students. London: Kegan, Paul, 1932. Pp. 106.

tions which are normally omitted from frequency studies. It also affords objective evidence that a word list of general importance can be built up entirely apart from a consideration of frequency. Those who are prone to rely largely on relative frequency should give thought to this list.

The studies referred to in the preceding paragraphs have typically included the gathering of children's compositions, social letters, and other examples of child or adult usage of words in everyday situations. Many of the studies have supplemented such information by counts of the words in published materials. Word lists have been referred to as illustrative of the technique of counting frequencies of occurrence in informal usage, and they are not meant to suggest that the technique is limited to this field. Study of the informal usage of arithmetic [159] and other subjects has been undertaken, in addition to the analyses of the more formal usage occurring in printed sources, as typified by the curriculum studies of Bobbitt.

Error studies. A different purpose has prompted another set of studies of informal usage. These investigations are concerned, not with the frequency of use, but with the frequency of errors made in usage. The method has been similar to that of the analyses of usage, except that the error studies have perforce depended more completely upon informal materials. These investigations have been devoted chiefly to language in its various phases, since errors in language (including reading and the mechanics of writing) normally constitute the bulk of the errors which are made in informal written material. Charters gave considerable impetus to this movement in its earlier days. Studies of errors have been made in considerable number, especially in the "usage" fields. Spelling,[160] arith-

159 For a pioneer study, see G. M. Wilson, "A Survey of Social and Business Uses of Arithmetic," pp. 128-42, in the *Second Report* of the Committee on Minimal Essentials in Elementary-School Subjects. Sixteenth Yearbook of the National Society for the Study of Education, Part I. Bloomington, Ill.: Public School Publishing Co., 1917. Pp. 204.

160 See the discussion and references in "Special Methods and Psychology of the Elementary-School Subjects," *Review of Educational Research*, V (February, 1935), No. 1, pp. 87-8.

metic,[161] geography,[162] modern foreign languages,[163] capitalization, punctuation, grammar, sentence structure, speech,[164] and other fields have recently been subjected to such analysis, in addition to many studies in earlier years. The errors made by teachers have also been studied in several cases.[165] Fifty-eight of these error analyses are reviewed and classified as to technique of gathering data by Brownell and Easley.[166]

Characteristics of reports. As a third field that illustrates documentary frequency studies, based largely on collected specimens, studies of school records and reports are referred to. Records and reports constitute a phase of administration, and also instruction, that is of basic importance, and many studies of them have been made. One of the predominant types of investigation has collected records or reports from a number of school systems and analyzed them. This analysis usually involves noting certain characteristics of the forms and then counting the number of school systems that have this characteristic (frequently an item on a blank) in their set of records or reports. An interesting table occurs when one counts

161 *Ibid.*, pp. 21-2. See also, "Psychology of the School Subjects," *Review of Educational Research*, I (December, 1931), No. 5, pp. 358-9.

162 "The Curriculum," *Review of Educational Research*, IV (April, 1934), No. 2, pp. 155-6. See also footnote 165.

163 *Ibid.*, p. 159.

164 *Ibid.*, p. 202; also, "Psychology and Methods in the High School and College," *Review of Educational Research*, IV (December, 1934), No. 5, pp. 449-51.

Studies of errors in oral and written English up to 1929 have been reviewed in detail by R. L. Lyman in his *Summary of Investigations Relating to Grammar, Language, and Composition*, see Chapter III, pp. 71-133. Supplementary Educational Monographs, No. 36. Chicago: The University of Chicago, January, 1929. Pp. 302.

See also, Henry Harap, "The Most Common Grammatical Errors," *English Journal*, XIX (June, 1930), 440-6.

One study dealt with letters written for publication in a newspaper; these differ somewhat from material usually studied in that they may be regarded as formal. See Sarah A. Bobbitt, "Shortcomings in the Written English of Adults," Chapter XII, pp. 110-8, in *Curriculum Investigations*. (See footnote 138.)

165 Edward U. Engleman and J. R. Shannon, "An Analysis of Teachers' English Errors," *English Journal* (College Edition), XXII (January, 1933), 45-52.

Isabelle K. Hart, "A Classification of Common Errors in Geography Made by Teachers and Pupils," in *The Teaching of Geography*, pp. 479-82. Thirty-Second Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1933.

Walter S. Guiler, "Computational Errors Made by Teachers of Arithmetic," *Elementary School Journal*, XXXIII (September, 1932), 51-58.

166 William A. Brownell and Howard Easley, "Analyses of Errors," pp. 302-7, in "Psychology of Learning, General Methods of Teaching, and Supervision," *Review of Educational Research*, III (October, 1933), No. 4.

the number of school systems that have certain numbers of records, resulting in a sort of double frequency distribution in which the scale numbers are themselves frequencies.

These studies have not infrequently combined other criteria with their frequency analysis. For example, Heck [167] secured four different frequencies and ratings in addition. In studying the pupil-record forms used in 131 cities, he ascertained the frequency with which each item appeared (i.e., the number of cities having this item on their forms), the frequency with which each item is needed by superintendents or others to prepare the required reports made to the state (reports from the forty-eight states were collected), the frequency with which each item would be needed to make various studies that have been listed in the literature as desirable, and finally, the frequency with which each item was actually used by teachers and principals. This information was then put in the hands of 133 judges, who passed judgment on the value of each item for inclusion in a "universal list" of items for all school systems.

Studies have been made of many different aspects of records and reports. Some workers have studied the superintendent's report, as to its mechanical make-up,[168] and as to its effectiveness in giving information and in properly publicizing the schools.[169] Such investigations may follow the same pattern as textbook analysis. A number of studies have been concerned with the records of city school systems,[170] of county school

167 Arch O. Heck. *A Study of Child-Accounting Records.* Bureau of Educational Research Monographs, No. 2. Columbus: Ohio State University, 1925. Pp. 245. Reviewed briefly in his *Administration of Pupil Personnel,* pp. 230-5. Boston: Ginn and Co., 1929. Pp. 479.

168 Emil Rinsch, "An Analysis of 56 City Superintendents' Annual Reports." Master's thesis. Bloomington, Ind.: Indiana University, 1927. Pp. 92.

169 Robert Augustus Jacob, "The Superintendent's Annual Report Functioning as a Tool." Master's thesis. Nashville, Tenn.: George Peabody College for Teachers, 1928. Pp. 64.

The following study, though based on the frequency with which items appeared in the literature rather than in collected specimens, is mentioned because of its significance in this general field: Zenas Read Clark, *Recognition of Merit in Superintendents' Reports to the Public.* Teachers College Contributions to Education, No. 471. New York: Teachers College, Columbia University, 1931. Pp. 123.

170 Arch O. Heck, *op. cit.*

systems,[171] and state school systems.[172] Other analyses have been devoted to particular forms or sets, such as the cumulative record card of pupils, the report card or other forms of reporting to parents, and teacher's class register, the records of the head of a department in high school, office records, the principal's monthly and annual report to the superintendent, the superintendent's monthly report to the school board, reports to colleges, financial reports, the annual report of the business manager, etc. Various studies have divided their consideration according to school level and reported on the records appropriate for elementary schools, high schools, etc.

References to these numerous studies will be found in the annual *Bibliography of Research Studies in Education* published by the U. S. Office of Education, beginning with 1926-27. The topic heads vary; one should look in the Subject Index (at the back) for "School Records and Reports," "School Reports," "Reports," or "Records and Reports"; also, for "Child Accounting," "School Attendance," or "Attendance and Child Accounting." These references are mainly to theses; studies reported in periodicals and elsewhere will be found in the *Education Index* under the topics, "Reports and Records," "Report Cards," and "Child Accounting." Related topics are: "Census, School," "Marking Systems," and "Marks, Students'." Look also for cross references to other topics.

It is of course clear that frequency analyses may be made of other types of documents than those which have been here discussed. For example, Shank [173] studied tests of silent reading to ascertain the frequency with which thirty-three different types of response were called for by the different tests. Analyses of this type should prove fruitful.

Related forms of study. It will be recalled that frequency

171 Robert Oliver Nelson, "A Study of Southern County Superintendents' Annual Reports." Master's thesis. Nashville, Tenn.: George Peabody College for Teachers, 1930. Pp. 75.

172 Frank Leslie Shaw, *State School Reports*. Contributions to Education, No. 242. New York: Teachers College, Columbia University, 1927. Pp. 142.

173 Spencer Shank, "Student Responses in the Measurement of Reading Comprehension," *Journal of Educational Research*, XXII (September, 1930), 119-29.

studies of other phases of administration are somewhat common also, being made through the use of the questionnaire and check-lists. Ascertaining and analyzing current practices is one of the principal purposes of normative-survey research, and counting is a favorite procedure.

There are of course other kinds of analysis that can be made of documents besides counting the frequency with which certain aspects occur. For example, the field of historical work is dependent upon documents as sources, but makes an entirely different use of them. There are diaries or other forms of autobiographical records which can be analyzed for one purpose or another. Closely related to these are personal reports, written upon request or given orally, and usually involving a certain amount of introspection. Such material may be analyzed in a variety of ways, for different purposes. One instance which may be pertinent to the present general treatment is Blumer's analysis of preliminary case reports,[174] for the purpose of finding the topics treated in them, so that he could use these topics in blanks which he was preparing for further reports, as suggestive outlines for the later reports.

Interpreting frequency studies. The interpretation of frequency analyses based on existing materials is in many respects similar to the interpretation of questionnaire returns, and one should refer to the discussion of the latter topic. The same problems arise in obtaining practical significance from frequencies; that is, in determining the legitimate conclusions which can be drawn from frequency distributions. In the case of curriculum work this problem has been clearly recognized and dealt with from several angles. Probably frequency is an element in importance, but it is only one element, and its significance must be evaluated by carefully analyzing its logical contribution to the total picture. We may note the comments made by Bobbitt in connection with the frequency analyses

[174] Herbert Blumer, *Movies and Conduct*. New York: The Macmillan Co., 1933. Pp. 157. Briefly described by W. W. Charters, *Motion Pictures and Youth*, p. 36. New York: The Macmillan Co., 1933. Pp. 66.

of literature which sought to identify the major fields of human concern: [175]

> In the aggregate, man seems to prefer to dwell on the little things that make up his existence from hour to hour and is reluctant to dwell on the things that are large and high and intrinsically important. He will attend to the large things when they reach the point where they worry him, but only because they worry him and not because of their inherent importance. . . . "Language" . . . is infrequently discussed. The fact that it is an absolutely indispensable factor of civilization does not place it high in the list. . . . It is probable that "government," which heads the list with a count of 9,920, is not more important than is "language," with a frequency of only 220. The political world is a seething ferment of problems, difficulties, worries, and fears, however, while language presents us with few problems, none of them threatening our very existence.
>
> Things bristling with immediate problems of which people are generally aware are far more frequently discussed than are things which involve problems more remote and visible only to the specialized few. Problems of population, for example, are probably more serious when the long view is taken than are those of a political or economic character. They are almost certainly our most threatening problems, but there is a general unawareness of them. Hence the frequency of mention is low.
>
> The foregoing discussion shows the impossibility of accepting the frequency figures as indices of the relative importance of the several fields. They seem to constitute one of many types of evidence which can be used in the evaluation of the fields.

Such considerations make it clear that one cannot properly infer general importance directly from relative frequency. It does not follow, however, that frequency has no worth. One has to define carefully what he has in mind by "importance." Importance for what? Facts vary in importance depending upon the purpose for which one desires to use them. One may properly infer from Bobbitt's findings that a knowledge of problems and events in the realm of government is of large importance if one is interested in following with some understanding and appreciation the literature that appears in current periodicals. To conclude that such a knowledge is im-

[175] Franklin Bobbitt and Others, *Curriculum Investigations*, pp. 9-11. Supplementary Educational Monographs, No. 31. Chicago: University of Chicago, June, 1926. Pp. 204.

portant for *any* purpose, however, does not necessarily follow. To assert, for example, that such knowledge becomes the responsibility of the school to inculcate in each pupil, is a conclusion that does not grow immediately out of the research findings, but depends on a chain of reasoning which involves many other considerations outside of the objective evidence. Whether relative frequency throws much or little light on one's problem depends upon the relation of the factors which the data represent to the conclusions one desires to draw.

Heck [176] recognized the dependence of importance upon purpose and secured data on four aspects of importance. In seeking to determine a universal, minimum list of items for school-record forms, he secured the frequency (universality) with which items appeared in the record systems of different city school systems. This frequency represents a composite of judgments of general importance on the part of many persons who prepared the forms in the different school systems. A second frequency value was determined for each item by analyzing state-report blanks, to see how many states called for each item. This is obviously important from the standpoint of meeting state requirements. A third frequency grew out of the need for items of information in order that important studies of school systems could be made. This frequency was determined by analyzing lists of studies that were recommended in educational literature as being desirable. The fourth frequency grew out of direct use in the school system; how often were items needed by principals and teachers? It is obvious that each of the last three frequency lists throws light on the importance of an item for a particular purpose. The first frequency suggests judged importance. In order to relieve the reader of having to weigh all of these factors, Heck had a large group consider these four frequencies and interpret them as indicating a certain degree of "general" importance. Perhaps the four frequencies combined with the general judgment of the "jury" would yield a good estimate of general importance.

[176] Arch O. Heck, *op. cit.*, (footnote 167).

Charters and Waples, in the extensive Commonwealth Teacher-Training Study,[177] secured only one series of frequencies, but they secured *ratings* on three other aspects of each teacher activity in their list; namely, importance (desirability or cruciality) for good teaching, difficulty of learning to perform the activity, and appropriateness of learning the activity in a training institution. Note that *importance* was directly rated, as a product of group judgment and was not deduced from frequency. The relative importance of providing for teaching an activity in a teacher-training institution would be decided after a consideration of all four sets of evidence on the activity. Such additional data lessen the strain upon frequency when it is the sole basis for conclusions.

Attention should be given to the concept of "frequency." It is commonly used in two different senses. If one secures responses which indicate the number of people who do a certain thing or the number of times it occurs throughout the group, the frequency may be interpreted in the sense of proportion of the group, or as universality. It is in the nature of a per cent. On the other hand, frequency may refer to a time concept; i.e., how often does a single individual do something? This figure should be thought of with reference to an average individual in the group. In the Commonwealth Teacher-Training Study both types of frequency were secured; *e.g.*, each teacher reported the activity as performed very frequently, infrequently, or with intermediate frequency (as defined in the check-list). Tyler [178] studied the relationships between universality and temporal frequency and found them to be somewhat related. Of course an activity which an individual never performs counts as zero both in the sense of the per cent of the group reporting that activity and in the sense of the frequency with which an individual does it. The more items, therefore, which are in the list which individuals do not do, the more the

[177] W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929. Pp. 666.

[178] Ralph W. Tyler, "The Relation Between the Frequency and the Universality of Teaching Activities," *Journal of Educational Research*, XXII (September, 1930), 130-2.

two types of frequency tend to merge, and the closer the relationship will be between them.

A second large question concerning frequency studies as related to curriculum work is raised about their influence on progress. The criticism is that they necessarily find out the commonplace or the average, and this does not provide a suitable goal. On this point Bobbitt comments:[179]

> Education has no function except that of leading persons to perform properly the activities which constitute an enlightened, humanistic civilization. Our first task is to find out with definiteness and certainty what these activities are. The problem of determining the activities is not to find out what is *usually* done. It is not to find the average performance. The frequency of an activity on the part of a mediocre generation is not of much value in showing us at what education ought to aim. Those who have achieved the highest and most desirable levels of human performance are relatively few. The activities of the high type to be aimed at are therefore relatively infrequent. Let us find, therefore, if possible, those persons who come nearest to living life as it ought to be lived.

From these remarks it is evident that Bobbitt would select his cases at the beginning, and that the element of evaluation enters into his research plans at the beginning of the work more prominently than at the close.

Charters and Waples make the following statement:[180]

> The criticism has commonly been raised against activity analysis that it determines duties that *are* performed rather than duties which *should* be performed. While this criticism is widespread, it is not well taken.

These writers point out that in the Commonwealth Teacher-Training Study the master list of teacher activities was referred to a number of experts with the request that they add to the list all of the duties that they thought *ought* to be performed by teachers. Progressive literature was also examined

179 Franklin Bobbitt, *op. cit.*, (footnote 175), p. 2.

180 W. W. Charters and Douglas Waples, *op. cit.*, pp. 120-5.
W. W. Charters, "The Curriculum and the Future," *Journal of Educational Research*, XIX (February, 1929), 141-2.

to the same end. In the evaluation of the activities, provision was made for determining frequencies of performance and ratings on importance, etc., by teachers in progressive experimental schools and by professors of education. These groups should represent forward-looking tendencies. The returns from these two groups were reported separately [181] so that one may be guided by their data or by the more typical average data, as he prefers.

A third large question relating to frequency analyses as bases for curriculum work centers around the aspects of learning which they tend to emphasize. That is, such studies tend to be concerned with details; most educators say, at least, that they desire to place their emphasis upon integrating principles and general orienting ideas. On this point we may quote again from Charters and Waples. In commenting upon the use of their evaluated list of teacher activities as an important reference in the construction of curriculums for teacher-training institutions, they say: [182]

> Without in any sense wishing to argue that a course for prospective teachers should be confined to the study of the significant activities in teaching, one may note in the foregoing list many activities that most inexperienced teachers need to have analyzed and explained at some length. If the index of curricular value is as valid as we believe, it would follow that at some point in the training program the significant activities should be described, together with the problems to be avoided or solved and the theoretical principles needed to give coherence and unity to the course. It may be seriously questioned whether any treatment of the principles that govern the performance of these activities can be highly effective unless the application of the principles to the activities is made explicit.

B. R. Buckingham has called attention to some of the shortcomings of frequency studies, in an address which he has given repeatedly to educational groups. Without contending that the study of frequency of use is unimportant, Buckingham points

181 W. W. Charters and Douglas Waples, *op. cit.*, (footnote 177), Table C, pp. 564-92, groups L and M.

182 *Ibid.*, p. 145.

out that it has serious limitations and should not, therefore, be made the sole or the chief basis of curriculum construction. The results of frequency counts bring highly heterogeneous concepts together in juxtaposition with the result that the findings lack any system or organization, an essential element in well-rounded mental development. Obviously the material is not related to the individual interests of the learner. The procedure is likely to restrict usage still further by limiting instruction to the commonplace, instead of attempting to bring into the experiences of ever larger numbers those educational contributions that will enrich their lives and broaden their mental powers. In Buckingham's words, "Education contemplates something more than the round of common experience, something richer and more joyous than the repetitious elemental facts of life."

His criticisms agree with other lines of evidence in emphasizing that frequency studies need a large amount of supplementary interpretation if they are to be put to practical use with profit. Perhaps the full contribution which frequency studies can make must await the more complete development of a procedure for properly utilizing the findings in a frame of reference which recognizes other criteria of importance besides frequency, which includes the psychology of learning, and which gives due consideration to integrating principles, balance, and orientation. One of Buckingham's points of criticism is that the technique has not yet developed a philosophy which will properly interpret the findings.

Something should be said about the interpretation of error studies, such as those made in English usage and in arithmetic. These analyses may appear at first to have more intrinsic value than other frequency studies, for they deal directly with deficiencies. They are made for the purpose of revealing weaknesses; one may feel that their significance is plain and incontrovertible. They suffer, however, from much the same types of limitation as do other frequency studies.

In the first place such investigations do not reveal ***why*** the

child made the errors which are noted, and hence they afford little that is helpful in teaching the child. An error is not to be looked upon simply as an error; it is a response habit that probably has a long history, growing out of a complex background of information and associations which at some place or other have become tangled. To correct the error economically and permanently requires locating the point where the trouble is and giving the child a new insight before proceeding to drill him. In this connection Brownell and Easley comment:[183]

> Too many of these studies represent ends in themselves and make no contribution to an understanding of the learning process or to the direction of the teaching process. . . . Too frequently the data contain no suggestions as to *why children encounter these difficulties*, as to *the precise nature of the difficulties*, and as to *how these difficulties may be avoided.*

In the second place, there is an implication in these error studies that whatever children do not know they should know. It may take several minutes of thought for the full significance of such naïveness to be realized. There is little value in knowing what a child cannot do unless we also know what he should be able to do. We are interested in knowing what a child's habits should be for each age and for each grade. Some error studies have given attention to this phase; the majority have not. There is no inherent value in comparing the habits of children—or, for that matter, the informal habits of adults—with the academically perfect formalities that the more intellectual members of the race have found delight in codifying.

In the third place, typical error studies give no suggestion as to the psychology of learning—no hint as to how the material that should be learned may be worked into the child's experiences so that it will contribute to, and become a part of, those larger patterns of response which give to language (or to reasoning processes) significance and effectiveness. In reviewing

[183] William A. Brownell and Howard Easley, "Psychology of Learning, General Methods of Teaching, and Supervision," p. 306, *Review of Educational Research*, III (October, 1933), No. 4.

studies of errors in written English, John Paul Leonard is prompted to comment: [184]

> It is very doubtful if we can ever arrive at a satisfactory teaching program by basing our selection of items upon studies of the errors which children make. . . . Studies of the functioning of the child's mind as he creates speech and writing are far more valuable than continued error counts.

In the fourth place, by their very objectivity, the findings of such studies tend to distort the true picture of the child's needs. They direct attention to certain very narrow aspects of his under-development and fail to reveal the condition of many other kinds of deficiency which probably exist in the pupil's abilities or habits, and which may be of far greater import. After all, we desire good habits not only in details but in one's larger adaptations, and the latter are far more difficult to build up. It is, furthermore, difficult for the teacher to keep her attention on them, since they are less tangible, less easily held before one's attention for effective consideration. From the practical point of view, there is positive danger in the emphasis that naturally grows out of error studies of the typical sort. A perspective that begins with errors rather than with a more complete picture of the accomplishment which is desired seldom reaches the more subtle, less conspicuous, but tremendously important aspects of ability, such as interest, pleasure in doing or using, emotional adjustment, purpose, and other large integrating and dynamic patterns of performance.

The foregoing discussion of interpretation of frequency studies has been detailed because the authors believe it is important for students to realize that there is more to research than simply gathering data. The data must be selected and gathered for a purpose, and they must contain those factors which, when analyzed, will throw light on that purpose. There is little use in gathering data which cannot be interpreted, or

[184] John Paul Leonard, "English Language, Reading, and Literature," pp. 452-3, in "Psychology and Methods in the High School and College," *Review of Educational Research*, IV (December, 1934), No. 5.

which, when legitimately interpreted, have no bearing upon one's problem. The selection and gathering of data which are significant must be done in terms of the desired interpretation. Some of the difficulties of interpreting frequency counts have been pointed out. The writers are inclined to suggest that the simpler and the more objective the facts, the more circumspect one has to be in drawing practical conclusions from them.

The forming of categories. The chief technical problem of frequency studies is the formation of appropriate categories in which frequencies may be secured. The source of difficulty in these studies does not lie in the recognition and counting of separate objects; usually these are sufficiently discrete units for easy identification, such as pages, lines, errors, etc. The difficulty lies in determining suitable divisions among the larger or more general characteristics of these units; that is, in deciding upon, characterizing, and delimiting the classes into which these units shall be placed. The problem is then, what *kinds* of pages, lines, errors, etc., shall be counted, and what groups shall be kept separate among them?

The formation of appropriate categories is a rather general characteristic of research. It is essentially a process of noting similarities and differences, delimiting concepts, and fitting them into an integrating scheme. If one analyzes research in general, he will see how these processes underlie most of the steps. Choosing a problem involves delimiting the field of work; selecting factors for study and sources of data, defining units for measuring or enumerating data, and choosing aspects of the collected data as a basis for analysis, all involve the processes of perceptual and conceptual differentiation and synthesis. In wrestling with the problems of securing satisfactory categories for data-gathering instruments, therefore, one is, in effect, epitomizing the whole of research.

In a certain sense, all of the normative-survey techniques may be said to depend directly upon the use of suitable categories. The items in a test are selected aspects of a more general set of abilities, which they are to sample. Questionnaires and

check-lists consist of aspects of some particular set of conditions, these aspects being set up as categories within which returns will be summarized. The methods to be discussed in the next chapter—the interview, direct observation, and appraisal —also have distinct categorical elements. The preparation of categories is, however, a particularly prominent part of frequency studies, and is therefore given special attention at this point.

The worker encounters the problem of categorization from two different approaches. The first of these, and the simpler, is the choosing of those aspects of any group of objects which one desires to study to see how these aspects vary from one object to another. For example, if one is to compare different textbooks, what aspects of textbooks will he select to study? There are of course many objective aspects of textbooks, such as chapters, paragraphs, lines, words, pictures, and the like. He can count these, but when he considers doing so, he should ask himself, "By what manner will I have advanced the understanding and competence of educators when I have counted these things?" Or, somewhat more narrowly, "Will the counting of these things answer the basic questions involved in the problems of my research?"

If one considers the less objective qualities of textbooks, such as style, scholarship and authenticity, scope and breadth of treatment, emphasis, interest, articulation with the experiential background of a particular group of pupils, and the like, he begins to realize the many characteristics which a textbook has. How shall he choose those aspects which are significant for his purpose? Are there other aspects that would be still more significant if he could think of them? And (practically), how can he measure or count them after he has thought of them?

The goal of this first type of category forming is to choose those aspects (categories) of the objects being studied which will represent the factors necessary to afford a satisfactory answer to the principal questions which are raised in the problem. Or, looking at it in the other direction, the purpose is to

analyze the problem into components which are observable in the group of objects to be studied. One wishes to secure evidence on a set of aspects which, when taken together, will provide a true representation both of the objects and of the general variable constituting his problem. To secure these one must study both his problem and the objects. We speak of "choosing" or "selecting" aspects; in reality the process is more than this, for one must *perceive* in his problem and in the objects those elements which form quantifiable aspects, and, at the same time, embrace enough of the essential characterizing elements of each so that elements of crucial importance will not be omitted.

Much of the difficulty with mechanical research lies at this point—either in accepting a problem which permits of nothing more than routine study, or of seeing nothing more in the problem than what a "wooden" interpretation of it affords. The research consumer who is charged with the responsibility for managing the practical affairs of education may not be able to put his finger on what is lacking in certain research studies, but he is in many cases certain that the conclusions are not sound. Often the trouble is that the investigator failed to see in his problem and in his cases some of the essential elements, without which his conclusions become relatively insignificant, if not misleading. If one is ingenious enough to formulate the appropriate categories, even counting words might tell him which textbook was the most engaging, the best written, the most suitable, etc.; the problem is to break down such general concepts into *classes* of words and word groups so that, when the words within these different classes are counted, the totals will have telling significance.

This first type of categorization is concerned chiefly with an analysis of the problem, but in terms of characteristics of the field. It yields rubrics under which data are gathered. It is the essential process in constructing tests, questionnaires, checklists, and other schedules which are or might be prepared in advance of receiving the data. The second type of categorization

is somewhat the reverse of the first. It is concerned chiefly with an analysis of the field, but in terms of, or from the point of view of, the research problem. It also yields captions within which data may be placed, but it does so only after specimens have been collected from the field, analyzed, and classes made which will fit them and arrange them into logical relationships. It may be said that the first type is essentially a division of the problem (or the general variable constituting the problem) which will fit the field, and the second type is a division of the field which will fit the problem. It is more important that the first be complete with respect to the problem, and that the second be complete with respect to the field. The second type is probably the more difficult and, fortunately, seems to be required less often.

An example of the second approach to category formation is furnished by the analysis of literature (referred to earlier in connection with the curriculum studies sponsored by Bobbitt) for the purpose of ascertaining the major fields of human concern. These major fields were not set up in advance; they emerged from an examination of the literature. It is true that they were used to gather the frequency of occurrence of each one, but they grew nevertheless out of the analysis of the field and could not have been properly set up in advance. Similarly, a codification of errors found in informal manuscripts will be based principally upon the types of errors found, not upon an *a priori* assumption—unless one has built up his categories from previous experience with the same type of material. These statements do not mean that one cannot start out with some tentative categories, but they mean that the categories are properly indigenous to the field being studied.

Categorization of this second type is at best complex, and there are no simple rules to make it easy. It may be helpful to refer to certain criteria. Three of these will be mentioned, namely, purpose, differentiation, and homogeneity. The purpose of the research study must be satisfied by the categories which are established. This purpose should be the determining

factor in choosing between many different possibilities of division. Differentiation relates to the distinctions between the categories; they should be different; they should not overlap; and the basis of differentiation should be clear and reasonably consistent. Homogeneity relates to the opposite characteristics of the classes. All of the cases which fall within any single category should be satisfactorily similar; that is, they should possess enough characteristics in common so that they belong together. In addition, the entire set of categories should possess enough common elements so that they can logically be regarded as belonging in the same series.

To produce a classification scheme which satisfies these criteria usually calls for a great deal of trying and readjusting. Although selection of bases for classification is to be made in the light of one's purpose, it is not always easy to tell how different bases will suit one's purpose, and to begin with, one has to perceive a variety of bases for classification before he can select from among them. With the multiplicity of aspects which ordinary phenomena present, it is true that classification could proceed on almost any basis. For example, the animal kingdom could be classified, not on the basis of structure, but on the basis of weight, or length of life, or numerical predominance, or other bases. One will probably say that such bases would not be satisfactory for science, and perhaps they would not. But before one can judge the relative satisfactoriness of any basis for his division, he must see a number of different possibilities. Then he has to try out several of these possibilities to see whether the characteristics on which he would like to make divisions can be observed satisfactorily, whether they furnish divisions that are useful for his purpose, etc.

A fair way to begin classification is to approach it empirically instead of theoretically. One may begin his classification by noting the cases (objects or phenomena) which seem to be different and to belong appropriately to different groups. One may, in fact, make up a classification scheme by merely writing down the names of objects of his study which experience or

cursory examination has indicated to him are different. When he has proceeded on this basis for a while, he will soon run into difficulties of classification which will force upon him a critical analysis of his attempts. Out of this examination should come a clearer idea of the basis he is using to differentiate his classes, as well as a refinement in the classes which he has temporarily set up.

Perhaps as pure theory the forming of categories would not be commenced until all of the specimens had been collected. As a practice, however, this is frequently impossible and is probably of little consequence. It is reasonable to gather a few data (specimens) or to draw upon one's experiences if they are sufficient, and to attempt a preliminary classification on this basis. One may then gather more data and try out his tentative scheme on these. If it works, well and good; he will gather more data. Usually, however, he finds that, in the light of new data, his early scheme must be modified. He may need only to add new categories; he may find that he must reconsider his basis of classification; and he is likely to find that he needs to re-define some of his classes and change their limits. The process of categorization thus continues, with the gathering of a few data, the formulation of a scheme, and then the adjustment of the scheme to accord with the facts observed. It is understood that in all of these steps, one will constantly recall the demands of his purpose and that tentative outlines and subsequent adjustments will be made in the light of such needs as well as in terms of the data.

The steps taken in the Commonwealth Teacher-Training Study provide an interesting illustration of building categories to classify a large number of items. In the study of teachers' traits, an initial list of 2800 trait-actions was assembled. These were then grouped ("translated") under eighty-three different traits which were either mentioned or selected to represent all of the trait actions. Finally, these eighty-three heads were reduced to twenty-five heads by combining ("telescoping") those which seemed to be reasonably similar. (The number twenty-

five was selected arbitrarily to provide a sufficiently detailed list for practical purposes.) Both the "translating" and the "telescoping" were done on the basis of majority judgment of a group of persons.

In the study of teachers' activities, a sample of some 12,000 activities was drawn from the collection of 235,000 statements and was used as a basis for building up a classification. This proved to be a formidable problem. Charters and Waples report: [185]

> Experiments to determine an efficient method of classification extended over a period of approximately eighteen months and occupied the major attention of the entire staff. In general, it may be said that three types of classification were attempted. The first was a *structural* classification, consisting primarily in the alphabetical classification of nouns reported on the blanks. The second was a functional classification, represented by selecting the verbs which were reported on the blanks. The third method of classification, and the one finally adopted, combined the other two methods. That is to say, while the main headings of the classification represented the essential functions of teaching and consisted mainly of verbs, the subdivisions represented the structural elements of teaching as supplied by the nouns. Yet it is not entirely accurate to say that the classification finally adopted is a purely mechanical combination of nouns and verbs. It is more accurate to say that the total meaning of the activity statement had been reduced to its essential terms.

The procedure adopted was then not a *mechanical* following of any plan. The same final scheme might have been arrived at by a general analysis formally considering and examining a basis of differentiation, for no single basis was held to. The concepts referred to in the quoted paragraph above underwent normal modifications that were required to make them more workable. The large divisions became differentiated on the basis of the individual with whom the teacher came in contact, such as pupils, other professional workers, and the community. But obviously a teacher has relationships with the physical environment, and relationships with abstract concepts (for example, organizing subject-matter), and so divisions had to

185 W. W. Charters and Douglas Waples, *op. cit.*, (footnote 177), pp. 81-2.

be included for these. Again, a teacher's activities in connection with her professional advancement are fairly distinct, but these are not thrown into a separate group by any of the foregoing bases of classification. To adapt the classification scheme to practical interests, a division was included for this group of activities, thus introducing the element of purpose into the classification. Furthermore, it was found desirable to break up relations with pupils into three main divisions and to combine other sets of activities with them in two of the main divisions.

The resulting divisions therefore represent a mixture of bases of differentiation and homogeneity, in order that they might conform to groups that seem natural in our everyday thinking. Attention is called to these facts, not by way of criticism of the classification in this study, but rather to point out that what happened in this process is typical, and one should not only expect it but should adapt his working plans to that expectancy. If one attempts to select a single basis of differentiation and actually holds to it rigorously, there is grave danger that his resulting categories will prove satisfactory to no one, for the concepts of "groups" and of "different groups" which are built up in our everyday thinking do not usually depend upon variation in any single factor.

Probably the chief difficulty of classification grows out of the fact that objects do not belong to any single *system* of classes, but to an intricate network of systems. When we speak of bases of differentiation, it must be recognized that what we really use in a classification scheme that is at all elaborate is a hierarchy of bases. It may be suggestive to say that we normally differentiate in more than one plane, and that we might differentiate in an indefinitely large number of planes. By way of illustration we may refer again to the classification of the animal kingdom. Although the general basis of classification may be denoted as that of structure, such a generality does not disclose the division between the different phyla, or classes, orders, families, genera, and species, on the same hierarchical level, or between the different levels. In building up

categories, one has to decide when a difference is sufficiently great so that a new group on the same level is called for, or so that a new level is called for. If one could see in objects only the characteristics which differentiate them with respect to any one level, and this level were appropriate to his purpose, his problem of classification would be simple. But what one really sees is a host of characteristics belonging to different levels of a hierarchy—perhaps of several different hierarchies at once. He sees objects differing in several respects and similar in several others, and he does not know immediately whether these differences should be ignored or should constitute a separate class or a new level. Therefore, one has to classify the various characteristics of a set of objects into different levels of generality, to select those that belong on a level (or on levels) suitable for his purpose, and to use these, disregarding other similarities and differences which are judged not to be of immediate significance.

One does not follow such a process rigorously, because it is much too great a task for the ordinary study. Ordinarily one attempts to accomplish approximately the same result by short-cut methods. Although this is normal, it calls for a critical examination of the work at every step to see that it is defensible. In examining his tentative products, one should consider ordinary ideas of natural groups, as well as abstractly logical differences. Many practical classification schemes in everyday use are not highly logical, but seem to work with a high degree of satisfactoriness. For most purposes we want something that is serviceable rather than theoretically finished, and the student should strive in the direction of the practical —or he will probably never complete his study. As examples of practical classification one may study the tables of contents of encyclopedias, textbooks, or other thought-skeletons of organized material.

In closing this topic, it should be said that classification is a mental phenomenon and not an objective one. Objects differ, but the grouping of these objects into classes is a product of

the mind. Recognition of this fact will show that classification is associated with purpose as it is with objective facts. The facts alone do not indicate the scheme of classification; this must grow out of the mind of the worker, considering the facts *in the light of his purpose.* As a final caution, it should be repeated that what one finds as a result of his study may be determined largely by the particular categories which he sets up; if these are satisfactory, his results may be representative; if the categories are poorly set up, his results may be entirely misleading.

Barr recognized these difficulties of classification in connection with the determination of a working set of objectives for supervisors and proposed a method which utilizes the judgment of several workers in classifying objectives that have been proposed by others.[186]

Concluding statement. It was pointed out in the first part of this chapter that normative-survey research is designed to secure information on conditions or practices as they exist. The type of information which this kind of research yields is in wide demand, particularly by persons who have practical problems to solve. The method forms a useful supplement to other methods of research in affording knowledge of conditions over a wide area, and the procedures used in gathering data for normative-survey purposes are also utilized by other research methods.

Three types of normative-survey research have been treated in the present chapter. *Survey testing* is used to ascertain the general level of a group with respect to school achievement, intelligence, or personality. Survey testing is carried on in large volume both within city school systems and in larger areas by state or regional agencies. *Questionnaire inquiries* are also frequent and may extend over wide areas. They are

186 Earl Miller, "A Study of the Objectives in the Teaching of American History." Master's thesis. Madison, Wis.: University of Wisconsin, 1928. Pp. 120.

A. S. Barr and Lester M. Emans, "What Qualities Are Prerequisite to Success in Teaching?" *Nation's Schools,* VI (September, 1930), 60-4.

The method is briefly outlined in Barr's *Introduction to the Scientific Study of Classroom Supervision,* pp. 54-6, and 328-40. New York: D. Appleton and Co., 1931. Pp. 399.

adapted both to gathering facts and to gathering opinions and attitudes and have a wide range of application. *Documentary frequency studies* represent a quantitative analysis of written or printed material by counting the frequency with which specified characteristics occur. The method has received extended use as a basic step in curriculum construction, through analyzing uses or goals, and errors or shortcomings. The method affords a survey of what is going on, or what has taken place, in the field of written and printed materials, much as the questionnaire does for information and attitudes which may not be expressed in writing.

Normative-survey data are not generally easy to interpret. They require careful evaluation and thoughtful analysis in order that their true significance for practical conclusions may be discovered.

A discussion of the construction of appropriate schedules for collecting data has been given in connection with each of the three types discussed, and references have been made to the literature which will be helpful in carrying out the technical details of preparing to undertake research. Typical studies of each kind of research have been cited so that those who are interested may extend their familiarity with the methods to any point desired.

Three additional types of normative-survey research will be similarly treated in the chapter which follows.

Problems and Exercises

1. Prepare a brief description of two research studies illustrating each of the three types of normative-survey research described in this chapter. Describe the similarities and differences existing between the studies representing the different techniques. These studies may be taken from the footnote references.

2. Prepare a questionnaire on some subject of your selection, and present it to the class for detailed criticism. Preferably it should be mimeographed and filled in by each member, who should raise all of the questions possible about the form. The questionnaire might be worked out as a committee or a class project, and submitted to other persons for criticism. There should be class discussion of the results.

3. As an exercise in making categories, divide up the functions of a city school system, and arrange them in some systematic scheme of classification.

4. To illustrate the difficulties met in a simple problem of classification, group the forty-eight states into classes, on any appropriate basis, for any specified purpose, and defend this classification before the class. States may or need not be adjacent within any one class, as the instructor directs. In classifying and discussing, consider the homogeneity of each class, the differences between the classes, and the variations existing within a single state.

5. Assume that you wished to make a study of how high-school pupils spend their entire time, and that you had secured the coöperation of 100 pupils who were willing to report to you for a month. Devise a set of categories in which you would like for them to report. Choose your own purpose for making the study, and then discuss the categories in the light of the purpose. Better still, in advance of the discussion, exchange classification schemes with other members of the class, and attempt to record your own time for two days in the categories which have been devised.

Selected References †

Bixler, H. H. *Check-Lists for Educational Research*. New York: Teachers College, Columbia University, 1928. Pp. 118.

Bobbitt, Franklin, and Others. *Curriculum Investigations*. Supplementary Educational Monographs, No. 31. Chicago: University of Chicago, 1926. Pp. 204.

Buros, Oscar K. *Educational, Psychological, and Personality Tests of 1933 and 1934*. Studies in Education, No. 7. New Brunswick, N. J.: School of Education, Rutgers University, May, 1935. (To be issued annually for new tests of preceding year.)

Charters, W. W. *Motion Pictures and Youth: A Summary*. New York: The Macmillan Co., 1933. Pp. 66.

———, and Waples, Douglas. *Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929. Pp. 666.

Cowley, W. H. *The Personnel Bibliographical Index*. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

Education Index. Published monthly; cumulated at intervals during the year, at the end of year, and every three years. Available in most libraries in the periodical room or reference room. Published by the H. W. Wilson Co., 950 University Ave., New York.

* Goodenough, Florence L., and Anderson, John E. *Experimental Child Study*. New York: The Century Co., 1931. Pp. 546.

Hildreth, Gertrude H. *A Bibliography of Mental Tests and Rating Scales*. New York: The Psychological Corporation, 1933. Pp. 242. Covers both scholastic achievement tests and intelligence tests.

† See also the footnotes of this chapter.

* KOOS, Leonard V. *The Questionnaire in Education*. New York: The Macmillan Co., 1928. Pp. 178.

* LEE, J. M. *A Guide to Measurement in Secondary Schools*. New York: D. Appleton-Century Co., 1936. Pp. 514.

* ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research*. New York: Henry Holt and Co., 1929. Pp. 448.

* RICE, Stuart A., and Others. *Methods in Social Science*. Chicago: University of Chicago Press, 1931. Pp. 822.

SMITH, Henry Lester, and WRIGHT, Wendell William. *Second Revision of the Bibliography of Educational Measurements*. Bulletin of the School of Education, Indiana University, IV (November, 1927), No. 2. Bloomington, Ind. Pp. 251.

* SYMONDS, Percival M. *Diagnosing Personality and Conduct*. New York: The Century Co., 1931. Pp. 602.

* ——— *Psychological Diagnosis in Social Adjustment*. New York: American Book Co., 1934. Pp. 362.

THOMAS, Dorothy S., and Associates. *Some New Techniques for Studying Social Behavior*. Child Development Monographs, No. 1. New York: Teachers College, Columbia University, 1929. Pp. 204.

* TYLER, Ralph W. *Constructing Achievement Tests*. Columbus: Bureau of Educational Research, Ohio State University, 1934. Pp. 102. (Planographed reproduction of fourteen articles which previously appeared in the *Educational Research Bulletin*.)

U. S. Office of Education. *Bibliography of Research Studies in Education*. Issued annually. To date the bulletin numbers are as follows: For 1926-1927, Bulletin, 1928, No. 22; for 1927-1928, Bulletin, 1929, No. 36; for 1928-1929, Bulletin, 1930, No. 23; for 1929-1930, Bulletin, 1931, No. 13; for 1930-1931, Bulletin, 1932, No. 16; 1931-1932, Bulletin, 1933, No. 6; for 1932-1933, Bulletin, 1934, No. 7; for 1933-1934, Bulletin, 1935, No. 5.

WAPLES, Douglas, and TYLER, Ralph W. *Research Methods and Teachers' Problems*. New York: The Macmillan Co., 1930. Pp. 653.

WOODY, Clifford, and SANGREN, Paul V. *Administration of the Testing Program*. Yonkers-on-Hudson, N. Y.: World Book Co., 1932. Pp. 398.

CHAPTER VIII

THE NORMATIVE-SURVEY METHOD: INTERVIEW, OBSERVATION, AND APPRAISAL PROCEDURES

Introduction. This chapter continues and concludes the discussion of normative-survey research. The preceding chapter dealt with three types: (1) survey-testing studies, (2) questionnaire inquiries, and (3) documentary frequency studies. The present chapter deals with the second series of three types: (4) interview studies, (5) studies of behavior employing observational procedures, and (6) survey-appraisal procedures. The last type, because of the quantity of material and variety of techniques, is treated in two divisions: (*a*) appraisal procedures which involve direct judgment, and (*b*) appraisal procedures which are relatively objective.

The three types of normative-survey research treated in the preceding chapter lean rather heavily upon prepared instruments, or schedules—tests, questionnaires, and categorical lists. The three types discussed in the present chapter—excepting 6-*b*—are more dependent upon the direct judgment of the worker at the time of gathering the data. The techniques in the 6-*b* group, like those of the preceding chapter, depend upon judgment primarily in the decisions which are made previous to the time of gathering the data.

4. STUDIES EMPLOYING INTERVIEW PROCEDURES

In the interview for investigational purposes the research worker is gathering data directly from others in face-to-face contacts, as contrasted to most of the procedures heretofore discussed. Several kinds of facts can be secured only from

other people—for example, many facts of personal history,[1] of certain personal habits and characteristics,[2] of family life,[3] opinions, beliefs, etc. Some of these facts can of course be ascertained through the instrumentality of a questionnaire, check-list, or test distributed to groups of people. For that reason some workers refer to the interview as an "oral questionnaire." Such a reference or definition, however, may tend to obscure the unique characteristics of the interview, for it is indeed more than an oral questionnaire.

By means of the interview it is possible to secure many data that cannot be obtained through the less personal procedures of distributing a reply blank. People generally do not care to put confidential information in writing; they may want to see who is getting the information and receive guarantees as to how it will be used; they need the stimulation of personal contacts in order to be "drawn out," and some may be too ignorant to read and write. Furthermore, the interview enables the worker to follow up leads and take advantage of small clues; in complex material where the development is likely to proceed in any direction, no prepared instrument can perform the task. Again, the interview permits the interviewer to gain an impression of the person who is giving the facts, to form some judgment of the truth in the facts, and to "read between the lines," things that are not said.[4] Finally the interview affords an opportunity for the interviewer to *give* information and to develop certain attitudes on the part of the respondent. Such an oppor-

1 Ruth S. Cavan, "Interviewing for Life-History Material," *American Journal of Sociology*, XXXV (July, 1929), 100-15.
E. T. Krueger, "The Technique of Securing Life-History Documents," *Journal of Applied Sociology*, IX (March, 1925), 290-8.

2 Arthur T. Jersild, Frances V. Markey, and Catherine L. Jersild, *Children's Fears, Dreams, Wishes, Day-Dreams, Likes, Dislikes, Pleasant and Unpleasant Memories:* A Study by the Interview Method of 400 Children, Ages 5 to 12. Child Development Monographs, No. 12. New York: Teachers College, Columbia University, 1933. Pp. 172.

3 Ernest R. Mowrer, *Domestic Discord*, Chapter V, "The Interview Process," pp. 53-64. Chicago: University of Chicago Press, 1928. Pp. 277.
Gilbert Van T. Hamilton, *A Research in Marriage*. New York: Albert and Charles Boni, 1929. Pp. 570.

4 Stuart A. Queen, "Social Interaction in the Interview: An Experiment," *Social Forces*, VI (June, 1928), 545-58.

tunity is particularly important in the "treatment interview" [5]— used extensively in case work. In other words, the interview permits an exchange of ideas and information; it is not necessarily a one-way method.

Employment interviews. Most people who are now employed participated in an interview when they were being considered for their positions. In an employment interview [6] certain facts concerning the individual's training and experience are usually sought, although these could very well be gathered on application blanks. The principal purpose of the face-to-face contact is to afford the employer an opportunity to observe the reactions of the respondent, to get some basis for judging the quality of the individual's mental reactions and the social aspects of his behavior. Employment interviews do not themselves constitute research, but they may be made the object of research.[7]

Interviews in education and personnel work. Perhaps no research technique is as close to the teacher's vital problems as the interview. Not only is it important for research purposes, but it can be used directly by the teacher in connection with her everyday classroom problems.[8] It is in fact indispensable in diagnosis.[9] Brownell [10] was one of the early

[5] Percival M. Symonds, *Diagnosing Personality and Conduct*, Chapter XII, "Interviewing," pp. 450-84. New York: The Century Co., 1931. Pp. 602. Includes seventy-six references in the bibliography.

Ernest R. Mowrer, *op. cit.*, Chapters IX-XIV, pp. 122-236.

[6] Donald A. Laird, *The Psychology of Selecting Men*, Chapter VI, "The Interview," pp. 101-15. (Second edition.) New York: McGraw-Hill Book Co., 1927. Pp. 345.

"Technics in Selection and Placement," p. 282, in "Teacher Personnel," *Review of Educational Research*, IV (June, 1934), No. 3.

[7] Richard S. Uhrbrock, "Analysis of Employment Interviews," *Personnel Journal*, XII (August, 1933), 98-101. See also studies referred to in the preceding footnote.

[8] Ruth Strang, *The Rôle of the Teacher in Personnel Work*, especially Chapter XV, "The Interview in Personnel Work," pp. 325-51, and pp. 401-2. (Revised and enlarged edition.) New York: Teachers College, Columbia University, 1935. Pp. 417.

George W. Hartmann, "Interview as a Research and Teaching Device," *Journal of Applied Psychology*, XVII (April, 1933), 205-11.

[9] Lofton V. Burge, "Interview Technique as a Means of Diagnosing," *Journal of Educational Research*, XXVII (February, 1934), 422-9.

[10] William A. Brownell, "An Experimental Study of the Development of Number Ideas in the Primary Grades." Doctor's thesis. Chicago: University of Chicago, 1926. Pp. 384. Also published as *The Development of Children's Number Ideas in the Primary Grades*. Supplementary Educational Monographs, No. 35. Chicago: University of Chicago, 1928. Pp. 241.

workers to recognize this fact. Buswell and John[11] used the technique to discover difficulties in arithmetic, and they have incorporated it into their individual diagnostic tests.[12] The procedure has proved revealing. Burton[13] employed the interview in addition to a test to learn what degree of understanding the test results represented. The interview is often the only means by which the teacher can discover the detailed processes that the child is using in his thinking. It is also useful in studying the more general habits of work and[14] usually reveals conditions that the average teacher "would never have dreamed of."[15]

The complete pattern of diagnostic research will be presented in Chapter X; here attention is called to those analyses which can be made directly through interviewing. To illustrate one application, let us assume that a certain fifth-grade teacher has a pupil who is having difficulty with arithmetic. The teacher has drilled him in the usual fashion; in fact she has given him more than the usual amount of drill, but he does not improve. His daily work is poor, even though the teacher marks his problems with a big red cross and assigns extra work for him to do at home. She has given him all sorts of arithmetic tests, and his scores are invariably low. Thus, having satisfied her teaching conscience by giving the pupil extra work, the teacher finally excuses herself by using standard tests to "prove" that the pupil simply cannot do arithmetic. Instances of this nature occur every semester in

11 Guy T. Buswell and Lenore John, *Diagnostic Studies in Arithmetic*. Supplementary Educational Monographs, No. 30. Chicago: University of Chicago, 1926. Pp. 212.

12 Guy T. Buswell and Lenore John, *Buswell-John Diagnostic Tests for the Fundamental Processes in Arithmetic*. Bloomington, Ill.: Public School Publishing Co., 1926.

13 William H. Burton, "The Nature and Amount of Civic Information Possessed by Chicago Children of Sixth-Grade Level." Doctor's thesis. Chicago: University of Chicago, 1924. Pp. 262. See also his article, "A Contribution to the Technique of Constructing Best-Answer Tests," *Elementary-School Journal*, XXV (June, 1925), 762-70.

14 Jessie Allen Charters, "Methods of Study Used by College Women," *Journal of Educational Research*, X (December, 1924), 344-55.

Maxie N. Woodring and Zaida F. Metcalfe, "The Use of the Interview in the Improvement of Study," *Teachers College Record*, XXXV (March, 1924), 480-92.

15 William A. Brownell and Others, "Remedial Cases in Arithmetic," *Peabody Journal of Education*, VII (September and November, 1929, January, March, and May, 1930), Nos. 2, 3, 4, 5, and 6. A series of five articles dealing with diagnosis and instruction of individual children.

thousands of schools. Yet if this teacher would avail herself of a little reading in diagnostic literature which has been produced as a result of research by the interview and other techniques, she might be stimulated to work *with* this pupil and talk with him about his processes and his difficulties. She might find that he was having difficulty because he had not learned the basic number combinations of the fundamental operations; or he might not know how to carry when adding, multiplying, subtracting, or dividing; he might not understand what multiplication really means, or how to start division; numbers might have no practical significance to him; or he might be handicapped by any number of other possible difficulties which are relatively specific and are remediable. The same type of situation may exist with reference to any of the school subjects, and it is likely to continue to exist until the teacher or somebody else talks with the pupil sympathetically, patiently, and for the purpose of *learning*. Teaching may begin after thoughtful consideration of what the teacher has learned from the interview. It is a wise teacher who knows when to teach—and when to learn.

The technique here described, together with the observational, experimental, and diagnostic procedures discussed later, throws much light on instructional problems. Many teachers believe that children do not succeed in school because they are mentally below average. Intelligence is one factor in school work, but there has been too general a disposition for teachers to use it as an excuse. It is every teacher's own responsibility to ascertain the real causes of her pupils' difficulties, and not to generalize at the outset that a pupil is failing because he is not bright enough, because he is not interested in the work, is inattentive, lazy, or absent too much. Such types of thinking are too superficial to be justified, with the current status of scientific understanding in education. Research of the type included in the references cited will disclose the real causes of pupil difficulty, including lack of interest, absence, and other symptoms of maladjustment.

Even though a teacher may not care to engage in producing research, she is under obligation *as a teacher* to keep in touch with the current findings of research and to expand her insights in keeping with the ever growing revelations of research on instructional problems. A further obligation of a teacher is to make practical application of these insights through studying individual pupils. In so doing, she may not be performing research, but she is meeting her opportunity as a teacher by utilizing methods which research has tested and found to be valuable.

In the interest of enlightened teaching it may further be pointed out that there are probably a fair number of universities with sufficient interest in practical research to accept Masters' theses based upon systematic, properly conducted study of the problems in a teacher's own classroom. Such opportunities should be welcomed by teachers.

School workers other than teachers have many occasions for interviewing. It is, in fact, a part of the regular work of vocational counsellors,[16] attendance officers,[17] visiting teachers,[18] and deans.[19] It is of course an essential part of the administration of the Stanford-Binet individual intelligence test, and D. S. Snedden[20] has made an informal disguise of an intelligence test which is entirely in the form of an interview. Although routine uses of the interview are not to be considered research, it is important to note practical applications of research techniques. Also, such applications may readily become research if the worker will integrate his experiences into large, embracing observations which grow out of his

16 Ethel P. Andrus, "Counselor's Interview to Assist in the Choice of Subjects and Occupations," *Occupations*, XII, Part II (March, 1934), 78-84.

17 Arch O. Heck, *Administration of Pupil Personnel*, Chapter V, "The Attendance Department," pp. 85-105. Boston: Ginn and Co., 1929. Pp. 479.

18 Esther Heath, *The Approach to the Parent*. New York: Commonwealth Fund, 1933. Pp. 163.
Jane F. Culbert, *The Visiting Teacher at Work*. New York: Commonwealth Fund. 1929. Pp. 235.

19 Esther A. Gaw, "Technique Used in the Office of a Dean of Women," *Educational Research Bulletin*, IX (May 28, 1930), 289-323.

20 Donald Scott Snedden, *A Study of Disguised Intelligence Tests (Interview Form)*. Teachers College Contributions to Education, No. 291. New York: Teachers College, Columbia University, 1928. Pp. 48.

regular work and afford substantiated insights which increase understanding in this field.

The interview is prominent in social case study [21] and in psychiatric work.[22] The preparation of case histories [23] has become a well-established technique,[24] involving (where possible and appropriate) measurements of intelligence, of educational status, of physical condition, and of personality, in addition to many data concerning the history of the individual and of his family.[25] In the clinic the psychiatrist will not only obtain facts of history from the patient, but will also gain some of his more important insights into the case by drawing out various comments from the individual. Symonds says, in fact, that "The personal interview, then, becomes the most important single device available in the differential diagnosis of mental disorder." [26] The nature of case study work will receive more complete description in Chapter X. These procedures are not foreign to the work of the practical educator; in fact teachers and administrative officers should regularly be active in the preparation and use of case histories.[27]

Field uses. The interview is the chief method of gathering data in the field. Censuses and other similar undertakings de-

21 Pauline V. Young, *Interviewing in Social Work*. New York: McGraw-Hill Book Co., 1935. Pp. 416.

Porter R. Lee and Marion E. Kenworthy, *Mental Hygiene and Social Work*, Chapters II, III, and Appendix C. New York: Commonwealth Fund, 1929. Pp. 320. 1931 edition has index.

George A. Lundberg, *Social Research*, Chapter VIII, "Case Studies and the Statistical Method," pp. 168-96, and pp. 338-41. New York: Longmans, Green and Co., 1929. Pp. 380.

22 Victor V. Anderson and W. M. Kennedy, *Psychiatry in Education*. New York: Harper and Bros., 1932. Pp. 430. See also Lee and Kenworthy, *op. cit.*

Percival M. Symonds, "The Province of Psychological Counseling," *Teachers College Record*, XXXVI (January, 1936), 313-27.

23 Caroline B. Zachry, *Personality Adjustments of School Children*. New York: Charles Scribner's Sons, 1929. Pp. 306.

24 William Claude Reavis, *Pupil Adjustment in Junior and Senior High Schools*, Chapters III-VI, pp. 41-125. Boston: D. C. Heath and Co., 1926. Pp. 348.

25 "Interviews, Interviewers and Interviewing in Social Case Work." Fifteen articles reported from *The Family*. Family Welfare Association of America, 130 E. 22d St., New York, 1931. Pp. 133.

26 Percival M. Symonds, *Psychological Diagnosis in Social Adjustment*, p. 70. New York: American Book Co., 1934. Pp. 362.

27 Ruth Strang, *The Rôle of the Teacher in Personnel Work*, Chapter XIV, "The Technic of the Case Study," pp. 289-324, and p. 401. (Revised and enlarged edition.) New York: Teachers College, Columbia University, 1935. Pp. 417.

pend upon the interview. Census takers ordinarily gather information concerning the entire family by talking to a single representative of the family. Censuses are of course useful in education, since they afford the basis for the administration of compulsory attendance laws.[28] Investigations of the social and economic status of the families from which school children come[29] usually involve visiting homes and interviewing parents,[30] although information is sometimes obtained at school from the children. Studies of home environment will undoubtedly become increasingly common as educators tend more and more to recognize the rôles that such factors play in determining the needs of school children, and consequently the kind of curriculum that they should be pursuing.

Sociologists and economists gather data for many important investigations by means of the field interview.[31] Standards of living and their costs are amenable to such methods. For example, one of our large automobile manufacturers desired to establish a rate of pay for its workers in foreign branches which would enable them to maintain the same standard of living as its employees in this country enjoyed. To do this, a careful study[32] was made of the purchases in this country by

28 Arch O. Heck, *Administration of Pupil Personnel,* Chapters VIII, "The School Census: Current Practice," and IX, "The School Census: A Program." Boston: Ginn and Co., 1929. Pp. 479.

29 J. B. Maller, "Economic and Social Correlatives of the School Program in New York City," *Teachers College Record,* XXXIV (May, 1933), 655-70.

30 P. M. Symonds, *Diagnosing Personality and Conduct,* Chapter XV, "Measures of the Environment." New York: The Century Co., 1931. Pp. 602. Gives bibliography of thirty references.

Seven scales for rating home and neighborhood conditions are described in some detail by Symonds in his *Psychological Diagnosis in Social Adjustment,* pp. 328-32. New York: American Book Co., 1934. Pp. 362.

See also a review of studies on rating the home, together with the scales which are available, p. 207, in Goodwin B. Watson, "Tests of Personality and Character," *Review of Educational Research,* II (June, 1932), No. 3.

31 Bruce V. Moore, "The Interview in Social Industrial Research," *Social Forces,* VII (March, 1929), 445-52.

George A. Lundberg, *Social Research,* Chapter VII, "Field Work: The Interview and the Social Survey," pp. 140-67, 336-8. New York: Longmans, Green and Co., 1929. Pp. 380.

Robert S. Lynd and Helen Merrell Lynd, *Middletown:* A Study in Contemporary American Culture, pp. 507-9. New York: Harcourt, Brace and Co., 1929. Pp. 550.

32 "Standard of Living of Employees of the Ford Motor Company in Detroit," *Monthly Labor Review* of the U. S. Bureau of Labor Statistics, XXX (June, 1930), 11-54 (or pp. 1209-52).

typical families dependent on the company wages; corresponding articles and services were then priced in the foreign markets, and the cost of a comparable standard of living determined. In order to gather the basic data, trained interviewers spent a great deal of time in each home. On the basis of these interviews they recorded information on a prepared list containing 480 items!

Twice, a similar method has been employed to determine the salaries of certain Federal employees.[33] The effects of the depression and consequent unemployment on home life have been studied by the interview method.[34] For some years industrial and commercial concerns have analyzed buying preferences[35] of householders by canvassing homes with carefully tested questions.[36]

Interviewing for analysis and appraisal. Charters[37] has indicated a vast field of information relating to the solving of practical problems, which can be tapped through the interview. That is, persons who are notably successful in their various undertakings have certain methods of work, they are guided by certain standards, and they react in certain ways, which make their work more successful than average. The factors that make for good work constitute important information for the training of others. By ingenious interviewing—and perhaps some observing—one can secure essential differences in the thinking and procedures of successful and unsuccessful workers. In this way Nietz[38] interviewed 111 outstanding men in

33 "Cost of Living of Federal Employees in Five Cities," *Monthly Labor Review* of the U. S. Bureau of Labor Statistics, XXIX (August—November, 1929), 315-35, 748-59, 1013-26, and 1039-48. (Available also as a reprint.) See also, "Changes in the Cost of Living of Federal Employees in Washington," pp. 59-69, in "Retail Prices and Cost of Living," for December, 1933.

34 Earle E. Eubank, "Consequences of Unemployment in Cincinnati, 1932" in *Report of the Ohio Commission on Unemployment Insurance*, Part II, Studies and Reports, Chapter III, pp. 41-69. Columbus, Ohio: The State House, January, 1933. Pp. 304.

35 Henry C. Link and Irving Lorge, "The Psychological Sales Barometer," *Harvard Business Review*, XIII (January, 1935), 193-204.

36 For an index to this literature, see the *Psychological Index*, Division VIII, Topic 4: "Advertising and Selling."

37 W. W. Charters, "The Collecting of Unrecorded Specifics," *Journal of Educational Research*, V (April, 1922), 280-94.

38 John A. Nietz, "Duties and Traits of a Good Citizen," Chapter VII, pp. 54-68, in Franklin Bobbitt and Others, *Curriculum Investigations*. Supplementary Educational Monographs, No. 31. Chicago: University of Chicago, June, 1926. Pp. 204.

Chicago to secure their ideas of the things the average citizen should do if he were to perform his citizenship duties well.

Interviews may play an important rôle in the preparation of questionnaires and check-lists which are to be put to extensive or crucial use. Reference was made in the preceding chapter to the study by Charters and Whitley of secretarial duties and traits.[39] To secure a set of activities which could be used as a check-list, 125 secretaries were interviewed. This procedure yielded 871 different duties, and these were submitted in check-list form to 2,000 secretaries to obtain the relative frequency with which the activities were performed. The second part of this study was concerned with discovering the relative importance of various vocational and personality traits in secretaries, as judged by their employers. For this part of the study the investigators depended entirely on the interview.

Employers were induced to talk about the qualities in secretaries which pleased them, which irritated them, the qualities which they would like to improve in their present secretaries, etc. These interviews were taken down in shorthand, and the typewritten reports analyzed. This procedure probably gave a much more valid return than would have been possible if employers had hurriedly checked a list, for the mere presence of a printed list of traits would to a certain extent spoil the perspective of the one responding to it and would result in a different order of ranking from that which he would give if analyzing his own experience without a list.

A further difficulty in the use of a list for this purpose is the inevitable difference in the interpretation of the terms used for the personality or action traits. This would be an additional cause of confusion for the person responding, since he would feel that many terms in the list overlapped, and he would not know which one to check. As a matter of fact, this same element must necessarily be a cause of confusion to the research

39 W. W. Charters and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits.* Baltimore: Williams and Wilkins Co., 1924. Pp. 186.

worker in the interpretation of his interview responses; he must strive to put together the different terms used by different respondents for the same concepts, or else he will simply pass on to the reader the problem of unravelling the confusion. In the example referred to in the foregoing paragraph, it was possible to ask the employer just what he meant by each term—could he give a few illustrations? This is one of the peculiar advantages of the interview—following up any lead that is given, and stimulating the person to talk on it and develop it.

The same technique was used by Charters and Waples in the Commonwealth Teacher-Training Study.[40] Ninety-seven interviews were held with administrators, teachers, parents, pupils, professors of education, and teachers' agencies,

> . . . to discover what they believed to be the traits most essential for success in teaching. . . . They explained the meaning of each trait by giving examples of activities whereby the trait was expressed. In this way were secured approximately 2,800 actions indicating the possession of traits. (pp. 15-16.)

In this way a master list was secured which was subsequently arranged under twenty-five heads as "traits." Charters points out that the interview was used because

> . . . it is possible to secure a much more definite and detailed description of the traits by the interview, which permits the asking of questions. . . . Only by asking a large number of specific questions can the interviewer be sure that he has clearly understood and accurately recorded the judge's definition of a given trait. . . . It is essential that the terms used in defining a trait be made explicit by synonyms and concrete examples. (p. 52.)

Articles suggesting other applications of the interview to research will be found in the *Education Index* under the topic, "Interviews."

Waples and Tyler show that the data which can be obtained through the process of interview are subject to four important limitations relating to the respondent: (1) his experience, (2)

[40] W. W. Charters and Douglas Waples, *Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press. 1929. Pp. 666.

his judgment, (3) his accessibility and willingness to divulge the information, and (4) his ability to express himself clearly.[41] The condition of each of these factors should be known before data are relied upon. Rice [42] has called attention to another source of danger in the interview—that of the interviewer transferring to the respondent some of his own ideas or leanings. Most people realize how much one tends to agree with another person in conversation on inconsequential topics. The one being interviewed may have little idea of the significance of the things he is saying and hence will in many cases tend to respond in accordance with any suggestion of an attitude or general trend that is dropped by the interviewer.

Preparation for the interview. Interviewing is an art and requires long study and experience for its development. Some guidance can be obtained from printed material, but one must expect to undergo a considerable period of practice before he is able to obtain through the interview the results which it is capable of yielding. The limited suggestions given here will serve mainly to introduce the literature and to emphasize the necessity for appropriate planning.

As in preparing the questionnaire and other schedules, one must give considerable thought to the planning of questions he is going to ask. An interview for research purposes cannot be a haphazard affair, or just a pleasant meeting. These statements do not mean that the interview should proceed simply as a series of questions. It should be pleasant and to some extent informal, but underneath this social naturalness must be a thread of questions that will give to the interviewer the information he is seeking, without gaps and without doubtful interpretations.

The interviewer will normally have a set of carefully prepared questions [43] which he will introduce into the conversa-

41 Douglas Waples and Ralph W. Tyler, *Research Methods and Teachers' Problems*, p. 520. New York: The Macmillan Co., 1930. Pp. 653.

42 Stuart A. Rice, "Contagious Bias in the Interview: A Methodological Note," *American Journal of Sociology*, XXXV (November, 1929), 420-3.

43 Several studies cited in the foregoing discussion of the applications of the interview

tion at appropriate points. He may vary such queries to adapt them to individual circumstances; he will usually amplify questions by following up leads as the occasion may suggest, since this is the great opportunity of the interview. To avoid a meaningless set of material when he has his facts all gathered, however, all of the interviewer's work must be done with a plan. He must have decided in advance, or before going very far, just what information is necessary to draw conclusions that will satisfy his principal purpose in making the study.

The interview provides unlimited opportunity for the use of tact. Some information can be secured by direct questions; much more can be secured indirectly. This is because the respondent recoils more or less from the thought of revealing certain information too openly and bluntly and does not generally know the significance of certain details which he omits mentioning. He probably has not been thinking about the material from the angle of the investigator. Again, in the case of children, they do not have sufficiently mature concepts to give a complete recount of experiences or ideas.[44] The responsibility rests upon the interviewer to sample rather thoroughly the knowledge and attitudes of the person being interviewed, through skilfully drawing out responses that represent various elements in the person's thinking. This is where tact and technique count.

Symonds' treatment [45] includes within a brief compass the more important aspects of interviewing, such as the preview, the initial contact, conditions of the interview, securing rapport, "rising action," lessening tension, etc. He gives a bibliography of seventy-six references, including most of the important ones prior to the publication of his book. His analysis affords an excellent brief discussion. For longer, more detailed

technique contain examples of schedules of questions which have been prepared as a basis for the interview.

[44] "The Psychoanalytic Method," in "Methods and Techniques of Educational Research," p. 70, *Review of Educational Research*, IV (February, 1934), No. 1.

[45] Percival M. Symonds, *Diagnosing Personality and Conduct*, Chapter XII, "Interviewing," pp. 450-84. New York: The Century Co., 1931. Pp. 602.

treatises, the reader should consult the standard works of Bingham and Moore and of Young.[46]

Uhrbrock [47] has suggested that stenographic reports furnish an important means for the study and improvement of one's interviews. Bixler [48] gives twenty-two points for conducting interviews. Lundberg [49] treats the problem of interviewing in social work, including the supporting administrative organization. Several other references may prove valuable.[50]

5. STUDIES OF BEHAVIOR EMPLOYING OBSERVATIONAL PROCEDURES

Analysis of documentary material, treated in the preceding chapter, is concerned with what people think and do, as revealed by what they put on paper. The interview, just discussed, reveals what people think and do by what they express in conversation with the interviewer. Observation seeks to ascertain what people think and do by watching them as they express themselves in various situations, selected to typify the conditions of informal living or to represent some special set of factors.

Observation is recognized at once as the most direct means of studying people when one is interested in their overt behavior. In an interview people may tell what they think they

46 Walter Van Dyke Bingham and Bruce Victor Moore, *How to Interview*. (Revised edition.) New York: Harper and Bros., 1934. Pp. 308.

Pauline V. Young, *Interviewing in Social Work*. New York: McGraw-Hill Book Co., 1935. Pp. 416.

47 Richard S. Uhrbrock, "Analysis of Employment Interviews," *Personnel Journal*, XII (August, 1933), 98-101.

48 H. H. Bixler, *Check Lists for Educational Research*, pp. 38-40. New York: Teachers College, Columbia University, 1928. Pp. 118.

49 George A. Lundberg, *Social Research*, Chapter VII, "Field Work: The Interview and the Social Survey," pp. 140-67, 336-8. New York: Longmans, Green and Co., 1929. Pp. 380.

50 H. L. Myrick, *Interviews: A Study of the Methods of Analyzing and Recording Social Case Work Interviews*. Studies in the Practice of Social Work, No. 1. American Association of Social Workers, 1928. Pp. 75.

Sarah M. Sturtevant and Harriet Hayes, "The Use of the Interview in Advisory Work," *Teachers College Record*, XXVIII (February, 1927), 551-62.

Additional references will be found by consulting "Interview," p. 38 of the Subject Index, in: W. H. Cowley, *The Personnel Bibliographical Index*. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

A. S. Barr and Mabel Rudisill, *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education*, pp. 87-93. Bulletin of the Bureau of Educational Research, No. 13. Madison: University of Wisconsin, June, 1931. Pp. 129.

do, but this is often different from what they really do, for they are not generally accurate observers of themselves. Furthermore, they may not wish to give accurate descriptions of themselves; few of us would care to, if we could. It is true that the interview is itself a form of expression, and one may be interested in studying the behavior of others when they are being interviewed; in that case, however, it is really observation that one is depending upon, since the interview then becomes simply a means of setting up a given situation under which to observe people.

Direct observation of behavior has only recently come to be looked upon as a scientific procedure; in fact, a great many scientists would at the present time express serious misgivings as to the possibility of anything "objective" coming from such a method. Regardless of questions about its scientific nature, the fact remains that there are many aspects of behavior which can be studied in no other way, and one has to choose between bearing the criticism of those who emphasize the formalities of science, and foregoing the study of many characteristics which are of large practical importance. It would seem reasonable that the first requirement of a research technique is that it be adapted to the kind of data and the field conditions with which it must deal. Other criteria of science are important, but secondary.

Recent changes and use. In recent years there has been an increasing number of studies of infants and older children, concerned with various activities and characteristics, and based upon direct observation.[51] The rapidly growing interest in child

51 For current references to studies based on observation, consult the *Education Index* for the topic "Behavior" and "Child Care"; consult the index of the annual United States Office of Education *Bibliography of Research Studies in Education* for the topics "Behavior," "Child Study," and "Preschool Education." In the *Psychological Index*, studies utilizing observation are likely to be found under the following heads: VI—1, "Attention and Interest"; VII, "Social Functions of the Individual"; XI, "Mental Development in Man."

A review of studies based upon observation will probably be found in the *Psychological Bulletin* of July each year, where various tests are reviewed. For example, see the comments by Maller in the *Psychological Bulletin*, XXXII (July, 1935), 510. See footnote 32 of Chapter VII for further details of this series.

Another review of observational studies is given by George D. Stoddard, "Observational

study has shifted attention to a great variety of aspects of child growth, and some method of measuring the status of these different characteristics has become necessary. Attempts to measure attainment of the objectives of progressive education have furthered this work. Supervision of classroom teaching depends in large part upon observational methods.

At first, the data that were gathered tended to be too inclusive. Stoddard comments: [52]

> In the past such records consisted of omnibus accounts of everything the child did or said over long periods of minute observation. Voluminous data resulted which were unique for the child being observed. These sometimes led to improved insights on the part of the person doing the recording, but they did not contribute much to the working out of a scientific approach.

As the technique of direct observation has been refined, the tendency has been to restrict the data to a limited (although possibly very complex) characteristic of behavior which could be identified readily by one trained in the work. The results of such observation tend to become measurements of a single trait and can be studied as such. The older case-history types of data, however valuable they might be for clinical use with an individual child, were not readily amenable to statistical treatment. Further, as Stoddard states, "Each set of material contains so much of the peculiar ability, attitude, or even prejudice of the person who assembled it." [53] By limiting the scope of the data to be gathered and by careful definition of the characteristic to be observed, the newer attempts seek to eliminate much of the personal variation in the observer.[54] The

Method," pp. 65-6, in "Methods and Techniques of Educational Research," *Review of Educational Research*, IV (February, 1934), No. 1. See also the discussion in George D. Stoddard and Beth L. Wellman, *Child Psychology*. New York: The Macmillan Co., 1934. Pp. 419.

Percival M. Symonds devotes a chapter to observation (Chapter II) in his *Diagnosing Personality and Conduct*. New York: The Century Co., 1931. Pp. 602.

A number of annotated references will be found in: A. S. Barr and Mabel Rudisill, *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education*, pp. 83-6. Bulletin of the Bureau of Educational Research, No. 13. Madison, Wis.: University of Wisconsin, June, 1931. Pp. 129.

52 Stoddard, *op. cit.*, p. 65.

53 *Ibid.*, p. 69.

54 A tabular comparison of the characteristics of the newer "systematized" observation and the earlier more "unsystematized" observation is given by: Florence L. Goodenough

reliability of such observation compares favorably with the reliability of paper-and-pencil tests.[55]

As a concrete application of this point of view, a series of studies have been made in the Child Development Institute of Teachers College, Columbia University, under the general direction of Dorothy Swaine Thomas. These are known as the Child Development Monographs,[56] of which more than twenty have been published to date. In the first volume,[57] published in 1929, Thomas states that the newer techniques of observation which are used in this series are designed to overcome the difficulties of the older techniques—particularly of the diaries and case studies. She points out that when one is observing behavior in general, he will notice and record different elements at different times, and that the records tend to be a mixture of fact and interpretation because the traits have not been well defined in concrete terms. To overcome these difficulties, only specific reactions of the child are noted. Each study has dealt with a characteristic selected on the basis of its judged significance in the total behavior patterns of individuals.

In explaining why she does not regard the controlled experiment as satisfactory, Thomas states that the real problem is to note the particular stimuli (out of "the multifarious stimuli which comprise their social milieu") to which individual chil-

and John E. Anderson, *Experimental Child Study*, pp. 428-9. New York: The Century Co., 1931. Pp. 546.

A description of important steps in the development of present techniques is given in: Dorothy Swaine Thomas and Others, *Observational Studies of Social Behavior*, Vol. I, "Social Behavior Patterns." New Haven, Conn.: Institute of Human Relations, Yale University, 1933. Pp. 271. See especially Chapter I, pp. 1-42.

The successive steps in the improvement of observational procedure in classroom supervision are given by A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, pp. 4-5, and Chapter V. New York: D. Appleton and Co., 1931. Pp. 399.

55 Symonds, *op. cit.*, pp. 33-6.

See also Thomas and Others, *op. cit.*, especially Chapter V, and Part II.

A. S. Barr, *op. cit.*, especially Chapter V, "The Validation of Data-gathering Devices," pp. 190-248.

56 For bibliographical purposes the latest volume in this series at the date of writing is given: Arthur T. Jersild and Sylvia F. Bienstock, *Development of Rhythm in Young Children*. Child Development Monographs, No. 22. New York: Teachers College, Columbia University, 1935. Pp. 97. This volume contains a list of the preceding twenty-one studies published in this series.

57 Dorothy Swaine Thomas and Associates, *Some New Techniques for Studying Social Behavior*. Child Development Monographs, No. 1. New York: Teachers College, Columbia University, 1929. Pp. 203.

dren react, and to study the consistency of this reaction in an individual, as well as the variability in such reactions between different members of the group.

Thomas is apparently thinking of the artificiality of many experimental situations, especially in laboratories. It should be clear, however, that the conditions under which observation takes place may approach and actually satisfy the requirements for a carefully controlled experiment. (The general nature of experimental research is explained in the following chapter, IX.) The general conditions of observation may be controlled by selecting the room, the equipment, the children who make up the group, special forms of stimuli, and the observers. The remaining requirement in experimentation is the study of the effects produced by changes in a certain factor. A number of investigations which have used direct observation under conditions that make them practically experiments have appeared in the series of bulletins known as the University of Iowa Studies in Child Welfare.[58] These investigations have been made in the Iowa Child Welfare Research Station which sponsors studies of children covering nutrition, physical growth, child psychology, preschool education, and character education.

The University of Minnesota has also contributed studies of the direct observation type. W. C. Olson is credited by one writer with making the pioneer adaptation of the observation method in a rigorous form to educational work,[59] through devising and validating the "time sampling" technique. Other persons at the same university, working in the Institute of Child Welfare, have also utilized this method.[60] Scattered studies of the observation of children have of course been made in many institutions throughout the country. Interest in ob-

[58] See for example, Lois M. Jack and Others, "An Experimental Study of Ascendant Behavior in Preschool Children," in *Researches in Child Behavior.* University of Iowa Studies in Child Welfare, Vol. IX, No. 2. Iowa City: University of Iowa, 1933.

[59] Williard C. Olson, *The Measurement of Nervous Habits in Normal Children.* Institute of Child Welfare Monograph Series, No. III. Minneapolis, Minn.: University of Minnesota Press, 1929. Pp. 97.

[60] See the "Annotated Bibliography of the Publications of the Institute of Child Welfare, 1925-1934," (or later issue). Minneapolis, Minn.: University of Minnesota, June, 1934. Pp. 82. Contains 267 references.

servation for purposes of classroom supervision has been manifested in a number of centers, as recorded by Barr (see footnote 54).

Observing large outcomes of education. Direct observation of behavior has become an important means of appraising the work of progressive schools [61] and of teachers who are interested in certain outcomes in addition to the academic ones. Many of the larger goals of education fall outside of the range of the usual academic abilities, embracing in general the social characteristics of the individual (such as coöperation and adaptability), the self-reliant traits (appropriate independence and self-confidence), the dynamic traits (initiative and spontaneity), good judgment in choosing companions, and other elements of the well-rounded, well-developed individual. Such characteristics cannot be indexed satisfactorily by the methods of testing which have heretofore been used.[62] One may, of course, make a direct appraisal of the work of a class by just "looking on," but a more reliable procedure is to look for definite acts which are regarded as evidence of the attainment of certain objectives.[63] After the observation, the frequency with which these significant acts have occurred may be taken as an index of the extent to which certain habits have become established. Groups which exhibit these significant acts with greater or less frequency show more or less evidence of having grown in the desired direction.[64]

Caswell and Campbell [65] point out that evaluation is in reality a part of the curriculum, and as such it is being given

61 J. Wayne Wrightstone, "Measuring Intangibles in Progressive Schools," *Progressive Education*, XII (February, 1935), 95-7.

A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, Chapter III, "The Survey of the Products of Learning," pp. 62-115. New York: D. Appleton and Co., 1931. Pp. 399.

62 Ralph W. Tyler, "Techniques for Evaluating Behavior," *Educational Research Bulletin*, XIII (January 17, 1934), 1-11.

63 Frederick Pistor, "Valid Scientific Appraisal of an Enterprise in Progressive Education," *Journal of Educational Research*, XXVIII (February, 1935), 433-49.

64 Consult the *Education Index* for appropriate articles on "Progressive Education," and see other articles listed by such writers as Wrightstone, Tyler, and Pistor.

65 Hollis L. Caswell and Doak S. Campbell, *Curriculum Development*, Chapter XIII, "Evaluating the Outcomes of Instruction," pp. 362-76. New York: American Book Co., 1935. Pp. 600.

definite attention in modern courses of study. After a brief discussion of the inadequacies of the more common methods of measurement, in the light of important purposes which evaluation should serve, they refer to the appraisal of "generalized controls of conduct." Citing "The Course of Study for Florida Elementary Schools, Grades I to VI," 1933, pp. 766-70, they quote: "Observational tests are much more important than teachers usually realize. More can be told about the complete development of a child by observing him from day to day than in any other way." The course of study recommends observing the pupils to obtain answers to such questions as: "Does he work well with a group?" "Is he on time?" "Is he pleasant and cheerful?" "Does he read good books during leisure time?" etc. The observational technique is also recommended for individual subject fields, to cover such general traits as self-reliance, responsibility for personal growth, interest, etc.

A different form of observation is represented by the anecdotal technique. This consists in writing down each day certain revealing sayings or doings of children. A teacher may note some half dozen of these a day, for various children. Over a long period of time, such records give a significant picture of a child's development.[66] It is obvious that this type of observation and recording embraces situations which are as natural as possible in the classroom or school environment, and that it is free from strictures imposed by a prepared record form or a specially controlled situation. Therefore it depends entirely on the selective ability of the teacher. When well kept, however, such records provide an important type of information about children. They have been given extended use in the Rochester Athenaeum and Mechanics Institute.[67]

[66] Louis Raths, "Anecdotal Records." Bulletin No. 1 of the research staff in the Eight-Year Evaluation Experiment of the Progressive Education Association. Columbus, Ohio: Bureau of Educational Research, Ohio State University, September, 1935. Pp. 9. Ben D. Wood, "Information for Guidance: The Anecdotal Method of Personal Analysis," *Occupations*, XIII (June, 1935), 795-803.

[67] J. A. Randall, "The Anecdotal Behavior Journal," *Progressive Education*, XIII (January, 1936), 21-6.

H. C. Morrison has devised an observation procedure, with record blanks, for ascertaining the amount of attention during a class period.[68] Knudsen shows at some length how this may be used and interpreted.[69] He points out that attention, although intrinsically a conscious state, has accompanying forms of physical expression. Schmidt is reported to be developing an observational technique for industrial-arts pupils that "goes beyond knowledges and skills into the fundamentals of habits, attitudes, and appreciations." [70]

The appraisal of educational practices, especially when check-lists, rating scales, or score cards are used, is treated more broadly in the following section on "Appraisal Procedures." Other applications will be found in that treatment.

Special forms of recording. In addition to note-taking during direct observation, there are various special forms of recording that provide a more complete record of what takes place. For example, shorthand records may be made of conversations, still or motion pictures may be taken, sound records may be made, and other devices may be employed. The study of records made by such means may be regarded as indirect observation, in contrast with the direct observation that has been discussed. Although records are of course made in the case of direct observation, they are the records of the observer's judgment of what happened; the records referred to as leading to indirect observation are sufficiently complete so that one can secure from them the information desired instead of having to depend directly upon the actual situation.

Stenographic notes lie between direct observation and mechanical means of recording. The human element of the recorder may enter to a considerable extent. The study of shorthand reports is to be regarded, however, as indirect ob-

[68] Henry C. Morrison, *The Practice of Teaching in the Secondary School*, Chapter VIII, "Measuring Group Control," pp. 121-40, and Chapter IX, "Sustained Application," pp. 141-57. (Revised edition.) Chicago: University of Chicago Press, 1931. Pp. 688.

[69] Charles W. Knudsen, *Evaluation and Improvement of Teaching* (in secondary schools), Chapter VII, "Evaluation and Improvement of the Teacher's Group Control," pp. 249-84. Garden City, N. Y.: Doubleday, Doran and Co., Inc., 1932. Pp. 538.

[70] See *Review of Educational Research*, IV (December, 1934), p. 497.

servation. Stenographic records have been made chiefly in the field of supervision and teacher training.[71] At times there has been some disposition to draw conclusions from them as though they represented the classroom situation in its entirety. Such use must prove both misleading and disappointing. It is necessary that the limitations of all research data be recognized, and that they be used only for the purpose for which they are suited. Stenographic reports of classroom conversation give evidence of the relative amounts of verbal participation by teacher and by pupils; they show the extent to which participation is concentrated or scattered in the class; they reveal the type of English used; and they may show the topical emphasis. On the other hand, there are many things which such reports cannot reflect—the dynamic aspects of the teacher's personality, the enthusiasm of the group, the shifting of overt attention, the tempo of the intellectual exchange, etc., in addition to many other non-verbal elements in the classroom situation. They do not in themselves afford a satisfactory basis for judging the work of a teacher beyond certain restricted aspects.

The study of oral English has been greatly retarded by the lack of suitable means for recording and analyzing. Stenographic records have been used to some extent, but their administration is difficult, they are costly, and are not entirely accurate. A sensitive, electric recording device has been developed by Betts, which promises to open up new opportunities in this field. An extensive study of oral language[72] has been

71 H. A. Peterson, E. A. Turner, and B. C. Moore, *Stenographic Reports of Elementary School Lessons.* (Second edition.) Bloomington, Ill.: Public School Publishing Co., 1929. Pp. 96.

See also the topic, "Stenographic Reports of Lessons," in the *Education Index* for references to lessons reported from many different fields of work.

72 For a general description of the work at the University of Iowa, see Harry A. Greene, "Research Techniques Peculiar to English," pp. 133-9, in *The Application of Research Findings to Current Educational Practices.* Official report of 1935 meeting of the American Educational Research Association. Washington: The National Educational Association, 1935. Pp. 273.

For a report of the validation of an electrical record device, see Emmett A. Betts, "An Evaluation of Certain Techniques for the Study of Oral Composition," pp. 7-32, in *Research Studies in Elementary School Language, No. 1.* University of Iowa, Studies in Education, IX (March 15, 1934), No. 2. New Series No. 271. Iowa City, Iowa. Pp. 62. Bibliography of thirty-four references.

As an illustration of the study of oral language usage through shorthand reports, see:

undertaken at the University of Iowa, under the direction of Harry A. Greene, in which electrical equipment will be used for recording and Hollerith tabulating equipment for analysis. Normative studies of language usage of different groups of children and their errors, genetic studies of the development of language patterns, and experimental studies of the effects of different teaching procedures, are important fields which may be more thoroughly investigated in the future with the aid of new mechanical devices.

An extensive study which utilized both motion pictures and stenographic notes was made by Gesell, at Yale University, on infants. This large work, eventuating in *An Atlas of Infant Behavior*,[73] was carried on over some twenty-five years in which goals were defined and techniques sharpened. Gesell was interested in ascertaining what constituted normal behavior of infants at various ages, and children's typical reactions to test situations are shown in the first volume of the *Atlas*. The second volume deals with "naturalistic behavior," and shows children's typical reactions in ordinary home situations, such as feeding, bathing, playing, etc. Although the study as a whole is essentially genetic and therefore will be discussed in Chapter X, it has normative aspects insofar as it is directed toward the establishing of typical behavior patterns of children at various ages.

Mention should be made here of the use of moving pictures in the study of physical activities, such as the movement of players of a football team. Such pictures have the advantage of being able to present the action slowly so that it can be analyzed. Also, each player can see himself from another perspective than his own. Gymnasium performance has been an-

Mary S. Fisher, *Language Patterns of Preschool Children*: Child Development Monographs, No. 15. New York: Teachers College, Columbia University, 1934. Pp. 88. A summary is given in the *Journal of Experimental Education*, I (December, 1932), 70-85.

[73] Arnold Gesell and Others, *An Atlas of Infant Behavior*. New Haven, Conn.: Yale University Press, 1934. 2 vols.

For many purposes the following work will serve as well or better: Arnold Gesell, Helen Thompson, and Catherine Amatruda, *Infant Behavior: Its Genesis and Growth*. New York: McGraw-Hill Book Co., 1934. Pp. 343.

A brief and enlightening account of this study is given in *Fortune*, XI (May, 1935), 86-91, under the caption, "Behold the Babe."

alyzed in the same fashion. One may use such methods for gathering data for many types of research problems.

The recording of certain aspects of behavior by mechanical means tends to make the observation objective. The observer may look at the same record repeatedly and thus improve his judgment as to what actually happened, in contrast with the possibility of an immediate judgment based upon a single impression of something that has ceased to exist after an instant. Furthermore, other workers may also study the record, and if all agree that the behavior recorded represents a certain kind of activity, the method may be said to be highly objective.

An important question with reference to such methods of recording, so far as normative-survey research is concerned, is whether they cover at one time enough different elements of behavior, of the individual and of the group, so that all of the different kinds of significant factors are recorded. It must be remembered that the distinctive contribution which direct observation can make lies in its capacity for dealing with very complex phenomena, especially those occurring in social situations. It is quite possible to vitiate this opportunity through making the character one observes so narrow and simple that it loses the significance it should have for contributing to the understanding of behavior in such situations. This result may occur whether or not one resorts to mechanical means of recording, but any objective form of recording must not in itself impose restrictions upon the nature of the characteristic which it is desired to observe.

Estimates from photographs. Perhaps an illustration of this standpoint is to be found in the difficulty of estimating the intelligence or other personal characteristics of an individual from a still picture. One may say at once that "motion" is not portrayed by still pictures, but it is equally true that any mechanical—or even direct—form of observation may fail to record other elements which, though less immediately obvious, are just as important for one's purpose.

In most of the forms of personality appraisal, direct observa-

tion of behavior is an essential. It is usually of the incidental kind, forming the background for ratings. It has been found also that in giving individual intelligence tests the examiner can learn many things about the intelligence and personality of the subject by noting various elements in his behavior,[74] in addition to the responses formally recognized.

Observation of more static characteristics, however, such as facial features, cannot be relied upon to provide a satisfactory basis for judging either character or intelligence. After reviewing a number of studies of judging character on the basis of looking at an individual or his photographs, Watson states:[75]

> The conclusions of all these investigators are well in accord: temporary emotional states can be identified from facial features, but the more permanent trends in character are not indicated by the measurement of any facial features. Later investigations . . . all point in the same direction.

The judging of intelligence from photographs has failed almost completely.[76] Phrenology and physiognomy are condemned by scientific evidence.[77] Thus the observation of relatively static physiological characteristics of human beings, either directly or through photographs, is not to be classed with the observation of overt behavior.

74 Harry J. Baker, "Clinical Interpretations," pp. 189-91 in "Psychological Tests," *Review of Educational Research*, V (June, 1935), No. 3.

Janet Fowler Nelson, *Personality and Intelligence: A Study of Some Responses Other than Intellect Noted in a Simple Mental Test Situation*. Child Development Monographs, No. 4. New York: Teachers College, Columbia University, 1931. Pp. 62.

75 Goodwin B. Watson, "Character Tests and Their Applications Through 1930," p. 197, in "Tests of Personality and Character," *Review of Educational Research*, II (June, 1932), No. 3.

76 Donald A. Laird, *The Psychology of Selecting Men*, pp. 109-15. (Second edition.) New York: McGraw-Hill Book Co., 1927. Pp. 345.

Katherine T. Omwake, "The Value of Photographs and Handwriting in Estimating Intelligence," *Public Personnel Studies*, III, No. 1, pp. 2-15. Washington, 1925.

Percival M. Symonds, *Diagnosing Personality and Conduct*, pp. 521-2. New York: The Century Co., 1931. Pp. 602.

"Technics in Selection and Placement," p. 282, in "Teacher Personnel," *Review of Educational Research*, IV (June, 1934), No. 3.

Note, however, that personality sketches may be identified from photographs more successfully. See P. E. Vernon, "The Evaluation of the Matching Method," *Journal of Educational Psychology*, XXVII (January, 1936), 1-17.

77 Laird, *op. cit.*, Chapter VII, "Character Reading."

Laboratory observation. In general, laboratory studies involve mechanical records and may be considered an indirect type of observation. Furthermore, they are usually confined to a type of behavior which is not immediately social in its stimulation or expression. It is not our purpose to discuss here the various means of securing laboratory records, since these means will be referred to in the next chapter which deals with experimental research. It is appropriate at this point, however, to call attention to the fact that laboratory investigations normally rely upon mechanical means of observing behavior. Due to this fact, and to the fact that the characteristic being studied is usually made very simple, laboratory investigations are frequently thought of as producing relatively artificial results; that is, not typical of usual life situations.

It is true that the laboratory studies, in the narrow sense, are not capable of measuring directly the more complex types of response which constitute the domain of direct observation; they may, nevertheless, produce results which have large significance for education. This comes about primarily through the discovery of some response which, though fairly simple in itself, is indicative of variation in a much more complex response. Two illustrations will serve to clarify this statement. For one example, we may look to laboratory studies of eye-movements. Although eye-movements in reading are relatively simple in themselves, they may be taken as an indication of the direction of one's attention. By photographing eye-movements, therefore, and noting how many pauses are made in reading a line of type, where these pauses are made, what their duration is, under what circumstances one makes regressive movements, etc., a great deal can be learned about the difficulties the subject is experiencing in reading. In studying eye-movements of a subject looking at a picture, one can learn how people explore pictures, what features catch their attention, what the artist looks at in a picture, etc. Such studies may be normative in character, if made for the purpose of establishing prevailing habits, or they may be experiments, if made

for the purpose of studying variation in performance which follows changes in some factor, such as different sizes of type, different lengths of line, different kinds of reading material, pictures in different colors, etc. These studies will be reviewed at some length in the following chapter.

As a second illustration, we may consider the experiments made by Renshaw and his colleagues in connection with the Payne Fund Studies of Motion Pictures and Youth.[78] Among many experiments conducted in this study, one was concerned with the effect of movie attendance upon restlessness during sleep. A hypnograph was placed beneath bed springs, to register the number of movements which the subjects made while asleep. Many readings were taken first to establish the normal amount of movement; this much of the study may be regarded as normative. Further readings of restlessness were taken after children attended movies of various kinds, and these readings were compared with the norm. As a matter of interest, studies were made of the effect of other factors, such as drinking coffee, staying up late at night, etc. The study of the effects of these several factors, one at a time, makes the investigation an experiment. The aspect with which we are here concerned, however, is that the simple, mechanically recorded character, number of movements made during sleep, represents one form of physiological response to emotional tension or nervous condition and, when studied, affords some insight into the effect of movie attendance and other special factors.

It will thus be clear that laboratory observation may study problems of large moment through recording relatively simple forms of behavior. In so doing, it is only extending the method used in direct observation, namely, the use of some characteristic of behavior as an indication of psychological response tendencies which underlie the overt activity. Laboratory

[78] Samuel Renshaw, Vernon L. Miller, and Dorothy Marquis, *Children's Sleep*. New York: The Macmillan Co., 1933. Pp. 242. Briefly described in W. W. Charters, *Motion Pictures and Youth: A Summary*, pp. 31-5. New York: The Macmillan Co., 1933. Pp. 66. Or see: Samuel Renshaw, "Sleep Motility as an Index of Motion Picture Influence," *Journal of Educational Sociology*, VI (December, 1932), 226-30.

studies, in the usual sense, are ordinarily concerned with behavior in non-social situations. Mechanically recorded observation may, however, be used to study behavior in situations in which the predominating stimuli are social, as previously discussed, care being taken to see that the means of recording portray a sufficiently large or complex aspect of behavior to retain elements vital for one's purpose. Any of the procedures which have been presented—direct or indirect observation of social behavior, or laboratory observation in its restricted sense —may be directed toward normative, experimental, genetic, case study, or other purposes. It is the larger frame of a study, rather than the techniques employed, which determines its methodological character.

Characteristics of observation for research. In concluding the discussion of observation, it may be well to summarize the characteristics which distinguish it from ordinary looking around and entitle it to the claim of a scientific procedure. There are at least six characteristics which may be mentioned in this connection. First, the observation is specific. It is not just looking around for general impressions (however satisfactory that may be for non-scientific purposes). There are definite things for which one looks. These things, furthermore, have been carefully defined, so that there is practically nothing left to the judgment of the observer. All questions of whether a certain activity constitutes an instance of what one is looking for are supposed to be ironed out in the preliminary trials of the technique.

Second, scientific observation of behavior is systematic. It is not a chance "dropping in" on a situation at any time when one happens to be passing by. The length of the observation periods, the interval between them, and the number are carefully planned. These plans are made in the light of other factors which are known—for example, the daily program of the school the children attend, the visiting hours, the periods when the children may be tired, etc. Also, there may be careful arrangements for the control of the situation if special factors

are to be watched, as when the study takes on some of the aspects of an experiment. The entire program of observation is planned with a view to meeting the requirements of scientific work.

Third, the observation is quantitative. Usually the number of instances of a certain type of behavior are recorded. Sometimes it is the total duration of the particular conduct during the period of observation, or it may be the distance traveled by a child, or some other countable or measurable characteristic. Sometimes a diagram is made showing spatial relationships. Such relatively exact qualification is another distinguishing feature as compared with everyday observation. Although it is implied in the foregoing thought, perhaps it is worth mentioning as a separate, and fourth, characteristic that a record of the observation is made immediately. The results are not entrusted to memory, but notes are made as promptly as possible. This is more important than it may appear at first thought, and scientists will recognize its significance.

Fifth, the observation is expert. That is, it is done by some one who is trained to do such work. This statement may, as a matter of fact, appear hopeful, when one considers the many studies which are made by students who are just beginning. Such studies, however, are not likely to be the ones on which the science of education ultimately rests, and it is fair to say that the fundamental investigations in education will be made by those who have had ample training in the appropriate techniques. The difference between the observation of one who is trained and one who is not trained, both in the use of the technique and in the field for which he intends to use it, is sufficient in itself to make the difference between valid and invalid results.

Sixth, and finally, the method makes claim to being scientific because the results can be checked and substantiated. The procedure can be checked by comparing the results of different observers, or by repeating the study. Such checks, however, do

not insure validity; the validity of direct observation depends essentially upon the definitions of the acts which are to be regarded as falling within the category being studied. Validity is the more difficult thing to check upon in most scientific techniques, and in many cases it must rest ultimately upon the consistency with which the findings of different scientific approaches point to the same general conclusions. The reliability of observation can, however, be ascertained, and it has been found to be relatively satisfactory.

Symonds gives a list of detailed requirements if the observation is to be satisfactorily done. In his list of nine essentials to good observation he calls attention to the need for good eyesight, alertness, the ability to estimate, the ability to discriminate, good physical condition, an immediate record, good perception, freedom from preconceptions, and emotional disinterest.[79] Most of these constitute requirements which the observer himself must meet if he is to qualify as an expert, prepared to do scientific observation.

Preparation for observing. One can secure a good idea of the steps he should take in preparing to observe by reading over a number of the studies that have been made since 1928 and by noting the discussions that have been made of the difficulties which were encountered and the steps which have been recommended by the writers to correct these difficulties. The literature is not voluminous; one can read typical studies and treatises with a reasonable expenditure of time. Leading references have been given in the preceding section.

The principal problems arising in connection with observing fall into four groups—planning the administrative aspects, defining the activities, arranging for the record, and training oneself to observe. Brief comments will be made on these phases of the work.

Under administrative aspects are included those larger aspects of the study such as securing an appropriate group of persons to observe, deciding and arranging any special con-

[79] Percival M. Symonds, *op. cit.*, pp. 24-30.

ditions for the group, determining the length of each observation period, the interval between periods, and the number of periods. These are in part problems of adjusting to local conditions, and not much can be said in general. On the other hand, one must consider the general principles of sampling, especially the facts of different numbers of children and different numbers of periods. The length of the period of observation must of course be related to the type of activity being studied, periods of a minute or so being suitable for some things and periods of an hour being better for others. Within limits of appropriateness, there is some evidence that a greater number of short periods is better than a smaller number of long periods.[80]

In defining the activities which are to be observed, the object should be, first, to include those activities which are true representatives of the general category which one is studying, and second, to define them so carefully that questions as to what is included do not arise.[81] Obviously these two steps present real difficulty. They cannot be achieved without time, careful analysis of what one is trying to do, probably some reading, and actual observation in the field. The validity of the results will depend in large part upon how well one chooses and defines activities that will contain the essential elements in which he is really interested. Not infrequently the proper analysis can be made only after extended experience in the field —learning what to look for and deciding upon questionable acts. Perhaps it should also be said here that there is some danger in the tendency to restrict the trait being observed to as narrow or simple an element of behavior as possible; if carried too far, this often defeats the peculiar advantage of the observation technique in being able to deal with significant units of normal behavior.

80 *Ibid.*, pp. 32-38.

81 Definition of what one is looking for is discussed at some length by Ralph W. Tyler, "Techniques for Evaluating Behavior," *Educational Research Bulletin*, XIII (January 17, 1934), 1-11.

See also references to reliability of observation, footnote 55.

The definitions or specifications will, of course, not appear on the record form that is used; they must be well understood in advance. The form for recording will be arranged so as to make note-taking easy and rapid; a great deal of attention may well be given to this point. Much time can be saved by the appropriate use of symbols, abbreviations, and some use of shorthand. Suggestions can be secured from other studies of a similar nature, but in the end one will have to subject his record form to actual trial, along with critical analysis of the blank during and after trial. In designing a record form,[82] one will try to achieve convenience in analyzing or copying off the data from the original record. Although this is secondary to convenience in recording, it nevertheless should not be overlooked as a consideration. If the record is to be made by a stenographer, or moving-picture operator, or by some other special means, one should make preliminary or exploratory observations in advance.

The fourth phase of the work that should receive careful attention is training oneself or others to observe. Perception improves with practice. One learns to see characteristics of behavior by thoughtful practice in seeing them. Even a person who has become aware of the extent to which one has to *learn* to perceive certain characteristics of any situation will have little idea of the impossibility of his noting at the outset all of the instances of some act he is trying to catch. Every kind of research necessitates some expertness in technical skill, and observing is no exception. One is likely to think that such an everyday thing as "seeing" is commonplace and simple. This is not the case, because it is not the physical side of seeing that is the most important, but the psychological side, and this requires the building up of a recognition readiness before skilled seeing can take place. It may require several months of looking through a microscope before one can see things that are in plain sight to the trained person. One should expect to un-

82 George A. Lundberg, *Social Research*, Chapter VI, "The Schedule as an Instrument of Observation," pp. 113-39, 335-6. New York: Longmans, Green and Co., 1929. Pp. 380.

dergo training of several months in the observation of behavior characteristics before he begins to gather data for a study.

Help in learning to observe may be secured from any systematic, purposeful set of observations. A laboratory manual which is excellent for this purpose has been prepared by Wagoner.[83] There are ninety-six exercises classified as to the type of characteristics to be observed. Although this book is designed primarily for nursery-school and kindergarten teachers in training, essentially the same procedures will be used by research workers. Further, one will find the kinds of things which are to be looked for in these different exercises suggestive of characteristics which he may desire to observe in a study of his own. A helpful bibliography is included.

In closing, the worker should be cautioned against underestimating the preparation which is essential to success in the use of this technique. Stoddard comments,[84] "The observational method used to be popular because it required no preparation and no apparatus. One simply watched the child, and the amount he was able to select and observe accurately was dictated by his conscience or his genius." But that day has passed, and the work done under such concepts is one of the things which educational research has to live down.

6. STUDIES EMPLOYING SURVEY-APPRAISAL PROCEDURES

A. Procedures which involve direct judgment. Appraisal procedures are divided into two groups for convenience in treatment, the first group involving direct judgments, and the second group being more objective in immediate form, but involving judgment in the preparation of the instruments or the selection and treatment of the factors which are represented. The first group produces a type of data which are different from most of those that have been discussed under other types of normative-survey research. Tests and question-

[83] Louisa C. Wagoner and Others, *Observation of Young Children*. New York: McGraw-Hill Book Co., 1935. Pp. 297.

[84] *Review of Educational Research*, IV (February, 1934), p. 66.

naires which call for the evaluation of certain items, particularly when a choice from among several scaled opportunities is called for, yield the same type of data as the procedures treated in the present section.

Appraisal is a form of classification or scaling according to subjective values. If an instrument is used which makes the procedure relatively objective, the instrument must have been calibrated in terms of human judgment when it was constructed. In the procedures which are more directly subjective, the value which is assigned to any specimen being rated depends more or less on the individual doing the rating, and it may vary with the same individual from one time to another. Direct rating is perhaps the least satisfactory of the data-gathering techniques from the scientific point of view. On the other hand, there are many practical problems for which it is the most important of all research techniques. Apparently, the more nearly we get to the heart of human problems, the less completely we can depend on approaches that are acceptable to those who emphasize the formal characteristics of objective science. In these areas one has to choose between loyalty to formalism and the desire to do something of practical worth, even though it is not entirely above criticism.

For those who feel that all is lost whenever a research worker allows judgment to enter into his data, it should be pointed out that social scientists are confronted with problems which differ fundamentally from those of the physical scientist, and they must utilize procedures which are appropriate to their problems. The criterion of the social sciences cannot be how nearly they approach the concepts which have proved useful in the physical sciences, but rather how well they deal with the problems which comprise their own responsibility. Because the social sciences are in their infancy, early attempts in the more complicated areas of their field will naturally be primitive; it is their task, however, not to say that they will avoid certain things because these can only be done imper-

fectly, but rather to use crude beginnings as a starting point for a long road of discovery and constant improvement, both in techniques and in findings. In making this progress, these sciences must be oriented by the search for truth that is important in their field and must use increasingly satisfactory measures that will yield this truth, whatever these measures be.

It should not be thought, however, that even objective science of the usual sort is entirely free from observational error. All measurement—even measuring short distances—contains some inexactness and, if we make the units of measurement small enough, the observation will vary for the same person from time to time and from one observer to another. Astronomers long ago noted this fact and denoted such differences in observation as the personal equation, or observational errors. There is a definite statistical theory for dealing with such errors in the physical sciences, known as the theory of least squares, and this has been used for many years. The more modern theories of physics, introduced since the work of Bohr in 1912 and modified further by discoveries of the last five years, recognize certain variations in the behavior of matter, and thus add irregularities in the object to those which may occur in the observation. No science—not even abstract mathematics—can claim to be entirely free from error or approximation.

Appraisal leans more heavily upon the human element than do the objective sciences, for appraisal is undertaken for the specific purpose of including the human element. It is not an attempt to measure objective characteristics; that can be done by the usual methods of the physical sciences. It is rather an attempt to determine *the effect of these characteristics upon human beings*. It is concerned primarily with human values and secondarily with the physical attributes to which these values are, somewhat ephemerally, attached. Our efforts to improve the techniques of appraisal will not, therefore, be directed toward eliminating those changes in value which are truly characteristic of human preferences, for to do so would

be to inject spurious elements into what we desire to keep natural. We should strive only to free the expression of value from sporadic elements so that we may secure a judgment, of the essential characteristics of specimens that is true or typical for the individual judge at a given time. We must expect reasonable variation from time to time, or place to place, or between one judge and another.

At present the foregoing position is not widely accepted among research workers, who are likely to attempt to apply to evaluative procedures the same criteria that they would to a yardstick. Human beings, however, are something more than inert measuring sticks; they have a large number of very unstable characteristics of response, and the canons of science cannot invalidate their right as human beings to have wants, express opinions, and make choices, however changeable these may be. Appraisal is simply the procedure by which we secure and make overt these characteristically variable reactions. Whatever its scientific standing, we recognize that for certain purposes an index of human values may be more important than any number of physical measurements made perhaps with incredible accuracy and reliability.

The discussion will turn at this point to types of rating and various applications that have been made of them. These will be introduced in the order of their increasing complexity or refinement of technique. As was noted in connection with survey testing, these procedures enter into research in various ways. They are treated here, not as processes which normally represent complete research studies in themselves, but as techniques which enter into research undertakings in various ways and to various degrees. Their relation to a complete research investigation depends upon the nature of the particular study. In some instances the techniques are themselves the object of investigation.

Direct comparison. Apart from simple estimation of the worth of any object by itself, the most direct form of evaluation is the comparison of various specimens that can be brought

together, studied, and ranked in order. This form of appraisal is most likely to occur in the construction of a schedule or scale which is later to be used in rating. It is, however, sometimes used directly. An investigator secures the coöperation of a number of persons, referred to as "judges," who rank or rate in some other way the objects with which he is concerned. This process is commonly referred to as the "jury technique," since it involves the pooled judgments of a number of persons —sometimes several hundred or more.

Perhaps the commonest form of this technique is the rating of items in a list. We may refer again to the study of items for school records, made by Heck.[85] Four series of frequencies were secured, and these data were submitted with the items to a group of 133 judges who were requested to pick out the items of basic and universal value. On the basis of the judgments of this "jury," the final list was compiled. In an attempt to ascertain the most pressing problems in education, Hurd[86] scanned current educational literature and secured a list of 102 constructive criticisms. He submitted these to 154 judges to pick out the most important ones. Forty-three of the items were rated as very important by at least 80 per cent of the judges, and these forty-three were reported by Hurd as important points for foci of attention in making educational progress.

An illustration of the jury technique on a large scale is to be found in the Commonwealth Teacher-Training Study.[87] One part of this study had for its purpose the ascertaining of teacher traits that are important for successful work. A master list of twenty-five traits was secured by interviews and subsequent analysis. This phase of the study has been discussed earlier. This master list was submitted to twenty-five judges

85 Arch O. Heck, *A Study of Child Accounting Records*. Bureau of Educational Research Monographs, No. 2. Columbus: Ohio State University, 1925. Pp. 245. Reviewed briefly in his *Administration of Pupil Personnel*, pp. 230-5. Boston: Ginn and Co., 1929. Pp. 479.

86 Archer W. Hurd, "How May Present-Day Educational Practice Be Improved?" *School and Society*, XXXIX (April 7, 1934), 442-4.

87 W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929. Pp. 566.

(experienced school administrators) to rate the traits on the basis of importance. Separate ratings were made for each of five groups of teachers: senior high school, junior high school, intermediate, primary, and rural schools. The judges were asked to designate each trait as most important, of average importance, or of least importance. The frequency with which each trait was placed in one of these three categories was then used to derive finer gradations, so that complete ranking of the twenty-five traits was finally deduced.[88]

As a second part of this same study, a master list of teacher activities (duties) was rated on four aspects. The frequency of performance of the duties was determined by submitting the list to groups of teachers. For ratings on the other three aspects, the check-list was submitted to groups of judges—usually twenty-five to a group, since this number was found to yield a reliable judgment. These groups included administrators, critic teachers, graduate students, etc., and were so selected as to represent many different backgrounds. They were asked to rate each item on a scale of three degrees, for each of the three aspects—difficulty of learning to perform the activity, the importance of the activity, and the desirability of learning the activity in a teacher-training school rather than learning it on the job or in life at large. Each of the four different aspects was found to contribute something unique to the picture of the activity.[89]

The technical details of evaluating the ratings and of combining them into a composite score are discussed in the study.[90] The results of the four ratings and the resulting standing of the activities on the composite scale are given for each of five groups of teachers.[91] These are shown separately for different groups of judges. This presentation represents probably the

88 *Ibid.*, pp. 17-9; and pp. 70-2.

89 The coefficients of correlation between the various ratings for each trait were low. The statistical analyses for this study were made by Ralph W. Tyler. See his Doctor's thesis, "Statistical Methods for Utilizing Personal Judgment to Evaluate Activities for Teacher-Training Curricula," Chapters V and VIII. Chicago: Department of Education, University of Chicago, 1927. Pp. 211.

90 Charters and Waples, *op. cit.*, pp. 24-30, 102-36, 245-56.

91 *Ibid.*, pp. 493-649.

most elaborate and extensive piece of work of its kind in educational literature.

The ranking of a group of human beings may be regarded as constituting a second type of direct comparison. One may be requested to rank the pupils in a class, or to rank the individuals of any other group on one or more characteristics. Sometimes ranking takes the place of other marks or ratings given pupils on their classroom work.[92] Ranking does not necessarily involve the assignment of a particular numerical value to each individual; it only requires judging that one individual is higher or lower than another one in the group, with respect to the particular character on which they are being ranked. There are three procedures for ranking, known respectively as the method of paired comparisons, the method of comparative arrangement, and ranking from a random list. These procedures are described in appropriate treatises.[93] The method used by Charters and Waples represents a ranking derived from a numerical composite of ratings.

A third type of direct comparison is afforded by scaled specimens, such as a handwriting scale or a composition scale. The user compares the specimens to be rated with those which constitute the scale to determine whether his specimen is better or poorer than a certain sample in the scale. When he finds the approximate position which his specimen would occupy on the scale, he assigns the appropriate scale value to it. This requires less judgment than rating without the scale.

This is a common procedure where readily handled products are to be rated. Thorndike introduced this procedure early in the measurement era with his handwriting scale,[94] which was

92 A. Duryee Crooks, "Marks and Marking Systems: A Digest," *Journal of Educational Research*, XXVII (December, 1933), 259-72. See especially, "Ranking," pp. 263-4.

93 Florence L. Goodenough and John E. Anderson, *Experimental Child Study*, pp. 413-8. New York: The Century Co., 1931. Pp. 546. See also "Ranking Methods," in the Index of Subjects.

Percival M. Symonds, *Diagnosing Personality and Conduct*, pp. 54-5, 76-8. New York: The Century Co., 1931. Pp. 602. See also "Ranking," in the Index.

94 Edward L. Thorndike, "Thorndike's Scale for Measuring the Handwriting of Children." New York: Bureau of Publications, Teachers College, Columbia University, 1910; revised, 1912.

followed shortly afterwards by Ayres' scale,[95] by Thorndike's drawing scale,[96] and by Freeman's diagnostic handwriting scale.[97] Direct comparison has been a favorite method for the measurement of composition; Hillegas introduced his composition scale, consisting of 10 sample compositions, in 1912.[98] This scale has been followed by a number of others, being climaxed perhaps by the extensive scales of Odell for rating answers to thought questions.[99] Other products have been rated in similar fashion.[100]

The use of such scaled specimens is an attempt to make individual judgment representative of average or group opinion. In some cases, it enables the individual to know the opinion of experts. The scaled specimens also afford an objective representation of values, which aid in preventing undue variation in judgment from time to time. In this way idiosyncrasies and wanton caprices of individual judgment tend to be reduced, and a more typical, more true evaluation by the individual is secured.

1. .Scaling specimens. Perhaps this is the most appropriate time to note the procedure for scaling a set of specimens to serve as standards of judgment. The procedure of scaling by group judgment is in reality an example of the first form of comparison, directed, however, not toward the purpose of immediate end products, but toward the production of instruments with which to do further work. The technique has been well described in a number of places. Thorndike made an

95 L. P. Ayres, "Ayres' Handwriting Scale: Three-Slant Edition," 1912. (Revised in 1917 and published as the Gettysburg Edition.) New York: Russell Sage Foundation.

96 "Thorndike Drawing Scale," 1913. Revised and extended in 1924, as the "Thorndike Scale for the Merit of Drawings by Pupils." New York: Teachers College, Columbia University.

97 Frank N. Freeman, "Freeman Chart for Diagnosing Faults in Handwriting." Boston: Houghton-Mifflin Co., 1914.

98 Milo B. Hillegas, "Hillegas Scale for Measurement of English Composition by Young People." New York: Bureau of Publications, Teachers College, Columbia University, 1912.

99 C. W. Odell, *The Use of Scales for Rating Pupils' Answers to Thought Questions.* Bureau of Educational Research Bulletin, No. 46. Urbana, Ill.: University of Illinois, May, 1929. Pp. 34. The scales in question are published at the same place.

100 Rating scales consisting of scaled specimens will be found in general references on achievement testing. For these, see footnote 11 of the preceding chapter.

early contribution in preparing his handwriting scale.[101] Ayres employed a different basis, the length of time required to read specimens, as the criterion of legibility of handwriting.[102]

The field of composition presents a notable series of studies in scale construction, beginning with the work of Hillegas[103] and including successive contributions by Thorndike, Willing, Trabue,[104] VanWagenen, Hudelson,[105] S. A. Leonard,[106] and others. Odell's work on scoring essay tests[107] should also be consulted. One writer, in fact, suggests that these are excellent composition scales. This whole field of scale construction for composition has been reviewed in detail by Lyman,[108] who includes also a discussion of criticisms of the scales, as well as studies of their use.

The technique of constructing attitude scales utilizes the same fundamental principle, with special adaptations. These are presented by Thurstone and Chave[109] and include important contributions to theory by Thurstone.[110] Reviews and

101 Edward L. Thorndike, "Handwriting," *Teachers College Record*, XI (March, 1910), 83-175.

102 L. P. Ayres, "A Scale for Measuring the Quality of Handwriting of School Children." Bulletin E-113. New York: Russell Sage Foundation, 1912. Pp. 16.

103 Milo B. Hillegas, "Scale for the Measurement of Quality in English Composition by Young People," *Teachers College Record*, XIII (September, 1912), 331-84. Also issued as a separate publication: Teachers College, Columbia University, 1912. Pp. 54.

104 Marion R. Trabue, "Supplementing the Hillegas Scale," *Teachers College Record*, XVIII (January, 1917), 51-84. Also published separately: Teachers College, Columbia University, 1922. Pp. 38.

105 Earl Hudelson, *English Composition: Its Aims, Methods, and Measurement*, Twenty-Second Yearbook of the National Society for the Study of Education, Part I, pp. 1-100. Bloomington, Ill.: Public School Publishing Co., 1923. Pp. 173.

106 Sterling A. Leonard, "Building a Scale of Purely Composition Ability," *English Journal*, XIV (December, 1925), 760-75.

107 Odell, *op. cit.*, (footnote 99).

108 R. L. Lyman, *Summary of Investigations Relating to Grammar, Language and Composition*, Chapter IV, "Investigations in the Field of Written Composition," pp. 134-73. Supplementary Educational Monographs, No. 36. Chicago: University of Chicago, January, 1929. Pp. 302.

109 L. L. Thurstone and E. J. Chave, *The Measurement of Attitude*. Chicago: University of Chicago Press, 1929. Pp. 97.

110 L. L. Thurstone, "A Mental Unit of Measurement," *Psychological Review*, XXXIV (November, 1927), 424-32.

———, "An Absolute Zero in Intelligence Measurement," *Psychological Review*, XXXV (May, 1928), 175-97.

———, "Equally Often Noticed Differences," *Journal of Educational Psychology*, XVIII (May, 1927), 289-93.

———, "Psychophysical Analysis," *American Journal of Psychology*, XXXVIII (July, 1927), 368-89.

———, "The Law of Comparative Judgment," *Psychological Review*, XXXIV (July, 1927), 273-86.

analyses are cited in footnotes 51, 52, and 54 of Chapter VII and will not be repeated here. One may be interested in reading early statements of Thorndike [111] and Ayres,[112] made at the famous First and Second Annual Conferences on Educational Measurements at Indiana University. The underlying theory of scaling runs well back into the nineteenth century. For a key to this literature the reader may consult Kelley [113] and also the discussion in Brown and Thomson.[114] Very simple statements are given in Holzinger [115] and in Garrett [116] for those who want a one-page presentation. Kelley [117] gives a somewhat more detailed mathematical statement.

The procedure in establishing weights for items in a score card is similar in nature to the scaling of specimens, though the theory has not been well explored. The method will be found in later references on score-card construction.

Check-lists. Schedules are sometimes prepared which consist essentially of a list of items with a place to check, or to mark "yes" or "no." The chief purpose of the check-list is to call attention to various aspects of an object or situation, to see that nothing of importance is overlooked. A check-list may be used to direct attention to various large aspects, or to check against the completeness of details, according to the nature

111 Edward L. Thorndike, "Tests of Oral and Silent Reading," pp. 37-51, in *Proceedings of a Conference on Educational Measurements.* Bulletin of the Extension Division, Indiana University, XII (September, 1914), No. 10. Bloomington, Ind. Pp. 170.

112 L. P. Ayres, "The Measurement of Educational Processes and Products," pp. 127-35, and "Making Education Definite," pp. 85-96, in *Second Annual Conference on Educational Measurements.* Indiana University Bulletin, XIII (October, 1915), No. 11. Bloomington, Ind. Pp. 221.

113 Truman Lee Kelley, *Interpretation of Educational Measurements,* p. 13. Yonkers-on-Hudson, N. Y.: World Book Co., 1927. "Standardized Judgments," and the references given (somewhat fragmentarily) for these names in the Bibliography, pp. 349-53.

114 William Brown and Godfrey H. Thomson, *The Essentials of Mental Measurement,* Chapters I and II. (Revised edition.) Cambridge: Cambridge University Press, 1921. Pp. 216.

115 Karl J. Holzinger, *Statistical Methods for Students in Education,* p. 228. Boston: Ginn and Co., 1928. Pp. 372.

116 Henry E. Garrett, *Statistics in Psychology and Education,* pp. 108-9. New York: Longmans, Green and Co., 1926. Pp. 317.

Some of the classical background is portrayed by this same author's *Great Experiments in Psychology,* Chapter XII, "Weber's and Fechner's Laws, and the Rise of Psychophysics," pp. 266-93. New York: The Century Co., 1930. Pp. 337. He gives four references which are in English.

117 Truman L. Kelley, *Statistical Method,* Sec. 92, "Psychophysical Methods," pp. 326-30. New York: The Macmillan Co., 1923. Pp. 390.

of the instrument used. It may afford simply a number of suggestions of what is usually desirable to do. The check-list may be useful as an aid to recording, such as in observing behavior; this use was discussed in an earlier section of this chapter.

The check-list may also be used as a sort of scale, yielding a score. It is with such use that we are chiefly concerned in this section. Noting whether a characteristic is present or absent, and counting the number of favorable or unfavorable items that are checked afford a total that may be compared with other similar totals to indicate the general satisfactoriness of the thing evaluated. This process corresponds to a true-false test, in which the pupil is scored dichotomously, either as knowing or not knowing each item, the total score being indicative of the breadth of the pupil's acquaintance with the subject-matter.

Determining the presence or absence of a given characteristic may require little or no judgment, or it may require the exercise of considerable judgment. Check-lists which relate to highly objective aspects of a situation belong properly with the second set of appraisal procedures (to be discussed later), but no attempt will be made to divide check-lists into two groups for the purpose of separate treatment. The use of check-lists in observing the larger outcomes of education and in measuring personality has already been discussed. The general discussion of check-lists will be given at this place.

A number of check-lists have been prepared for the appraisal of school buildings, school property, and school-building plans.[118] For example, one check-list[119] contains the points one should look for when checking over plans, details, and specifications of the architect, including such aspects as heat-

[118] For references containing examples, see the topic, "Score Cards and Building Measurement," in *Bibliography of School Buildings, Grounds, and Equipment*, by Henry Lester Smith and Forest Ruby Noffsinger. This bibliography is published in four parts, in different numbers of the Bulletin of the School of Education, Indiana University. See Part II, Vol. IX, No. 2 (March, 1933), 40-2; and Part IV, Vol. XI, No. 2 (March, 1935), 32-5.

[119] "Check-Lists for School Buildings," *Architectural Forum*, LV (December, 1931), 772-4.

ing, ventilation, plumbing, design, materials, electrical work, and other special features. The reader is referred to the literature cited for a fuller acquaintance with such check-lists.

As illustrative of check-lists for the business phases of school administration the following may be mentioned: Linn's check-list for possible economies,[120] and various check-lists and specifications for the purchase of school supplies.[121] General administration, including provision for instruction, is represented by the following check-lists: Z. R. Clark's list for appraising the superintendent's report,[122] the Frederick-Schorling check-list for the organization of junior high schools,[123] and another for the organization of senior high schools,[123] and Wade's general check-list for all aspects of the secondary school, from the pupil's standpoint.[124] The Committee on the Revision of Standards for Higher Institutions, of the North Central Association, used a check-list technique to secure and evaluate certain college procedures which could be counted only as present or absent.[125] Presumably check-lists will constitute a part of their final procedure also. The Research Division of the National Education Association has prepared check-lists, with standards, which may be used in studying the provisions and practices of state school systems.[126] The

120 H. H. Linn, "Check-Lists for Determining Possible Economies in Public-School Administration." *American School Board Journal*, LXXXVII (July-November, 1933). See also his *Practical School Economies*. New York: Teachers College, Columbia University, 1934. Pp. 461.

121 See the references given on p. 363, of "The School Plant," *Review of Educational Research*, V (October, 1935), No. 4.

122 Zenas Read Clark, *The Recommendation of Merit in Superintendents' Reports to the Public*. Teachers College Contributions to Education, No. 471. New York: Teachers College, Columbia University, 1931. Pp. 123.

123 "Frederick-Schorling Standardized Check-Lists for the Organization of Senior High-School Grades, and Standardized Check-Lists for the Organization of Junior High-School Grades." Ann Arbor, Mich.: Ann Arbor Press, 1933, 16 pages each.

124 J. Thomas Wade, *A Measurement of Secondary School as a Part of the Pupil's Environment*. Teachers College Contributions to Education, No. 647. New York: Teachers College, Columbia University, 1935. Pp. 68.

125 John Dale Russell, "Measuring the Excellence of Institutions of Higher Education," pp. 83-94, in *Twenty-Second Annual Conference on Educational Measurements*. Bulletin of the School of Education, Indiana University, XII (December, 1935), No. 1. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 97. See especially p. 90. See also later footnotes, numbers 287, 292, and 293.

126 "A Self-Survey Plan for State School Systems," *Research Bulletin of the National Education Association*, Part I, "Check-Lists," VIII (March, 1930), 54-87; and Part II, "Handbook," VIII (May, 1930), 90-163.

Research Division points out that more will be gained from using the check-lists as a starting point for study than merely for immediate evaluation. This is a wholesome suggestion applicable to all instances of rating.

Check-lists are also applied to classroom instructional activities. References by Wrightstone and Pistor have already been given.[127] This is a developing field. Franzén has analyzed both general and specific aims in the teaching of algebra into detailed pupil and teacher activities; his list [128] may be used as a check-list by teachers or possibly supervisors. Tyler has prepared a check-list to be employed by an observer in studying the working habits of students in using a microscope.[129] A student is directed to find a certain specimen in a solution. While he is doing this, the instructor notes the actions which he makes, the length of time taken, and finally, success of the student, and the quality of his mount. For this purpose the instructor uses a check-list which contains all of the likely actions, both desirable and undesirable. The instructor writes numbers on the check-list to indicate the sequence of the student's actions. This procedure is both diagnostic and evaluative.

The use of check-lists in the supervision of classroom instruction was one of the early applications of this technique. This field is somewhat distinct from that of observing outcomes of instruction, being concerned more with the activities of the teacher, though it is generally conceived of as embracing to some degree the quality of the educational product. Burton is credited with being the first to make use of check-

127 See footnotes 61 and 63. See also: J. Wayne Wrightstone, "Instrument for Measuring Group Discussion and Planning," *Journal of Educational Research*, XXVII (May, 1934), 641-50. See other articles listed for Wrightstone in the *Education Index*.

128 Carl G. F. Franzén, "Measuring the Efficiency of Teaching First Year Algebra—A Technique in Supervision," *Twenty-Second Annual Conference on Educational Measurement*. Bulletin of the School of Education, Indiana University, XII (December, 1935), pp. 32-50. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 97. See especially pp. 34-36.

129 Ralph W. Tyler, "A Test of Skill in Using a Microscope," *Educational Research Bulletin*, IX (November 19, 1930), 493-6. Also reprinted in his *Constructing Achievement Tests*, pp. 37-41. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1934. Pp. 102.

lists in connection with supervisory studies.[130] Since that time check-lists for the observation of classroom activities and teacher-pupil relationships have gone through various stages of development, and many studies of their use have been made.[130] The appraisal of the teacher's instructional activities not infrequently depends upon the observation and rating of characteristics in addition to those which might be gathered on a check-list; some of these procedures were treated in the section on "Observation of Behavior," and others will be given in the next section, on "Rating Scales."

The check-lists which were built up in the Commonwealth Teacher-Training Study may be used in a number of ways, both for analysis and for evaluation. The extensive list of teacher activities,[131] particularly with the frequency and ratings attached to each activity, provides an important means of checking courses of study for the training of teachers. Another use of the list is the checking of textbooks which deal with topics related to teaching. Charters and Waples state, for example:

> A discussion of school records and reports by a well-known authority specifically treats of but twenty-five of the 153 duties contained in the master list that relate to recording and reporting, and the majority of the activities treated are below median importance. (p. 30.)

The authors point out that one may go farther in analyzing textbooks by noting the depth of treatment of each topic. They suggest using five degrees: (1) the idea is merely mentioned; (2) the idea is discussed in sufficient detail to make its meaning clear to some one who is unfamiliar with it; (3) the difficulties commonly met in making use of the idea are stated; (4) possible methods of overcoming the difficulties are

130 A. S. Barr, *Introduction to the Scientific Study of Classroom Supervision*, pp. 5, and 198 ff. See especially the references in the footnotes, and those at the end of Chapter V. New York: D. Appleton and Co., 1931. Pp. 399.

See the *Education Index*, topic: "Supervision and Supervisors," for an occasional article dealing with the use of check-lists.

131 W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*, pp. 493-535. The lists appear in complete form, but without evaluation, in pp. 257-303, or pp. 304-472. Chicago: University of Chicago Press, 1929. Pp. 666.

listed; and (5) a statement of the principles, or sources of authoritative support, for the methods given, are included.[132] Other definitions of degrees may be more appropriate for the content of a given book. However, the procedure offers a method of indexing the fullness of treatment accorded topics of varying degrees of importance to teachers. Johnson has prepared a check-list which applies to other aspects of textbooks.[133]

Personality is sometimes rated by means of a check-list. It would be possible, for example, to use the list of traits and trait-actions derived in the Commonwealth Teacher-Training Study[134] as a check-list for the personality traits of a school worker. Hartshorne, May, and Maller made use of check-lists in the Character Education Inquiry.[135]

Bixler has prepared a check-list for research studies[136] which investigators may use to check over their research plans. The list applies to practically every kind of quantitative research, and students will find it useful, whatever their problem. It not only suggests steps which one might overlook but indicates the manner in which it is desirable to do things.

Several of the studies which utilize check-lists contain descriptions of the procedure by which they were prepared. One who is considering constructing a check-list will do well to examine closely those that have been made, and to read as many descriptions as possible, particularly the references by Charters and Waples, Frederick,[137] Wade, Tyler, and Bixler; also the references given earlier in connection with "Observa-

132 *Ibid.*, "Checking the Adequacy of Textbook Content," pp. 137-42.

133 Franklin W. Johnson, "Checking Lists for the Selection of High School Textbooks," *Teachers College Record*, XXVII (October, 1925), 104-8.

134 W. W. Charters and Douglas Waples, *op. cit.*, Part II, Section I, "A List of Teachers' Traits and Trait-Actions," pp. 223-44. Contains 83 traits with about 10 actions under each one.

135 Hugh Hartshorne, Mark A. May, and Julius B. Maller, *Studies in Service and Self-Control*, pp. 91-3. Studies in the Nature of Character, II. New York: The Macmillan Co., 1929. Pp. 559. Also described in Symonds, (footnote 149), pp. 72-3.

136 H. H. Bixler, *Check Lists for Educational Research*. New York: Bureau of Publications, Teachers College, Columbia University, 1928. Pp. 118.

137 Orie I. Frederick, "Two Standardized Check-Lists for the Organization of Secondary Schools." Ann Arbor, Mich.: The Author, January, 1933. Pp. 64. See Chapters II, III, V, and VI.

tion of Behavior" (footnotes 61-63) and most of the volumes in the series of Child Development Monographs (footnotes 56 and 57). Any good treatise on the use of a check-list will throw some light on the construction of such an instrument.

Rating scales. The most commonly used instrument for making appraisals is probably the rating scale. There are a large variety of forms and uses of rating scales. Typically, they direct attention to different parts or aspects of the thing to be rated, but not as many as the check-list or score card—normally about three to ten aspects. They provide a scale for assigning values to each of these aspects. The scale may take any of a number of different forms; it may be simply a series of numbers, or a graduated line, or qualitative terms such as "Good," "Poor," etc., or a series of named attributes peculiar to each scale, or a series of carefully worded descriptions of states representing different degrees of each aspect to be rated. Sometimes a special scale is eliminated, and the objects are rated on each characteristic in terms of per cent. Some of the applications of rating scales will be discussed.

Possibly we should regard carefully codified criteria, or standards, as constituting a sort of inchoate rating scale. The essence is there, but not the form. A number of these exist and serve to orient judgment. Examples of criteria for the appraisal of the school plant,[138] playgrounds,[139] and written English[140] will be found in the references cited. In addition there are sets of standards which accompany building score cards,[141] which one might use directly, if he desired.

138 See for example, Arthur B. Moehlman, "Appraising the Existing School Plant," *Nation's Schools*, VII (March, 1931), 84, 86, 88, 90; also, "Location and Use as Factors in Plant Appraisal," *Nation's Schools*, VII (June, 1931), 78, 80, 82.

139 National Recreation Association, *Report of Committee on Standards in Playground Apparatus*, 1931. Also, *Space Requirements for the Children's Playground*, 1934. New York.

140 Z. L. Huxtable, "Criteria for Judging Thought Content in Written English," *Journal of Educational Research*, XIX (March, 1929), 188-95. A separate rating scale also is published.

141 George D. Strayer and N. L. Engelhardt, *Standards for Elementary School Buildings*, Revised and enlarged, 1933. Pp. 181. *Standards for High School Buildings*, 1924. Pp. 95. With W. S. Elsbree, *Standards for the Administration Building of a School System*, 1927. Pp. 40. *Standards for Village and Rural School Buildings of Four Teachers or Less*, 1920. Pp. 22. N. L. Engelhardt, *Standards for Junior High School Buildings*, 1932.

A simple form of rating scale is commonly employed in judging contests of various kinds, such as speaking and music competitions. One may be asked to judge a debate, giving perhaps 70 per cent of the weight to content and 30 per cent to form of presentation. These directions constitute a rudimentary form of rating scale. They mention two aspects and assign the weight to be given to each, the scale being per cent. For the judging of choral music performance, one good rating scheme divides the consideration into six aspects—accuracy, tone, diction, rhythm, phrasing, and interpretation and general effect.[142] Judges may be asked to give equal weight to each of these or to give some other specified weighting. Usually such divisions and weights are based on no formal study, though considerable thought may be devoted to them. Such a division as that referred to for music represents the consensus of opinion of experts who have analyzed the field and given critical thought to trying out the scheme set up.

1. Teacher rating. Rating scales have been put to extensive use in the field of rating teaching and teachers.[143] This process, of course, extends to the selection of teachers, and the prediction of teaching success. A considerable number of such rating scales have been prepared and subjected to much statistical study.[144] Although common sense and experience seem

Pp. 161. The above are all published by Teachers College, Columbia University, New York.

T. C. Holy and William E. Arnold, *Standards for Junior High School Buildings.* Bureau of Educational Research Monographs, No. 17. Columbus: Ohio State University, 1932. Pp. 62. Also in the *American School Board Journal,* LXXXVI (January, March, and April, 1933).

142 Sir Hugh S. Robertson, *Choir Singing.* Festival Booklets, No. Two. London: Paterson Sons and Co., Ltd. Pp. 46. n.d.

143 A good general discussion of rating teachers is given in Charles W. Knudsen, *Evaluation and Improvement of Teaching,* Chapter VI, "The Use of Rating Devices in the Evaluation of Teaching," pp. 205-48. Garden City, N. Y.: Doubleday Doran and Co., Inc., 1932. Pp. 538. Includes a bibliography of eighty-two references to articles and rating scales.

A. S. Barr and Lester M. Emans, "What Qualities Are Prerequisite to Success in Teaching?" *Nation's Schools,* VI (September, 1930), 60-4. Reported in summary form in A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision,* pp. 328-40. New York: D. Appleton and Co., 1931. Pp. 399.

144 See the discussions, and the references, in the following: T. L. Torgerson, "The Measurement and Prediction of Teaching Ability," Chapter II, pp. 261-6; also, "Technics in Selection and Placement," p. 282, in "Teacher Personnel," *Review of Educational Research,* IV (June, 1934), No. 3.

Russell L. C. Butsch, "Teacher Rating," Chapter VII, pp. 99-107, in "Teacher

to indicate that rating scales must be a help in appraisal, statistical analysis gives disappointing results.[145] Barr finds evidence, however, that their use is superior to judgment of teaching merit when unaided by any kind of analytical scale.[145] Torgerson points out, probably with considerable justification, that the low correlations between the results of rating scales and other criteria may be the fault of the criteria.[144] The establishing of valid criteria is one of the most difficult tasks in the validating of research instruments, and it is at the same time one of the most essential steps.

In reviewing these techniques, Anderson calls attention to another important factor, namely, that "specific traits and characteristics may be helpful or detrimental to a teacher according to the combinations in which they occur in him."[146] The pattern or organization of personality characteristics is a matter that has not received adequate attention in research.

A different rating procedure is provided by the Probst Service Ratings.[147] The report forms do not consist of a series of scales, but simply of statements which describe various forms of the individual's behavior, such as, "Talks too much," "Accurate but very deliberate," "Works well without supervision." These appear in mixed order. Some statements are obviously favorable and some obviously unfavorable; others are indeterminate (on the surface). The rater checks those statements which he believes to be descriptive of the performance of the individual being rated. The check marks are then scored by a stencil with weights which have been statistically

Personnel," *Review of Educational Research*, I (April, 1931), No. 2. See also p. 244 of "Tests of Personality and Character," *Review of Educational Research*, II (June, 1932), No. 3.

For current references see "Teacher-Rating," in the *Education Index* and in the annual *Bibliography of Research Studies in Education* of the United States Office of Education.

145 A. S. Barr, "The Measurement of Teaching Ability," *Journal of Educational Research*, XXVIII (April, 1935), 561-9.

146 Earl W. Anderson, "Techniques of Research Used in the Field of Teacher Personnel," p. 16, in "Methods and Techniques of Educational Research," *Review of Educational Research*, IV (February, 1934), No. 1.

147 J. B. Probst, *Service Ratings*. Technical Bulletin No. 4. Published as one of a series of joint publications by the Bureau of Public Personnel Administration and the Civil Service Assembly of the United States and Canada. Chicago: 923 East Sixtieth St., 1931. Pp. 94.

derived. The procedure avoids an awareness of how high or low one is rating another; it carries definite limitations, however. It was originated for rating employees in public service; a special form has been prepared for rating teachers. The items are weighted heavily on the administrative aspects of a teacher's work, and inadequate attention is given to instructional processes. The device is suggestive for further research.

2. Rating personality. Closely related to this field of teacher rating is the general area of personality and character rating. This differs from measurement of the same qualities by tests, as discussed earlier, only in the technique used; we refer here to forms of more direct judgment. This field constitutes the chief application of rating scales, and instruments of many varieties have been constructed. As stated earlier, there are scales with various degrees of refinement in the description of traits and of different levels of each trait. There are also graphic scales. The frequency of occurrence of certain kinds of behavior is utilized by at least one instrument [148] as the unit for the scale. There are also a number of self-rating scales.

Illustrations of two rating scales will receive separate mention. The first is Scott's Army Rating Scale, commonly known as the Man-to-Man Scale.[149] In using this rating scale, one thinks of persons he knows who represent the highest degree, the lowest degree, etc., of each quality as it is described on the scale. He then compares the individual to be rated with these selected "scale persons." The great difficulty is in the first step, namely, the selection of appropriate men to represent the scale.

148 "Haggerty-Olson-Wickman Behavior Rating Schedule." Yonkers-on-Hudson, N. Y.: World Book Co., 1930.

149 Percival M. Symonds, *Diagnosing Personality and Conduct*, pp. 57-61. New York: The Century Co., 1931. Pp. 602. Or, see W. D. Scott and R. C. Clothier, *Personnel Management*, pp. 203-208. A. W. Shaw Co., 1923. (Now published by McGraw-Hill Book Co., New York.)

Harold O. Rugg, "Is the Rating of Human Character Practicable?" *Journal of Educational Psychology*, XII (November and December, 1921), 425-38, 485-501; XIII (January and February, 1922), 30-42, 81-93.

Another form of identifying persons with given traits is found in the Character Education Inquiry "Guess Who Test," in which a series of character or personality descriptions is given for hypothetical individuals, and the pupils in a class are asked to write under each description the name of any classmate who seems to them to represent such a type of person.[150]

Various statistical studies have indicated that rating is satisfactory, or unsatisfactory, according to special conditions and factors that have entered into the particular study. Watson states that "the scale blank itself is undoubtedly less important than many of the conditions surrounding its use." [151]

Personality-rating scales and their uses are described at length by Symonds [152] and are treated by him again in a second book.[153] Garrett and Schneck [154] give much the same type of treatment, in briefer compass. An extensive bibliography of studies of ratings, with an interpretative discussion, is given by Watson.[155] Cowley [156] lists studies dealing with the value of rating scales in personnel work. Lundberg [157] includes rating scales of several kinds which are appropriate to sociological studies. Hildreth [158] lists rating scales which are available for general personality and for teacher rating. Barr and Rudisill [159]

150 Hugh Hartshorne, Mark A. May, and Julius B. Maller, *Studies in Service and Self-Control*, pp. 87-91. Studies in the Nature of Character, II. New York: The Macmillan Co., 1929. Pp. 559. Also described by Symonds, *op. cit.*, pp. 73-4.

151 Goodwin B. Watson, "Tests of Personality and Character," *Review of Educational Research*, p. 242, II (June, 1932), No. 3.

152 Percival M. Symonds, *op. cit.*, Chap. III, "Rating Methods," pp. 41-121.

153 Percival M. Symonds, *Psychological Diagnosis in Social Adjustment*, "Rating Scales," pp. 181-95; "Teacher Rating Scales," pp. 196-204; "Miscellaneous Rating Scales," pp. 205-6. New York: American Book Co., 1934. Pp. 362.

154 Henry E. Garrett and Matthew R. Schneck, *Psychological Tests, Methods, and Results*, Part II, "Rating Scales," pp. 103-22. New York: Harper and Bros., 1933.

155 Goodwin B. Watson, "Ratings, Reputation Measures," pp. 238-45, in "Tests of Personality and Character," *Review of Educational Research*, II (June, 1932), No. 3.

156 W. H. Cowley, *The Personnel Bibliographical Index*. Columbus: Bureau of Educational Research, Ohio State University, 1932. Pp. 433. See "Rating Scales," p. 49, in the Subject Index.

157 George A. Lundberg, *Social Research*, Appendix C, "Types of Social Measuring Devices." New York: Longmans, Green and Co., 1929. Pp. 380. See especially pp.366-68.

158 Gertrude H. Hildreth, *A Bibliography of Mental Tests and Rating Scales*, pp. 172-5, and pp. 195-6. New York: Psychological Corporation, 1933. Pp. 242.

159 A. S. Barr and Mabel Rudisill, *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education*, pp. 74-81. Bulletin of the Bureau of Educational Research, No. 13. Madison, Wis.: University of Wisconsin, June, 1931. Pp. 129.

list a number of studies and applications of rating scales. The *Psychological Bulletin* includes rating scales in its annual review of tests,[160] which has appeared every year since 1926 except in 1931.

As in other cases, the best material on the preparation of rating scales is found in the treatises which describe them and their applications. The student should consult especially the reviews in the *Psychological Bulletin* and in the *Review of Educational Research*, as referred to. Treatises by Symonds and by Garrett and Schneck discuss construction and give additional references. The problems of constructing rating scales are primarily the difficulty of securing satisfactory categories, and of setting up criteria by which the satisfactoriness of the scale may be carefully determined. One must have categories that possess approximately the same significance to all who will use the rating scale, and this is not easy to attain. Further, the categories must fit together into a satisfactory pattern so that, when taken together, they will afford an adequate picture. Some workers emphasize the statistical aspects of scaling; this point of view is represented in a report by Richardson and Kuder.[161]

Score cards. Score cards as a group represent the most elaborate form of rating instrument for utilizing judgments directly. There is no sharp dividing line between rating scales and score cards, and many workers use the two terms interchangeably.[162] In the present treatment, however, a distinction is made. The typical score card provides for more aspects of the object to be rated and has a definite number of "points" to be allotted to each item. A rating scale has fewer characteristics and uses a variety of different means of scaling, some of which are quite indefinite. Further, a rating scale may have descriptions of various degrees of each trait or characteristic;

160 For example, see *Psychological Bulletin*, XXXII (July, 1935), 509-10.

161 M. W. Richardson and G. F. Kuder, "Making a Rating Scale That Measures," *Personnel Journal*, XII (June, 1933), 36-40.

162 In the United States Office of Education *Bibliography of Research Studies in Education* and in the *Education Index*, the topics are likely to be cross referenced, and either topic may include material for both.

a score card may have general standards or criteria, printed separately, at some length, and describing only a satisfactory or ideal level. The score card differs from the check-list primarily in calling for an evaluation of each aspect rather than noting merely its presence or absence.

The most common application of the score card has been in the field of rating school buildings. To illustrate, we may use the Strayer-Engelhardt Score Card for High-School Buildings.[163] This divides the school plant into seven large divisions, such as site, general aspects, service systems, classrooms, etc. A total of 1,000 points is apportioned to the seven divisions according to their judged importance. Each division is then broken down into several sub-divisions; for example, the site is divided into: (A) location, (B) nature and condition, and (C) size and form. These are in turn broken down into still smaller aspects, with an indication of the number of points allowable for each aspect.

With a moderate amount of training, one can learn what constitutes desirable standards on each of these small aspects and can rate each part of a building with considerable fairness. A manual of standards is available for aiding the rater, and forms for making field notes have been prepared and are commercially available.

The important features of this procedure are that one reacts to a single unit of the gross situation at a time, he has been given mental standards with which he can compare this unit, and the number of points that he can allow for this aspect is assigned. If one should go far wrong on a few phases, this error of judgment would not invalidate his final outcome to any large extent, unless he tended to be wrong in the same direction in most of his detailed judgments. The score card being discussed[164] provides for 159 separate specific judg-

163 Published by the Bureau of Publications, Teachers College, Columbia University, New York.

164 The use of this particular score card for illustration should not lead to the implication that it is the only one. There are a number of score cards for school buildings of various kinds. Different ones deal with elementary, junior high, and high-school buildings; normal schools and teachers colleges; city and rural school buildings; and the

ments; the very number and variety of aspects that are to be judged tend to prevent subjective bias in the composite score. Even with such safeguards, however, the authors caution that it is desirable to have at least three individuals score each building, and to use their average score.

As in other cases where measurement utilizes units that are essentially subjective and highly variable in what they represent, interpretation of the total score presents a problem. It is possible to divide up the scale somewhat arbitrarily and to suggest that a total score of more than three-fourths of the maximum (750-1000 on the Strayer-Engelhardt scales) represents a good building; from one-half to three-fourths (500-750) a fair building; from one-fourth to one-half, a poor building; and below one-fourth of the maximum score, an unsatisfactory building. In another place [165] Engelhardt points out that a score of 900-1000 represents a "highly satisfactory degree of construction and equipment." A rating of 700-900 is fairly satisfactory, but the building should be studied for the possibility of improving the parts of it which the score card shows to be most unsatisfactory. A score of 600-700 indicates that considerable alteration is needed; buildings receiving a score of 500-600 require extensive repairs and replacements in order to be reasonably usable. Where a building scores below 500, it should be abandoned as soon as possible and no funds spent trying to make it more satisfactory, since too much money would be required.

It will be seen that the foregoing interpretation rests upon the association of certain scores with general judgment and

administration building. References to seventeen such score cards may be found in: "School Buildings, Grounds, Equipment, Apparatus, and Supplies," *Review of Educational Research*, II (December, 1932), No. 5; see bibliographical references, Nos. 1, 5, 15, 36, 64, 70, 71, 81, 82, 83, 84, 85, 86, 152, 172, 194, 204. Other references deal with standards for these cards. Three additional score cards are listed in: Henry Lester Smith and Leo Martin Chamberlain, *A Bibliography of School Buildings, Grounds, and Equipment*. Bulletin of the School of Education, Indiana University, Vol. IV (January, 1928), No. 3. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 326. See references, Nos. 314, 321, 323.

165 N. L. Engelhardt, *A School Building Program for Cities*, p. 57. Teachers College Contributions to Education, No. 96. New York: Teachers College, Columbia University, 1918. Pp. 130.

general experience concerning the buildings; it is, however, about the only kind of interpretation which is possible; and if confirmed by many years of experience, it is to be regarded as altogether satisfactory. Although he agrees in general with the above interpretation, T. C. Holy [166] points out that "it does not follow that two buildings scoring 500 each are of equal value." This comes about, of course, because the scores can be made up in different ways. It should follow, however, if the rating scales were ideal, that each of two buildings with the same score would yield the same gross amount of satisfaction in use, although not necessarily identical in the forms of satisfaction.

The score-card technique has had a number of additional applications to subjects closely related to buildings. For example, score cards have been prepared for the selection of school-building sites,[167] for architectural service and building plans,[168] for school-building utilization,[169] for the school housing program,[170] for structural and housekeeping sanitation,[171]

166 T. C. Holy, "Technics Used in School Building Surveys," Chapter VII, p. 53, in "Methods and Technics of Educational Research," *Review of Educational Research*, IV (February, 1934), No. 1.

167 N. L. Engelhardt and W. B. Featherstone, "Score Card for Selection of School Sites," in *American School and University*, 1930-31, Vol. III, pp. 29-31. New York: American School Publishing Corporation, 1930.

———, "Score Card to Be Used in the Selection of School Building Sites." New York: Teachers College, Columbia University, 1929. Pp. 4.

L. W. Reese, "A Score Card for Selecting the Site for a Consolidated School," *American School Board Journal*, LXX (January, 1925), 79-80, 130.

Robert Earl Iffert, "A Study of School Building Sites in Certain Districts of Allegheny County." Master's thesis. Pittsburgh: University of Pittsburgh, 1927. Pp. 118.

168 Z. M. Smith, "A Score Card for Evaluating Architectural Service in the Planning and Constructing of Rural School Buildings." Indianapolis: State Department of Public Instruction.

George D. Strayer, N. L. Engelhardt, and F. W. Hart, "Schoolhousing Series." Schoolhousing Form No. III, "Checking Chart and Score Card for School Building Plans and Specifications." (For Use by State and Local Building Authorities.) Albany, N. Y.: C. F. Williams and Son, Inc., 1920.

169 Edgar L. Morphet, *The Measurement and Interpretation of School Building Utilization*. Teachers College Contributions to Education, No. 264. New York: Teachers College, Columbia University, 1927. Pp. 102.

George D. Strayer, N. L. Engelhardt, and Edgar L. Morphet, *School Building Utilization Forms*. New York: Teachers College, Columbia University, 1927. Pp. 32.

170 George D. Strayer and N. L. Engelhardt, *A Checking List for Administrative Policies and Programs Concerned with Schoolhousing* (Tentative Outline). New York: Teachers College, Columbia University, 1926. Pp. 36.

171 Walter S. Cornell, "A System of Sanitary School Inspection with Graded Standards and Exact Ratings of School Buildings," *American School Hygiene Association, Proceedings of Eighth Congress*, 1915, pp. 44-9.

for janitorial services,[172] and for school seating.[173] These references will indicate the extent to which the device has been developed in connection with school housing and educational equipment.

Clark's score card for the school budget,[174] Strayer and Engelhardt's score card for school records and reports,[175] Proctor's score card for guidance,[176] Harrington's score card for the organization of junior high schools,[177] and Moehlman's score cards for publicity material and for the parent-teacher association,[178] illustrate other applications of score cards to administrative problems. Mort and Hilleboe have prepared a score card for elementary-school practices.[179] The Committee on Revision of Standards for Higher Institutions, of the North Central Association, validated a score card for aid in appraising colleges.[180] The work of the joint Secondary School Standards Committee[181] may result in the use of a score card or rating scale as an important means in determining the accrediting of high schools. Score cards are also used for rating the

172 N. L. Engelhardt, C. E. Reeves, and G. F. Womrath, "Score Card for Public School Janitorial-Engineering Service." New York: Teachers College, Columbia University, 1926. Pp. 6.

173 C. A. Anderson, "Tentative Score Card for Elementary Desks and Seats," *American School Board Journal*, LXXIX (July, 1924), 46-7.

174 Harold F. Clark, "Suggestions for Scoring School Budgets," *American School Board Journal*, LXXI (October, 1925), 47-8, 133-4.

175 George D. Strayer and N. L. Engelhardt, *A Score Card and Standards for the Records and Reports of City School Systems*. New York: Teachers College, Columbia University, 1923. Pp. 81.

176 William M. Proctor, "Evaluating Guidance Activities in High Schools," *Vocational Guidance Magazine*, IX (November, 1930), 58-66.

177 Harold L. Harrington, "A Score Card for the Mechanical Organization of Junior High Schools." Doctor's thesis, University of Michigan, 1931. Pp. 292. Also in *Abstracts of Dissertations and Theses in Education 1917-31*, pp. 70-3. Bureau of Educational Reference and Research, Monograph No. 1. Ann Arbor, Mich.: School of Education, University of Michigan, 1932.

178 Arthur B. Moehlman, *Public School Relations*. Chicago: Rand, McNally and Co., 1927. Pp. 261. In Chapter XVII, "Appraisal," Moehlman gives score cards for the annual report, the house organ or teachers bulletin, the home-contact bulletin, and the parent-teacher association.

179 Paul R. Mort, "Rating Scale for Elementary-School Organization—Development," *Teachers College Record*, XXXII (October, 1930), 34-49.

180 John Dale Russell, "Measuring Excellence of Institutions of Higher Education," pp. 83-94, in *Twenty-Second Annual Conference on Educational Measurements*. Bulletin of the School of Education, Indiana University, XII (December, 1935), No. 1. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 97. See especially pp. 90-91.

181 See references in footnote 292.

homes of pupils,[182] and for appraising other institutions and community conditions.[183] In this connection, the reader may consult the later discussion on "The Appraisal of Educational Service."

1. Score cards in the selection of textbooks. Another field in which the use of score cards is becoming common is that of evaluating textbooks for adoption. The selection of textbooks constitutes a problem of large importance, not only because considerable sums of money are involved, but because the textbook is, in the hands of many teachers, a more potent influence in determining what is taught than is the course of study which has been officially adopted. The literature on the selection of textbooks is already extensive.[184] The field of rating and selection is distinct from that of textbook analysis, which was referred to in the section, "Documentary Frequency Studies," in Chapter VII, although rating may well include a number of the elements revealed by textbook analyses.[185]

182 Percival M. Symonds, *Diagnosing Personality and Conduct*, pp. 546-9. New York: The Century Co., 1931. Pp. 602.

———, *Psychological Diagnosis in Social Adjustment*, Chapter XIII, "Environment Scales and Tests," pp. 328-31. New York: American Book Co., 1934. Pp. 362.

See also pp. 265-77 of the reference in the following footnote.

183 George A. Lundberg, *Social Research*, Chapter X, "The Measurement of Social Institutions," pp. 243-99, and Appendix C, "Types of Social Measuring Devices," pp. 362-6. New York: Longmans, Green and Co., 1929. Pp. 380.

Ellery Reed, "A Scoring System for the Evaluation of Social Case Work," *Social Service Review*, V (June, 1931), 214-36.

184 *The Textbook in American Education*, Chapters VII, VIII, XIV, XV, XVI, and XVIII. Thirtieth Yearbook of the National Society for the Study of Education, Part II. Bloomington, Ill.: Public School Publishing Co., 1931.

Frank A. Jensen, *Current Procedure in Selecting Textbooks*. Philadelphia: J. B. Lippincott Co., 1931. Pp. 157.

Florence D. Fuller, *Scientific Evaluation of Textbooks*. Boston: Houghton Mifflin Co., 1928. Pp. 88.

Bibliographies may be found in the following: 91 selected and annotated references are given in Chapter XVIII of the Thirtieth Yearbook of the National Society for the Study of Education, cited in the present footnote. Jensen gives an important bibliography (pp. 151-4).

The Curriculum Laboratory of Western Reserve University, Cleveland, has issued: "Bibliography: How to Select a Textbook," Bulletin No. 24, 1932. Pp. 3 (mimeographed). See also "Evaluation of Courses of Study and Textbooks," Chapter III, in "The Curriculum," *Review of Educational Research*, IV (April, 1934).

For current material see "Textbooks" in the Annual *Bibliography of Research Studies in Education*, of the United States Office of Education, and "Textbooks—Rating" and "Textbooks—Selection" in the *Education Index*.

185 See for example, Ivan R. Waterman and Irving R. Melbo, "Evaluation of Spelling Textbooks," *Elementary School Journal*, XXXVI (September, 1935), 44-52. Various analyses are reported and used as bases for rating.

To illustrate the content of the textbook score card, attention will be focused on one of them. Maxwell [186] presents an elaborate score card worked out by Mildred Dawson, for the rating of textbooks in language. This covers six pages in print. Its four main divisions are: I. Mechanical features, II. Derivation of materials, III. Content, IV. Presentation. Each of these is broken down into principal and minor subdivisions, making in all seventy-five separate aspects that are to be rated. The "basis of evaluation" is given, such as "Inspection," "Sampling of alternate 50-page groups," etc. Next, the "Method of Evaluation" is given, such as "Rank," "Rate from Exceptional to Poor," "Number of instances per page," etc. The next column on the blank is for recording the points allotted, and finally a general rating of A, B, C, or D is given to a book, in each division, on the basis of the total ratings in that division. Decision is finally made on the basis of the separate ratings on each book, rather than on the basis of a numerical total score. The score card is accompanied by directions and explanations.

Jensen [187] finds that, of 172 cities studied, about 40 per cent use score cards in selecting textbooks, and that the instruments are constructed by some one in the local system (textbook committee, research bureau, supervisor, etc.) in about two-thirds of the cases. Criticisms of the use of score cards in the selection of textbooks seem to grow primarily out of the fact that there is a strong tendency to set up such instruments with a particular set of books in mind, so that the score cards actually favor those books and thus result in the selection of books which would have been chosen anyway without the use of a score card. Score cards prepared by book publishers suffer the same criticism in a more pronounced form. A second

[186] C. R. Maxwell, "The Use of Score Cards in Evaluating Textbooks," Chapter VIII, in *The Textbook in American Education*. Thirtieth Yearbook of the National Society for the Study of Education, Part II. Bloomington, Ill.: Public School Publishing Co., 1931.

[187] Frank A. Jensen, *Current Procedure in Selecting Textbooks*, Chapter VI, "Devices for Evaluating Textbooks," pp. 126-45. Philadelphia: J. B. Lippincott Co., 1931. Pp. 157.

basis of criticism is that score cards are rather mechanical and overlook a number of the more important psychological elements of a textbook which can be evaluated only by actual tryouts or general appraisal. Whether these are inherent defects is debatable.

Some further comments on the evaluation of textbooks are given in Chapter XIV. The increasing use of score cards in this and other fields and the two major difficulties just mentioned indicate that this is an important area in which research of considerable significance may be conducted. The characteristics of a satisfactory score card, and the best techniques for constructing one, need to be determined. They will probably be found to vary with the field and purpose.

On the construction of score cards in the field of school buildings there is only meager literature. Commenting in 1916 on the Score Card for City School Buildings, Strayer [188] explains that it was developed through two years and a summer session with five groups of graduate students, and that the weights were assigned to the large divisions first, then to subdivisions, and then to the elements, by taking the medians of the ratings of 200 graduate students. Engelhardt,[189] in commenting upon this same score card, says that it "is constructed on the same plan as those utilized during past years in the work of agricultural colleges." He, further, gives statistical evidence to the effect that the median rating of three judges correlated to the extent of .98 with the median rating of five judges, indicating that rating by three people was probably satisfactory.[190] One will find more adequate descriptions by Clark,[191]

188 George D. Strayer, "Score Card for City School Buildings," Chapter III, pp. 41-51, *Fifteenth Yearbook of the National Society for the Study of Education*, Part I. Chicago: University of Chicago Press, 1916. Pp. 172.

189 N. L. Engelhardt, *A School Building Program for Cities*, pp. 54-6. Teachers College Contributions to Education, No. 96. New York: Teachers College, Columbia University, 1918. Pp. 130.

190 *Ibid.*, p. 60.

191 Harold F. Clark, "Measuring the Budgetary Procedure of a School System," pp. 10-7, in the *Eleventh Conference on Educational Measurements*. Bulletin of the School of Education, Indiana University, I (January, 1925), No. 3. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 141. See also the *American School Board Journal*, LXVIII (June, 1924), 47-8, 133-4.

Senska,[192] Cox,[193] and Marye;[194] other suggestions on construction may be gleaned from certain references already given.

Underlying assumptions. Two principles, on which appraisal instruments are based, represent fundamental assumptions. First, it is assumed that better judgment can be secured on the significant aspects of an object (or situation) by centering attention on one aspect at a time. This is a principle which is substantiated by common experience, in so far as we are thinking of the vividness of a single element in the focus of attention, in contrast to its clearness when attention is spread indifferently over a group of undifferentiated elements. There are other aspects of the premise, however, which are not so definitely established. Question arises concerning the isolation of elements which are the crucial ones. It is not difficult to pick out certain aspects of any phenomenon (object or situation) and concentrate upon them, but practical workers who have developed good judgment concerning complex situations are likely to have a feeling that the aspects selected by the makers of observation and appraisal schedules omit certain intangibles that are crucial. The question is important; it will undoubtedly be answered more satisfactorily as our research advances and becomes increasingly refined.

The second fundamental assumption involved in all of the instruments which yield a general total or composite rating is that general value can be approximated by a summation of the values of parts. Even granting that the first question has been satisfactorily answered, and that all of the really

[192] N. M. Senska, "Making a Detailed Score Card for Grading Student Teachers," *Educational Administration and Supervision*, XI (March, 1925), 191-201.

[193] Rose M. Cox, "The Development of Score Cards for Evaluating Silent Reading Lessons in the Intermediate Grades," *Teachers College Journal* (Indiana State Teachers College, Muncie), III (July, 1932), 301-22. Also, her Doctor's thesis, at Indiana University, "The Development of Score Cards for Evaluating Silent Reading Lessons in the Intermediate Grades," 1929. Pp. 344.

[194] Mary E. Marye, "A Form for Rating Textbooks in English Composition Prepared for the 9th and 10th Grades," *School Review*, XXXVIII (February, 1930), 124-37. Described briefly in "Special Methods on the High School Level," *Review of Educational Research*, II (February, 1932), 36-7. Also her Master's thesis at the University of Chicago in 1928, "The Construction of a Rating Form for Evaluating Composition Textbooks." Pp. 275.

significant aspects have been included in the rating, there is still room for question that any mathematical functions (such as a weighted sum) of these separate ratings will yield a relative value that corresponds well with one's reaction to the object or situation as a whole. We have involved here the question of atomistic and organic conceptions in analysis,[195] and the challenges raised by Gestalt psychology as to whether something is not lost when a complex whole is divided into parts—at least some element of pattern. Perhaps this element could be restored if the proper method of recombining elemental aspects could be discovered; so far we have been content with thinking of the problem in terms of weighted summation, which may prove too simple an approach. This second question also forces a new interpretation of the first one, for the aspects (elements) must be significant not only when viewed independently but when viewed in the light of their contribution to the picture as a whole.[196]

From the practical standpoint, these questions are not so acute. In the first place, improvements in practice or in objects (such as school buildings) are for the most part made in terms of details. We give attention to one relatively small area at a time and seek to improve it. The use of appraisal instruments is in line with this normal procedure. In the second place, the instruments are not likely to be applied at any one time to the appraisal of objects or practices which vary fundamentally. That is, a score card for buildings would not be applied to some experimental building that was constructed to suit an entirely special philosophy of education, or that was built on some new theory of building construction which sought to make an epochal advance. Appraisal instruments are clearly not adapted to the evaluation of fundamentally different things, unless they are specially constructed for that purpose.

195 Ernest R. Mowrer, *Domestic Discord*, Chapter II, "Case-Work and the Atomistic Conception," pp. 14-22. Chicago: University of Chicago Press, 1928. Pp. 277.

196 Raymond Holder Wheeler, "Postulates for a Theory of Education: II. a Methodology for Educational Research," *Journal of Educational Research*, XXIX (November, 1935), 187-95.

In the third place, it is possible to include in any schedule elements of varying generality, some very detailed, some rather broad, so that a hierarchy of levels is represented. The question of losing elements of organization or pattern through dividing things is thus met, at least in part. Perhaps more attention to this practical possibility should be given in the construction of schedules. It will, of course, be recognized that even without giving it specific attention there is little equality of generality in the items which are included; this is probably to be regarded as an asset. In the fourth place, it is probable that administrative action will always be tempered by general opinion and common sense—sometimes to the exasperation of the technical research worker, but not always to the detriment of education. As long as these elements of general judgment will enter into practical decisions, the extent to which they may be lacking in the instruments is not serious, though such a lack does tend to discredit the contributions of research in the eyes of the practical worker.

The foregoing remarks concerning the practical situation have no implication of the ideal situation. But we must always temporize ideals with practical considerations. Perhaps an *ideal* instrument would be so cumbersome and expensive of effort and time that its use would not be warranted. Possibly a combination of ratings and general judgment will ultimately be found to be more desirable than the scientist's dream of a perfect instrument. After all, appraisal schedules are normative instruments; they reflect general tendencies, tempered by the superior and by the inferior, but they represent in the main the things we are most used to. Differences in objects or practices which involve questions of changing philosophies and points of view must be evaluated by other means—principally by human beings giving their best attention directly to the consideration of requirements and consequences. The problem of human values may be studied scientifically, but it can never be supplanted by science without our having surrendered our prerogatives as human beings.

B. Appraisal procedures which are relatively objective. This is the second division concerned with appraisal procedures. Two groups of studies will be discussed, namely, those employing index numbers, and school surveys. A third topic is concerned with the selection of aspects of educational institutions for indicating quality of service.

In referring to these procedures as relatively objective, one should not lose sight of the fact that they are based on judgments or human values. That is, if an index number is to represent worth or quality, it must contain those elements which human beings have come to regard as valuable. The selection of these elements, and the securing of quantitative measures of them, are critical steps in index-number work. Again, in the school survey, it is necessary to devote considerable attention to the discovery of the vital problems in a school system, and to the identification of the factors which are contributing to these. Such steps require judgment—aided by such objective evidence as is obtainable, but initially and finally it is judgment that must be relied upon. The procedures are concerned with objective data only in an immediate sense.

Index numbers. In the desire to make complex comparisons as objective as possible, educators have often turned to the use of index numbers. These represent a particular form of analyzing quantitative data which can be gathered by one means or another, usually from available reports. In the typical case, index numbers do not depend for their basic figures on judgment at all; after the characteristics which are to be reflected in the index number and their respective weighting have been decided upon, the rest of the procedure is usually objective.

An index number is essentially an average. It combines in one figure the average of a number of different factors (variable elements). It is, however, an average of ratios, each of the factors being expressed as a per cent of its value at some other time (or perhaps at some other place). The technique is, therefore, applicable whenever it is desired to represent in a single figure the average status of a number of factors, each expressed

as a variation from a particular set of values that has been accepted as a base. The selection of a base year or a base locality, with its attendant value for each factor, though not entirely without effect on the comparisons, is not a crucial problem and may be done arbitrarily to suit convenience.

Index numbers have been applied to a number of phases of education, most of which are administrative. Most ambitious of these applications have been the attempts to rate the educational activities of the various states. First among these was a study by Ayres in 1912,[197] which received little publicity. In 1920, however, Ayres published his *Index Number for State School Systems*,[198] which became widely known and much discussed. This publication showed the standing of each of the states in terms of the index number, for 1890, 1900, 1910, and 1918. Indexes for the United States as a whole were printed for each of the forty-eight years from 1871 to 1918. The index was based upon ten items of information taken from the statistical reports of the United States Office of Education. These items, or factors, read: "Per cent of school population attending school daily," "Average number of days schools were kept open," "Average expenditure per child in average attendance," "Expenditure per teacher employed, for salaries," etc.

Phillips has made an extension of the Ayres index,[199] carrying it forward, modifying it slightly, and offering supplementary data. Schrammel prepared a third index number for the states.[200] In addition to these state index numbers, there have been at least three others prepared for cities, and four

197 L. P. Ayres, *A Comparative Study of the Public School Systems in the Forty-Eight States*. New York: Russell Sage Foundation, 1912. Pp. 33.

198 L. P. Ayres, *An Index Number for State School Systems*. New York: Russell Sage Foundation, 1920. Pp. 70.

199 Frank M. Phillips, "Educational Rank of the States, 1930," *American School Board Journal*, LXXXIV (February through May, 1932). (Also available as a forty-page reprint, from the author, Washington, D. C.) Earlier articles: "Educational Rank of the States, 1924," *American School Board Journal*, LXXII (April, 1926), 47, 141; and "Educational Ranking of the States by Two Methods," *American School Board Journal*, LXIX (December, 1924), 47-9. This earliest series is available as a 32-page publication from the Bruce Publishing Co., Milwaukee, Wisconsin, 1925.

200 Henry E. Schrammel, *The Organization of State Departments of Education*, Chapter IX, "Ranking of States According to Educational Achievements," pp. 115-34. Bureau of Educational Research Monographs, No. 6. Columbus, Ohio: Ohio State University Press, 1926.

for counties. This whole field has been excellently reviewed and summarizd by the Research Division of the National Education Association,[201] with a bibliography of 47 references added. The same publication contains data for the states on five factors selected by the Research Division, which refrains from combining these into a single index because it does not wish to decide on the relative weighting of each factor. An index number for higher education in the various states, based on eight factors, has been prepared by Chamberlain and Meece.[202] Private and public education are considered separately and jointly.

Numerous other series of data for states have been published, in ratio form, but it is not appropriate to regard every series of ratios as index numbers. For example, one may calculate and perhaps plot on a graph trends showing the change in school enrolment and the change in school-building construction during the last ten or twenty years, expressing each of these series in terms of per cent of the initial year values.[203] But such series are simply figures turned into per cents; they constitute single elements that might, along with a number of other such elements, *enter into* an index number. An index number is an *average* of a number of such series, taken at any desired points (such as years, or places). Thus, Witham, who used only holding power of the schools,[204] and Sias, who used only the average number of days of attendance for each child of school age,[205] as indexes of the efficiency of state school

201 "Estimating State School Efficiency," *Research Bulletin of the National Education Association*, X (May, 1932), 104-12.

See also, for some additional references: Frank L. Shaw, *State School Reports*, pp. 103-7. Teachers College Contributions to Education, No. 242. New York: Teachers College, Columbia University, 1926. Pp. 142.

202 Leo M. Chamberlain and L. E. Meece, *State Performance in Higher Education*. Bulletin of the Bureau of School Service, V (March, 1933), No. 3. Lexington, Ky.: University of Kentucky. Pp. 37.

203 See for illustration, "The Nation's School Building Needs," *Research Bulletin of the National Education Association*, XIII (January, 1935), No. 1. Figure II on p. 7, and Figure VII on p. 27.

204 Ernest C. Witham, "Index of Holding Power," *American Educational Digest*, XLVI (August, 1927), 548-51.

———, "Public School Progress of the States," *American School Board Journal*, LXXV (October, 1927), 37-9.

205 A. B. Sias, "The Financing of a State School System." Doctor's thesis, Stanford University, 1926.

systems, cannot appropriately be said to have employed index numbers in their analyses.[206]

Again, an index number is based on a sampling of items rather than on totals which are complete. Thus the total expenditures for school systems, although representing a diversity of elements, are not an appropriate basis for index numbers because they are complete, rather than being a sampling of costs. Such totals may be expressed as ratios and called indexes, and they may be of great value,[207] but they lie outside the strict limits of the present category. In some cases it is not readily possible to determine whether an index should be regarded as truly an index number or not.

It may be appropriate to call attention to certain index numbers which have been devised in the field of sociology to measure changes in complex social conditions. These are referred to in the footnote.[208]

Index numbers were originally constructed to measure changes in prices of commodities. Although such indexes do not serve directly the purpose of rating, they make possible critical comparisons which are closely associated with appraisal. There have been a number of price indexes constructed in the field of education. Notable among these were three series of index numbers prepared by H. F. Clark [209] and associates, dealing

206 For definitions of index numbers, see Irving Fisher, *The Making of Index Numbers*, Chapter I, "Introduction," pp. 1-10. Boston: Houghton Mifflin Co., 1922 and 1927. Pp. 538.

Also, Willford I. King, *Index Numbers Elucidated*, Chapter III, "The Nature of Index Numbers," pp. 46-9. New York: Longmans, Green and Co., 1930. Pp. 226. See the comments of Allyn A. Young, *Handbook of Mathematical Statistics*, edited by H. L. Rietz, p. 181. Boston: Houghton Mifflin Co., 1924. Pp. 221.

207 For example, see John K. Norton, *The Ability of the States to Support Education*. Washington: National Education Association, 1926. Pp. 88.

208 George A. Lundberg, *Social Research*. New York: Longmans, Green and Co., 1929. Pp. 380. In Appendix C, p. 362, the following are listed:

I. M. Rubinow, "A Dependency Index for New York City," *American Economic Review*, VIII (December, 1918), 713-40.

F. S. Chapin, "Dependence Indexes for Minneapolis: A New Method in Seasonal and Cyclical Analysis," *Social Forces*, V (December, 1926), 215-24.

R. G. Hurlin, "Indexes of Family Case Work Loads," *The Survey*, LIX (February, 1928), 634-5.

See also footnote 288.

209 The preparation and use of these three series are described in the following publication: Harold F. Clark, *Index Numbers in School Administration*. Bulletin of the School

with the cost of school supplies,[210] the price (interest rate) for school bonds,[211] and the cost of school buildings.[212] The latter field has also been worked on by others,[213] the most outstanding study being that by Burgess.[214] The cost of equipping new buildings has been studied by Loomis,[215] utilizing index numbers. Davis employed an index-number technique to study the increasing cost of operating school buildings.[216]

These data on educational building costs may be supplemented by figures on general building costs. The United States Bureau of Labor Statistics gives index numbers on the cost of building materials [217] and rates of union labor.[218] Other figures

of Education, Indiana University, III (January, 1927), No. 3. Bloomington, Ind.: Bureau of Coöperative Research, August, 1928. Pp. 35.

See also, by the same author: "Index Numbers in Educational Work," *Teachers College Record*, XXX (February, 1929), 453-60, and "Index Numbers of Costs in Education," March-May, 1929.

210 Harold F. Clark and John Guy Fowlkes, "Index Numbers for School Supply Prices." Appeared monthly in the *Nation's Schools* from September, 1928 (Vol. II) to December, 1929 (Vol. IV) and was then combined with the index of school-building costs, being discontinued with the March, 1930, issue (Vol. V).

211 Harold F. Clark, "Index of School-Bond Prices." Appeared monthly in the *American School Board Journal* from January, 1928 (Vol. LXXVI) to November, 1931 (Vol. LXXXIII).

212 Harold F. Clark. This series began as "School Building Cost Index" in *American Education Digest*, XLVIII (December, 1928), 28. Continued as "School Building Index" in *School Executives Magazine* from January to August, 1929 (Vol. XLVIII); continued with Oscar K. Buros, joint author, as "Index of School Building Prices," in the same magazine, September to December, 1929 (Vol. XLIX); then combined with the index of school supply prices in the *Nation's Schools* from January to March, 1930 (Vol. V).

213 T. C. Holy and W. E. Arnold, "School Building Expenditures in Relation to School Building Costs," *American School Board Journal*, LXXXV (July, 1932), 41-2. A. C. Monahan, "notes," *American School Board Journal*, LXIX (October, 1924), 64; LXXI (September, 1925), 65; and LXXXIII (August, 1931), 74.

214 Randolph W. Burgess, *Trends of School Costs*. New York: Russell Sage Foundation, 1920. Pp. 142. Chapter V traces building costs from 1841 to 1920, in terms of index numbers.

Also given in part in the following: "Eighty-year Fluctuations in the Cost of American School Buildings," *American School Board Journal*, LXII (January, 1921), 57-8; also in *Proceedings and Addresses of the National Education Association*, LVIII (1920), 329-30; also in *School Life*, V (August 15, 1920), 11-12.

215 Arthur K. Loomis, *The Technique of Estimating School Equipment Costs*. Teachers College Contributions to Education, No. 208. New York: Teachers College, Columbia University, 1926. Pp. 112. Also, *School Equipment Costs*. Teachers College, Columbia University, 1926. Pp. 259.

216 Harvey H. Davis, "An Index of School Plant Operation Costs," *American School Board Journal*, LXXIII (July, 1926), 53.

217 Bulletin No. 493 (see footnote 221), p. 243, gives index numbers on "Changes in Buying Power of the Dollar" from 1913 to 1928, for lumber, brick, cement, steel, paint materials, and other building materials, separately and combined.

218 "Index Numbers of Wages Per Hour, 1840 to 1932 (Exclusive of Agriculture)," *Monthly Labor Review*, XXXVII (September, 1933), 632.

Each issue of the magazine usually carries some data on wage rates and hours. See also the U. S. Department of Commerce *Statistical Abstract of the United States*.

and indexes are also available. Chawner [219] refers to a number of such indexes, setting forth certain cautions that should be observed in their use.

1. Index numbers of economic conditions. The U. S. Bureau of Labor Statistics calculates three series of general index numbers which are of basic importance. They cover the cost of living, wholesale prices, and retail prices. The index numbers dealing with cost of living [220] are perhaps the most widely known in educational circles. They extend back to 1913, by months, and are available separately for each of six groups of commodities, namely, food, clothing, housing, fuel and light, house furnishings, and miscellaneous. They are also available separately for a number of individual cities.

The series on monthly wholesale prices [221] extend back to 1890, in considerable detail, and are available as annual averages back to 1801. Other early index numbers of wholesale prices are referred to by Warren and Pearson,[222] who have calculated their own series running back to 1786.[223] Index numbers of wholesale prices are sometimes supplemented by

219 Lowell J. Chawner, "Construction Cost Indexes as Influenced by Technological Change and Other Factors," *Journal of the American Statistical Association*, XXX (September, 1935), 561-76.

220 Cost-of-living index numbers are given in various publications of the Bureau of Labor Statistics (Washington, D. C.). Current values appear semi-annually in a pamphlet, "Changes in Cost of Living," which started July 15, 1935. Previous to that time (back to 1922) they were added (twice a year (June and December) to the monthly pamphlet on retail prices. Previous to that, to 1917, they were compiled monthly. They are published at irregular intervals in the *Monthly Labor Review*. The basis for calculating cost-of-living index numbers was given in "Cost of Living in the U. S.," *Bulletin of the U. S. Bureau of Labor Statistics*, No. 357, May, 1924. Pp. 466. This method has recently been modified, as described in: Faith M. Williams, Margaret H. Hogg, and Ewan Clague, "Revision of Index of Cost of Goods Purchased by Wage Earners and Lower-Salaried Workers," *Monthly Labor Review*, XLI (September, 1935), 819-37.

221 The wholesale index numbers appear currently in a monthly pamphlet entitled, "Wholesale Prices." Beginning in January, 1932, weekly index numbers were calculated. For earlier data, and method of calculating the index number, see "Wholesale Prices, 1913-1928," *Bulletin of the U. S. Bureau of Labor Statistics*, No. 493, August, 1929. Pp. 257. This is supplemented by later annual bulletins, No. 521 for 1929, No. 543 for 1930, No. 572 for 1931. These wholesale index numbers also appear in the *Monthly Labor Review*. Bulletins No. 284 (1921), and No. 453 (1928), also deal with index numbers of wholesale prices; both are now out of print.

222 George F. Warren and Frank A. Pearson, "A Monthly Index Number of Wholesale Prices in the United States for 135 Years," *Journal of the American Statistical Association*, XXVI (March, 1931 supplement), 244-9.

223 George F. Warren and Frank A. Pearson, *Prices*, pp. 25-7. New York: John Wiley and Sons, Inc., 1933. Pp. 386.

One may be interested in critical comments by Tucker, *op. cit.*, (footnote 225).

the publishing of their reciprocals, which reflect the purchasing power of the dollar. Various authors, King,[224] and Tucker,[225] for example, have pointed out that such indexes do not properly represent changes in the *general price level.*

The series of index numbers of retail prices [226] (which are practically confined to food, at present) go back to 1890. They are calculated monthly and are available separately for several food groups and for a number of cities. Data on the cost of coal, gas, and electricity are also secured and are usually published with the retail-price index of food. A new, general-purpose index of retail prices was projected by the Bureau of Labor Statistics during 1935-36, its appearance being scheduled for late in 1936.

The National Industrial Conference Board has prepared its own series of index numbers on the cost of living,[227] which date from 1914. Differences between these and the index numbers of the Bureau of Labor Statistics have been analyzed.[228] Paul Douglas [229] has critically examined some of the index numbers of the U. S. Bureau of Labor Statistics and has pre-

224 Willford I. King, *Index Numbers Elucidated,* Chapter VIII, "Measuring the Purchasing Power of Money," pp. 189-218. New York: Longmans, Green and Co., 1930. Pp. 226.

225 Rufus S. Tucker, "Gold, Prices and Prosperity: No Statistical Basis for the Commodity Dollar," *The Annalist,* XLII (December 1, 1933), 707-9.

226 Index numbers for retail prices are given in a monthly pamphlet entitled, "Retail Prices." Before March, 1932, this bore the title, "Prices: Wholesale and Retail." *The Monthly Labor Review* also carries these index numbers. For a detailed recapitulation see the *Bulletin of the United States Bureau of Labor Statistics,* No. 495 (August, 1929). Pp. 219. This bulletin also describes the method of gathering and analyzing data for the index numbers, pp. 11-3.

Other descriptions of gathering data and calculating indexes are given in: "Methods of Procuring and Computing Statistical Information of the Bureau of Labor Statistics," *Bulletin of the U. S. Bureau of Labor Statistics,* No. 326, 1923. Pp. 54.

227 Basic figures and the method of calculating are given in: *The Cost of Living in the United States, 1914-1930.* New York: The National Industrial Conference Board, 247 Park Avenue, 1931. Pp. 170. Recent figures are given in the supplement to the *Conference Board Service Letter* in March of each year. Other data appear in the monthly *Conference Board Bulletin* incident to articles.

228 Elma B. Carr, "Cost of Living Statistics of the United States Bureau of Labor and the National Industrial Conference Board—Comparison of Methods Used in the Collection and Computation of Cost of Living Figures," *Journal of the American Statistical Association,* XIX (December, 1924), 484-507. See also chapters in the preceding reference, and in the one next following.

229 Paul H. Douglas, *Real Wages in the U. S., 1890-1926.* Publications of the Pollack Foundation for Economic Research, No. 9. Boston: Houghton Mifflin Co., 1930. Pp. 682. He discusses the construction of several sets of index numbers, presents some, and gives his own series of wholesale price numbers (p. 60), as well as others.

pared a revised set for the cost of living, together with index numbers for wages, and real wages.

Index numbers of business activity are too numerous and varied to be reviewed. Mention will be made here of only a few, together with sources of many others.[230] Under the direction of Leonard P. Ayres, the Cleveland Trust Company has published two series known as "American Business Activity Since 1790," (February, 1932), and "Business Activity and Four Price Series," (March, 1932). These are maintained currently by the Cleveland Trust Company's monthly *Business Bulletin*. The index of business activity, like other similarly constructed series, represents a special form of index number, in which variations are taken not from a fixed base but from a variable estimated "normal" as the base.

Six important business indexes are given by Leong,[231] for the years 1919-34, and other important series are referred to in his article. Whelden[232] also gives an index of business activity for 1919-34. The U. S. Bureau of Labor Statistics publishes monthly index numbers of employment and payrolls.[233] The survey of spendable money income, published periodically in *Sales Management*,[234] gives an "index number" in addition

230 Lists of current index numbers are given in the following references:

Frederick E. Croxton and Dudley J. Cowden, *Practical Business Statistics*, pp. 397-404. New York: Prentice-Hall, Inc., 1934. Pp. 529. See also the entirety of Chapter XVIII.

Irving Fisher, *The Making of Index Numbers*, pp. 436-7. Boston: Houghton Mifflin Co., 3d ed., rev., 1931. Pp. 538.

U. S. Bureau of Labor Statistics, *Index Numbers of Wholesale Prices in the United States and Foreign Countries*, pp. 115-75. Bulletin No. 284, 1921. Pp. 350. o. p. (Revision of Bulletin 173. o. p.)

231 Y. S. Leong, "Indexes of the Physical Volume Production of Producers' Goods, Consumers' Goods, Durable Goods, and Transient Goods," *Journal of the American Statistical Association*, XXX (June, 1935), 361-76. An index of manufactures, and one for consumers' goods excluding automobiles, are included in the article.

232 C. H. Whelden, Jr., "An Index of Business Activity—Manufacturing Values and Payrolls," *Harvard Business Review*, XIII (Summer, 1935), 503-12.

233 "Employment and Payrolls," monthly publication of the United States Bureau of Labor Statistics. Began in July, 1923, as "Employment in Selected Industries"; title has varied.

Lewis E. Talbert and Alice Olenin, "Revised Indexes of Factory Employment and Pay Rolls, 1919 to 1933," *Bulletin of the U. S. Bureau of Labor Statistics*, No. 610, 1935. Pp. 106.

See also *Real Wages*, by Douglas, previously cited (footnote 229), especially p. 205, and Parts II-IV, including the appendices.

234 Through 1930, contained in Section II of the Annual Reference Number of *Sales Management*. Beginning in October 31, 1931 (Vol. XXIX) the "Survey of Spending Power" became a part of the regular numbers, and has appeared in April 10, 1933

to many other valuable population and commercial data for states, counties, and cities of 10,000 population. A number of important economic indexes are given in the publications of the National Bureau of Economic Research.[235]

Many indexes of current conditions are available in periodicals, especially the following: weekly numbers of *The Annalist*, the monthly *Federal Reserve Bulletin* of the Federal Reserve Board at Washington, the *Bulletin of the National City Bank* of New York, the *Monthly Review* of the Federal Reserve Bank of New York, the *Harvard Review of Economic Statistics*, the *Standard Statistical Bulletin*, and the *Survey of Current Business* (published since 1921, by the U. S. Bureau of Foreign and Domestic Commerce).

2. Educational applications. These various index numbers of economic conditions have been used in a variety of research studies in education, both as patterns of analysis and as direct sources of information. Mention has already been made that Phillips modified the Ayres' Index Number of State School Systems; this was done by "deflating" the financial items according to variations in the index of the cost of living. The United States cost-of-living index numbers have also been used rather widely to account in part for the increasing costs of education since 1900; in fact, almost half of the increase in expenditures for education from 1900 to 1930 has been attributed to the decreased purchasing power of the dollar during this period.[236] Another type of comparison is that between the increase in expenditures for education and the increases in

(Vol. XXXII); by states only for April 20, 1934 (Vol. XXXIV); and by counties and cities again in April 10, 1935 (Vol. XXXVI). See corresponding numbers for later years. The 1931 number carried a cost-of-living index for each city in the U. S. over 10,000 population. Address of publisher: Sales Management, Inc., 420 Lexington Ave., New York.

235 See for example, Frederick C. Mills, *Economic Tendencies in the United States: Aspects of Pre-War and Post-War Changes*. No. 21 of the National Bureau Series. The National Bureau of Economic Research, 51 Madison Ave., N. Y., 1932. Pp. 639. Covers the thirty-year period, 1899-1929. Or see: W. I. King and Lillian Epstein, *The National Income and Its Purchasing Power*, 1930. Pp. 394. Current information is contained in the National Bureau of Economic Research Bulletin, published five times a year.

236 "Facts on School Costs," *Research Bulletin of the National Education Association*, X (November, 1932), 223-4. A criticism of this conclusion has been given by Nelson B. Henry, "Index Numbers and the Cost of Schools," *American School Board Journal*, LXIX (July, 1924), 58.

various indexes of industrial production and business activity.

Index numbers for the cost of living [237] have been used to show variations in purchasing power of teachers' salaries. [238] Several cost-of-living index numbers have been constructed especially for teachers to reflect variations in costs from year to year or from place to place. For example, the report of the Committee on the Economic Status of the Teacher [239] reviews the construction of special index numbers for the cost of living of teachers by four earlier writers and then constructs one of its own for the years 1928-34. Such studies are of basic importance in building salary schedules or in meeting the arguments of unfriendly groups. Harry [240] made a study of differences in the cost of living of teachers in different parts of New York. This study was repeated in Ohio, and the index number was included as one of the factors recommended for use in the distribution of state school money.[241] Other studies may be found by consulting the topics, "Index Numbers," and "Cost and Standard of Living," in the *Education Index*.

Preparation and use of index numbers. The objective character of the data utilized in the index number, and of the resulting series of figures, should not obscure the fact that the components of the index number may not, individually or in the aggregate, provide an adequate representation of the char-

237 The studies in the following volume may be interesting as illustrations of technique in estimating costs of living: *Standards of Living:* A Compilation of Budgetary Studies. Bulletin No. 7 (revised edition). Washington: Bureau of Applied Economics, Inc., 1920. Pp. 156. o. p.

238 T. C. Holy, "Cost-of-Living Indexes for Teachers' Salaries," *Educational Research Bulletin*, XII (February 8, 1933), 42-5.

F. K. Shuttleworth, "Dollar and Real Incomes of Public School Teachers and of Wage Workers, 1889-1890 to 1934-35," *Educational Administration and Supervision*, XXI (February, 1935), 81-96.

See also Paul Douglas, footnote 229.

239 "The Teacher's Economic Position," *Research Bulletin of the National Education Association*, XIII (September, 1935), Chapter VII, pp. 222-42. See also circular No. 1, January, 1933, of the *Educational Research Service* of the National Education Association, on "Estimating Changes in Teachers' Cost of Living."

240 David P. Harry, *Cost of Living of Teachers in the State of New York*. Teachers College Contributions to Education, No. 320. New York: Teachers College, Columbia University, 1928. Pp. 184.

241 *Equalizing Educational Opportunity in Ohio:* A Preliminary Report of a Survey of State and Local Support of Public Schools in Ohio, prepared under the direction of Paul R. Mort. The Ohio School Survey Commission, Columbus, Ohio, November 1, 1932. See pp. 39-40 and 147-9.

acter which one is seeking to index. The comments on "Underlying Assumptions," made in the preceding section, apply with equal force to index numbers. The Research Division of the National Education Association makes the following pertinent comments concerning the use of index numbers for rating school systems: [242]

As purely objective measures of school efficiency which can command universal acquiescence, none of the studies can be said to have succeeded. Statistical criteria for the measurement of state school efficiency possess the great advantage of definiteness, appeal to the public, and ease of recurrent application. But precisely because of these alluring advantages certain dangers lurk in placing exclusive reliance on them and in hasty or uncritical interpretation of the comparative statistics which quantitative criteria develop. Before it is possible to derive and to make proper use of quantitative criteria, the following difficulties must be faced and overcome:

1. The data from which the criteria are computed must be comparable. [That is, they must be uniformly defined and gathered from all states. This is at present far from the case.]

2. Every quantitative criterion to be used must possess a demonstrable relationship to the efficiency of the schools. . . . It must be possible to show (either logically or statistically, and preferably both) that these factors are directly and intimately associated with school efficiency. Therefore, the selection of a given criterion . . . merely because the data upon it are easily available, creates a second chance for error.

3. The relative weight of different factors in affecting school efficiency must be known. . . . The practice of averaging a number of different factors to secure a single measure of school efficiency is based on the doubtful assumption that all factors considered are of equal importance.

Results of such ratings should be cautiously interpreted, . . . [and] such ratings should be supplemented by such other estimates of school efficiency as are available.

The foregoing requirements and other criteria can be summed up under the two general requirements for all research; namely, that the data must represent the concept (the problem) which one is studying, and they must represent the

242 "Difficulties Involved in Statistical Analysis," p. 109 in "Estimating State School Efficiency," *Research Bulletin of the National Education Association*, X (May, 1932), No. 3.

conditions in the field. One has first to select factors (items) for his index number which will represent as faithfully and completely as possible the general characteristic which he desires to study. In the field of economics, selecting items which represent wholesale prices does not involve any difficulty, since anything sold at wholesale would answer the purpose. However, selecting items to represent more complex, specialized concepts, such as cost of living, general business conditions, or the efficiency of school systems, calls for a thoughtful analysis of the concept.

Proper weighting is a second element in representing the characteristic one desires to study. In the field of price indexes, one may weight by the quantity sold, and there can be little argument.[243] In indexes for more complex characteristics, such as business activity or the efficiency of school systems, the problem becomes important, and generally it must rest on judgment after a careful analysis. There is a somewhat prevalent misconception that when one uses data as they are collected, the data are not weighted. They have, however, a natural weighting which is just as real (and may be just as wrong for a certain purpose) as any artificial weighting that might be assigned. On the other hand, workers will frequently reduce all of the factors to equal weighting,[244] usually with the thought that they have thereby relieved themselves of all responsibility for judgment and made their work perfectly objective. But equal weighting may be less justifiable than natural weighting or some other arbitrary weighting. The problem is primarily one of judgment, barring the extensive research which might remove judgment another step, and must be faced as such.

[243] A question may arise as to whether to weight by the quantities in the base or in the given year. Certain formulas use a combination of the two. Exact weighting is not however regarded as important. See Irving Fisher, *The Making of Index Numbers*. Publications of the Pollack Foundation for Economic Research, No. 1, pp. 328, 346-8, 432, 447-9. (Third edition, revised.) Boston: Houghton Mifflin Co., 1927 (2d printing, December, 1931). Pp. 538.

[244] T. L. Kelley, *Interpretation of Educational Measurements*, pp. 66-74. Yonkers-on-Hudson, N. Y.: World Book Co., 1927. Pp. 363.

Douglas E. Scates and F. R. Noffsinger, "Factors Which Determine the Effectiveness of Weighting," *Journal of Educational Research*, XXIV (November, 1931), 280-5.

To have one's data truly representative of the field conditions, the measures must be uniformly (and carefully) defined. For example, such an apparently simple thing as "one day of attendance" varies a great deal in its concept from one school system to another. Phillips gives an illuminating discussion of this difficulty.[245] Again, the field must be properly sampled.[246] That is, items or sources which are closely representative of other items or sources in the field must be gathered. In the case of the forty-eight states, all can be included, and the only sampling involved is that in the initial selection of items to represent the concept, and perhaps in the further definitions of these factors in field terms. In the case of prices, one cannot gather data on all of the prices of any single commodity in every city and village in the United States, so he resorts to sampling of the field and gathers data from a certain number of cities which he believes will also represent other cities.[247]

The problem of putting the data together and performing the statistical calculations, after the above aspects have been given due attention, is a technical one.[248] The formulas for index numbers are well treated in statistical texts and will not be cited here. Fisher [249] gives the most elaborate treatment of formulas, though he does not exhaust the possibilities. He discusses six types of averages and six types of weighting (p. 351) and analyzes the resulting index numbers on the

245 Frank M. Phillips, "Educational Rank of the States, 1930," Section II, "Uniform Definitions, Records, and Reports," *American School Board Journal*, LXXXIV (March and April, 1932). Also in a pamphlet of same title, published by the author, Washington, 1932, pp. 25-40.

246 King, *op. cit.* (footnote 224), p. 49, says that the problem of sampling the field is the only real problem of index numbers. Though other writers recognize the importance of sampling, they do not concur in such an extreme emphasis. E.g., cf. Fisher, *op. cit.* (footnote 249), pp. 336-40, and 524-5. King's position is developed in Chapter IV, "Sampling as Related to Index Numbers," pp. 59-77, and Chapter VII, "Percentages of Error Found in Certain Price Indices," pp. 143-88 of his book.

247 A description of the methods by which the United States Bureau of Labor Statistics gathers data from the field for its index numbers is given in the following bulletin: "Methods of Procuring and Computing Statistical Information of the Bureau of Labor Statistics." *Bulletin of the U. S. Bureau of Labor Statistics*, No. 326. Washington, March, 1923. Pp. 54.

248 It is assumed that the student will familiarize himself with the references which have been cited, since a number of them describe the methods by which the index numbers were prepared. See particularly, Mills, National Industrial Conference Board, United States Bureau of Labor Statistics, Douglas, and Whelden.

249 Fisher, *op. cit.* (footnote 243).

basis of several criteria. He concludes that his formula No. 353 is the "ideal" one (pp. 360 and 493), but that formula No. 2153 is more easily calculated and practically as good (pp. 361 and 494). His formula No. 53 (estimated to be correct within 1 per cent, pp. 362 and 494) is both rapid and simple to explain to non-technical workers. It is the form used by the United States Bureau of Labor Statistics in calculating the index numbers of wholesale prices, retail prices, and cost of living. It will be found satisfactory for most purposes. His formula No. 1, which is a simple average, is the one that has been generally used in educational studies; Fisher says that[250] "It should not be used under any circumstances, being always biased and usually freakish as well."

Other sources of index-number formulas are Kelley,[251] Young,[252] and most books on statistical methods in economics. A practical and comprehensive treatment is given by Croxton and Cowden.[253] One should also consult the *Journal of the American Statistical Association* for many practical and theoretical articles.

Most of the useful formulas are really not difficult, though at first they may appear to be. They are generally stated in terms which grow out of the economic field; for example, p stands for the price of a commodity and q stands for the quantity of this item that was sold. To translate these symbols into non-financial terms, p would stand for the value observed for any particular item or character at any particular time or place, and q would be the weight that is assigned to this character.

The use of index numbers has been reviewed here in some

250 *Ibid.*, pp. 361, 466; see also pp. 64-6.

251 Truman L. Kelley, *Statistical Method*, Chapter XIII, "Index Numbers," pp. 331-47. New York: The Macmillan Co., 1923. Pp. 390. On pp. 344-5, Kelley's formulas Nos. 10, 12, 15 are respectively Fisher's formulas Nos. 2153, 53, and 353.

252 Allyn A. Young, *Textbook of Mathematical Statistics*, edited by H. L. Rietz, Chapter XII, "Index Numbers," pp. 181-94. Boston: Houghton Mifflin Co., 1924. Pp. 221. Young's formulas Nos. 10, 11, and 13 on p. 188 are respectively Fisher's formulas Nos. 53, 353, and 2153.

253 Frederick E. Croxton and Dudley J. Cowden, *Practical Business Statistics*, Chapter XVII, "The Construction of Index Numbers," pp. 362-77, and Chapter XVIII, "Some Current Indexes," pp. 378-404. New York: Prentice-Hall, Inc., 1934. Pp. 529.

detail because nowhere else in educational literature is the subject treated as a unit. There is room for many more studies in education utilizing the index-number technique.

School surveys. The final application of the normative-survey method to be discussed in this chapter is that of school surveys. Although surveys may be made for a number of different purposes, the discussion is introduced in connection with the topic of appraisal, since this is typically the essential element in school surveys. The survey is, however, a composite of normative-survey procedures, involving all of the various techniques which have been dealt with in these two chapters (VII and VIII) in order to realize its appraisal purpose. It can be well said that no other unified undertaking so fully represents the normative-survey method of research in all of its various phases as does the school survey.

1. Development of the school survey. The survey of educational practices in city school systems was patterned after the sociological survey at the outset, but rapidly developed characteristics of its own. There are a number of brief historical accounts of the development of surveys.[254] The following paragraphs are quoted from Caswell, to give a sketch of what may be regarded as the modern survey movement.[255]

> The Boise, Idaho, survey of 1910 marks the beginning of the movement. In 1911 and 1912 the East Orange and Montclair, New Jersey, and the New York City surveys were made. By 1914 the idea had become so popular that surveys of nine city school systems were made by outside experts during the year. In that year also the Carnegie Corporation made, in Vermont, the first state-wide survey. Dr. Leonard P. Ayres, then with the Russell Sage Foundation, in 1916 directed the most comprehensive survey of the Cleveland, Ohio, schools. This study was by far the most detailed of any made up to that time.

254 Henry Lester Smith and Edgar Alvin O'Dell, *Bibliography of School Surveys and of References on School Surveys*, p. 179, I. "Early Investigations" (not all of these are to be regarded as surveys in the usual sense); p. 180, "History of Surveys" (14 surveys). Bulletin of the School of Education, Indiana University, Vol. VIII (September and November, 1931), Nos. 1 and 2. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 212. (Two numbers published as one.)

255 Hollis Leland Caswell, *City School Surveys*, pp. 5-6. Teachers College Contributions to Education, No. 358. New York: Teachers College, Columbia University, 1929. Pp. 130.

During the years immediately following 1916 the results and the future of the movement were widely discussed. Many educational meetings throughout the nation gave prominent places on their programs to such discussions. In this process of popularization such extravagant claims were made for surveys that the movement later came to be considered an educational fad by many leaders. In fact, many inferior surveys were made during this period by those who lacked the necessary training to direct them successfully. It is not strange that much bitterness was caused by certain of these surveys which were used for partisan rather than professional purposes.

Following the World War, the popularity of locality surveys waned somewhat. Within the past few years, however, the number has gradually increased, until in 1927 more surveys of city school systems by outside experts were published than in any previous year. In addition, three state-wide surveys were made. It now appears that locality surveys have passed the period of widespread popularization, weathered a time of depression, and are now increasing in favor. Fewer extravagant claims are being made either in favor of or in opposition to surveys.

2. Kinds of surveys. Surveys may be classified on any number of different bases.[256] A few of these will be mentioned here. On the basis of *area,* surveys may be for cities, counties, states, regions, rural, urban, etc. Caswell refers to surveys covering a reasonably compact territory when he speaks of "locality surveys." On the basis of *level,* there are surveys of elementary schools, junior high schools, colleges, universities, adult education, etc. Surveys are commonly classified by area and *educational enterprise,* indicating the particular phase of the total educational problem with which they are concerned. For example, there are surveys of buildings, of reading, of vocational education, of administration, of finance, of pupil progress, etc. General surveys may be referred to as "comprehensive."

A fundamental basis of differentiation is whether surveys are *educational,* or *sociological,* or of some other general nature. It is assumed here that we are thinking of educational surveys. These may deal with *public* or *private* institutions. In either case the institutions may be scattered over the country, such as in the case of land-grant colleges, and these cases are in

[256] See Smith and O'Dell, *op. cit.* (footnote 254), p. 179, IV, "Classes of Surveys."

contrast to the "locality" survey. Another common basis of classification of surveys is that of *agency*. Surveys have been made by individuals, by organizations within university schools of education, by selected groups of college professors, by the United States Office of Education, by state departments of education, by the local staff, etc.

3. Survey techniques. As stated above, school surveys utilize in one instance or another the whole range of normative-survey procedures. In one of his studies Caswell analyzed the techniques which were commonly used in surveys and tabulated their frequency of use by the various agencies that have made large numbers of surveys. He thus brought out the characteristic types of attack emphasized by different survey agencies. His list and description of techniques follow: [257]

1. *Analysis of available basic data.* All cases in which data were secured from any regularly prepared record, report, or document were included under this heading; for example, the minutes of the Board of Education, the city charter, attendance reports, individual pupil record cards, etc. Usually these data have to be tabulated or treated in special ways; for example, an age-grade table is a special tabulation of data on the age and grade of pupils, which data are available from individual pupil record cards. Hence, the method of securing and treating data for an age-grade study was classified as analysis of available basic data.

2. *Score card and rating scale.* Any scheme whereby various elements in a situation were listed and weighted or evaluated was included under this heading. Ordinary check-lists which had no standards or rating were included under observation.

3. *Standard tests.* Both intelligence and achievement tests were included under this heading. Tests developed especially for use in a survey and standardized as a part of the survey work were also included under this heading.

4. *Case study.* The term *case study* is used here in a very general way. Whenever an individual pupil was studied and his case used as evidence to support a conclusion, this was classified as a case study.

5. *Experimental procedure.* Whenever groups were equated with respect to certain characteristics and compared with respect to a variable characteristic, this was classified as experimental procedure.

6. *Interview or questionnaire.* Whenever data were secured by

257 Hollis Leland Caswell, "Survey Techniques," *Educational Administration and Supervision*, XIX (September, 1933), 431-41.

means of conversation or by means of forms filled out by members of the staff of the school being surveyed, this was classified under the above heading.

7. *Observation.* Whenever the basis upon which a problem was solved was a subjective examination, this was classified as observation.

In studying fifty-one published surveys from 1914 to 1931, Caswell found that the experimental procedure was not used in any of them except one survey in 1929; case-study procedures increased over the period from less than 1 per cent to 5 per cent of all problems taken up; score-card and rating-scale techniques were employed for less than 1 per cent at first, and for 9 per cent of all problems taken up at the end of the period; standard tests were employed in the solution of 2 per cent of the problems surveyed at the beginning of the period, and for 6 per cent at the end; interviews and questionnaires decreased from 4 per cent to 1 per cent of the problems attacked, and observation decreased from 18 per cent to about half of that amount; the first technique, analysis of available basic data, continued throughout the period to furnish evidence for 70 per cent to 80 per cent of all the problems attacked by the survey.

The foregoing classification of school-survey techniques parallels closely that used in the present treatment of normative-survey research; it includes case study and experimental procedure, which are treated in other chapters; it combines interview and questionnaire, which are regarded in the present text as distinct; and it omits special mention of documentary frequency studies. These latter studies would be included under the first technique. As an illustration of documentary frequency studies in surveys. one may note the study of board minutes to ascertain the frequency of mention of various topics—used as an index of the kind of problem to which the board devotes its attention.[258]

4. Literature on school surveys. Because survey reports in large numbers are readily available for direct study, and

[258] Leonard P. Ayres, *School Organization and Administration*, Chapters I-III. Cleveland Education Survey. New York: Russell Sage Foundation, 1916. Pp. 135.

because the literature on surveys is well indexed, no elaborate analysis of surveys and their characteristics will be undertaken in the present chapter. One should pursue the subject in accordance with his interests, selecting those surveys which constitute examples of the type he desires to know. The following paragraphs will introduce the key publications in the literature on school surveys.

The most comprehensive general treatment on surveys is a textbook prepared by Sears [259] some years ago. This outlines the nature of surveys and discusses the type of consideration which is appropriate to the various phases of the educational system being surveyed. More recent writings by this author will be found under his name in the *Education Index*. Perhaps special mention should be made of his "The School Survey as a Means of Training Field Workers." [260] This article should be read primarily for the concept of survey work which is expressed incidentally in connection with the various phases of the work discussed. The point of view which it represents should be clearly understood by every one who essays to make a school survey.

The School of Education of Indiana University has prepared the chief indexes of this field. The *Bibliography of School Surveys and of References on School Surveys* [254] lists surveys by locality, with national surveys at the end. In all, about 1800 surveys are listed; many of these are not the type ordinarily connoted by the term *school survey,* but their inclusion serves to make the bibliography more comprehensive. Part II of this work is a bibliography of references which deals with surveys—either particular ones, or the work in general. These are arranged by author. There follows a "Classification of References on Surveys," which affords a classified index to these articles. This index may be used by the student for the location of survey reports in which he is most interested. If, on the other hand, one is interested to find out how

259 Jesse B. Sears, *The School Survey*. Boston: Houghton Mifflin Co., 1915. Pp. 440.
260 Jesse B. Sears, *Journal of Educational Research*, XXIX (October, 1935), 138-43.

various surveys have dealt with particular subjects or phases of the educational system and what they have recommended on them, he should consult the *Topical Analysis of 234 School Surveys*.[261] This publication is an index to the detailed treatments of the various survey reports which were included. It is a guide of utmost importance for material up to its date of publication (1927).

One can find a discussion of the surveys made during each two-year period since 1916 by consulting the proper chapter of the *Biennial Survey of Education in the United States*, made by the U. S. Office of Education. These chapters are also printed as separate bulletins of the Office.[262] For current surveys, one should consult "Surveys," and cross references, in the *Education Index*, and the topic "Surveys" or "Educational Surveys" in the Index of the *Bibliography of Research Studies in Education*, published annually by the United States Office of Education.

A review and appraisal of 230 surveys of higher institutions, prepared by Walter C. Eells, were announced for publication in 1936 by the Carnegie Foundation for the Advancement of Teaching, New York City.

One should also learn something of the sociological survey,[263] both because it was the forerunner of the educational

261 *Topical Analysis of 234 School Surveys.* Bulletin of the School of Education, Indiana University, Vol. III (March, 1927), No. 4. Bloomington, Ind.: Bureau of Co-operative Research. Pp. 111.

262 The first of these was: E. F. Buchner, *Educational Surveys.* U. S. Bureau of Education Bulletin, 1918, No. 45. Advance sheets from the Biennial Survey of Education in the United States, 1916-1918. Washington, D. C., 1919. Pp. 56.

263 Allen Eaton and S. M. Harrison, *A Bibliography of Social Surveys.* New York: Russell Sage Foundation, 1931. Pp. 468.

Manuel C. Elmer, *Technique of Social Surveys.* (Third edition.) Los Angeles: Jesse Ray Miller, 1917. Pp. 260.

Paul V. Kellogg and Neva R. Deardorff, *Social Research As Applied to Community Progress.* International Conference of Social Work, First Section, New York: Russell Sage Foundation, 1928.

George A. Lundberg, *Social Research*, Chapter VII, "Field Work: The Interview and Social Survey," pp. 140-67 and pp. 336-8; Chapter X, "The Measurement of Social Institutions," pp. 243-99, pp. 345-6, and pp. 361-70. New York: Longmans, Green and Co., 1929. Pp. 380.

Robert S. Lynd and Helen Merrell Lynd, *Middletown:* A Study in Contemporary American Culture. New York: Harcourt, Brace and Co., 1929. Pp. 550.

Dorothy C. Mott, "Community Survey Technic," *Department of Elementary School Principals Bulletin*, XI (April, 1932), 203-11.

Howard W. Odum and Katherine Jocher, *An Introduction to Social Research*, Chapter

survey, and because one may need to gather similar information as a part of an educational survey, or for direct use in instruction or administration.

5. National surveys. Because of their general interest attention is called to the national surveys undertaken by the United States Office of Education. Mention will be made first of the Biennial Surveys of Education, referred to in a preceding paragraph. These consist of data reported to the United States Office of Education on regular report forms every two years (both states and local districts make these reports), and of interpretations or discussions of these data. These Biennial Surveys began in 1916-18.[264]

Some idea of the scope of these reports may be obtained from the following list of topics treated. In Volume I of the report for 1928-30,[265] there were twenty-three chapters, covering, among other subjects, elementary education, secondary education, industrial education, commercial education, homemaking education, agricultural education, art education, music education, hygiene and physical education, education of exceptional children, adult education, college and university education, education of teachers, education of certain racial groups, radio and education, library service, and educational legislation. In Volume II, which is almost wholly tables of statistics, there were seven chapters containing statistics of state school systems, of city school systems, of universities, colleges, and professional schools, of high schools, of private schools, of expenditures, etc. The data are extensive. These Biennial Surveys constitute an important source of information on current conditions and trends in education in the

XVI, "Types of Method: The Survey," pp. 244-59. New York: Henry Holt and Co., 1929. Pp. 488.

Thomas E. Sullenger, "Approaches to Methods of Community Study," *Sociology and Social Research*, XVIII (May, 1934), 470-6. Excerpts in *Journal of Educational Sociology*, VIII (October, 1934), 94-7.

See also the field studies cited in connection with the interview, footnotes 31-6. See also the topic, "Social Surveys," in the *Education Index*.

264 *Biennial Survey of Education*. United States Bureau of Education Bulletin, 1919, No. 91. Washington, 1920. Pp. 797.

265 *Biennial Survey of Education*. United States Office of Education Bulletin, 1931, No. 20. Washington, 1932. Vol. 1, pp. 807; Vol. 2, pp. 833.

United States. Survey reports following the one for 1928-30 have been curtailed, owing to shortage of funds.

During the past decade, the United States Office of Education has undertaken five special surveys on a national scale, in addition to its regular biennial surveys of education in general. These five surveys include: the Survey of Land-Grant Colleges and Universities,[266] begun in 1926; the Survey of Negro Colleges and Universities,[267] begun in 1927; the National Survey of Secondary Education,[268] begun in 1929; the National Survey of the Education of Teachers,[269] begun in 1930; and the National Survey of School Finance,[270] begun in 1931. These national surveys of special phases of education are described in one of the government bulletins.[271]

6. Building surveys. A second set of surveys which will be given special mention, because of their general interest, are surveys of school buildings.[272] These generally constitute a

266 *Survey of Land-Grant Colleges and Universities,* Edited by Arthur Klein. United States Office of Education Bulletin, 1930, No. 9. Washington, 1930. 2 Vols., pp. 998 and 921.

267 *Survey of Negro Colleges and Universities,* Arthur J. Klein. United States Office of Education Bulletin, 1928, No. 7. Washington, 1929. Pp. 964.

268 *National Survey of Secondary Education.* United States Office of Education Bulletin, 1932, No. 17, Monographs Nos. 1-28. Washington, 1933-1935. 28 Vols.

See "National Survey of Secondary Education" in the *Education Index* for 1929-1932 and for 1932-1935, for ninety-five references relating to this survey.

269 *National Survey of Education of Teachers.* United States Office of Education Bulletin, 1933, No. 10, Volumes I-VI. Washington, 1933-1935. 6 Vols.

See "National Survey of Education of Teachers" in the *Education Index* for 1929-1932 and for 1932-1935 for thirty-three references relating to this survey.

270 National Survey of School Finance. Owing to the failure of continued appropriations, this survey was stopped at the end of its first year. One volume of the report was published by the Office of Education and two volumes by the American Council on Education.

Carter Alexander and Timon Covert, *Bibliography on Educational Finance, 1923-1931.* United States Office of Education Bulletin, 1932, No. 15. Washington, 1932. Pp. 344.

Research Problems in School Finance. Washington: American Council on Education, 1933. Pp. 164.

Paul R. Mort and Others, *State Support for Public Education.* National Survey of School Finance, Publication No. 3, 1933. Pp. 496. See "National Survey of School Finance," in the *Education Index* for 1929-1932 and for 1932-1935, for 30 references relating to this survey.

271 Walton C. John, "National Surveys of the Office of Education," Chapter XX, in *Biennial Survey of Education in the United States,* 1928-1930. United States Office of Education Bulletin, 1931, No. 20. Washington, 1931. Pp. 32.

272 For a list of building surveys, see Henry Lester Smith and Edgar Alvin O'Dell, *Bibliography of School Surveys and of References on School Surveys,* those surveys marked "bld" after "Type." For *references about* building surveys, see p. 179. (Complete reference is given in chapter bibliography.)

The building surveys in the above publication, about 230 of them, are listed, by number, in item No. 2442, in Henry Lester Smith and Forest Ruby Noffsinger, *Bibliography*

preliminary step in the formulation of a building program [273] which is to cover a period of years. They are frequently included as a part of a general or comprehensive school survey. They normally embrace an appraisal of the existing school buildings,[274] as a basis for determining what buildings should be rehabilitated or replaced at once and for estimating when other buildings will need to have additions, extensive repairs, or replacements. Such an appraisal makes use of the evaluating procedures described earlier.

A second important element of the building survey is the estimation of present and future needs. This step involves a study of the present utilization of buildings [275] to ascertain

of School Building, Grounds, and Equipment, Part II. (For complete reference, see chapter bibliography.)

In addition to the foregoing, many of the surveys marked "comp" in Smith and O'Dell contain surveys of buildings as a part of the comprehensive survey. These can be identified only by inspecting the survey reports.

For current surveys, consult the *Education Index:* "Surveys—School Buildings."

273 For a bibliography on building programs, including surveys incident to them, see "Preliminary Considerations and the Development of the Building Program," in Henry Lester Smith, and (Leo M. Chamberlain or Forest R. Noffsinger), *A Bibliography of School Buildings, Grounds, and Equipment:* Part I, pp. 48-53, and Part IV, pp. 28-32. (See chapter bibliography for complete reference.)

A comprehensive review is given by Harry P. Smith, "The Survey Preliminary to a School Building Program, Chapter I, pp. 346-63, in "School Buildings, Grounds, Equipment, Apparatus, and Supplies," *Review of Educational Research*, II (December, 1932), No. 5.

Fred Engelhardt and N. L. Engelhardt, *Planning School Building Programs*. New York: Bureau of Publications, Teachers College, Columbia University, 1930. Pp. 574.

Arthur B. Moehlman, *Public School Plant Program*. Chicago: Rand McNally and Co., 1929. Pp. 405.

For a book presenting school-building programs in ten cities, growing out of surveys, see: N. L. Engelhardt, *School Building Programs in American Cities*. New York: Teachers College, Columbia University, 1928. Pp. 560.

The Planning and Construction of School Buildings. Thirty-Third Yearbook of the National Society for the Study of Education, Part I. Bloomington, Ill.: Public School Publishing Co., 1934. Pp. 337.

Russell A. Holy, *The Relationship of City Planning to School Plant Planning*. Teachers College Contributions to Education, No. 662. New York: Teachers College, Columbia University, 1933. Pp. 135.

For a bibliography on the building program of higher educational institutions, see section IV of Henry Lester Smith and Forest Ruby Noffsinger, *Bibliography of College and University Buildings, Grounds, and Equipment*. Bulletin of the School of Education, Indiana University, X (March, 1934), No. 2. Bloomington, Ind.: Bureau of Cooperative Research. Pp. 199.

See "School Building Programs," in the *Education Index*.

274 See the following sections in the *Review of Educational Research:* II (December, 1932), 354-7; IV (February, 1934), 52-3.

See the section, "Score Cards and Building Measurement," in *Bibliography of School Buildings, Grounds, and Equipment* (footnote 273), Parts I, II, and IV.

275 See the following sections in the *Review of Educational Research:* II (December, 1932), 357-8; IV (February, 1934), 53-4; V (October, 1935), 340.

References to utilization are given in the section, "Score Cards and Building Measure-

how completely the existing plant is filled, and it involves a prognostication as to the general population growth of the city, as well as an estimation of the growth in school population.[276] Further, an estimation of the direction in which cities will extend, and of the growth in population density in various parts of the city, is necessary in order that specific recommendations may be made as to location of new buildings. The recommendations must, of course, be made with consideration of the present plant, the ultimate plant that is thought to be desired,[277] and the financial program that will be required.[278]

7. The school survey and educational science. Although a survey should be made for the benefit of educational practice in the field, it would be wrong to assume that this is its only contribution. Educational science, as represented primarily by the viewpoints of educational professors, is in part dependent

ment," of the *Bibliography of School Buildings, Grounds, and Equipment* (footnote 273), Parts I, II, and IV.

276 For references on prediction of population growth, see the following sections in the *Review of Educational Research:* II (December, 1932), 348-54; IV (February, 1934), 49-52.

See the section, "Studies in Population and Pupil Accommodation," in Parts I, II, and IV of the *Bibliography of School Buildings, Grounds and Equipment*, cited in footnote 273.

Arthur B. Moehlman, *op. cit.* (footnote 273), pp. 52-90, 299-300, and 323-83.

N. L. Engelhardt and Fred Engelhardt, *op. cit.* (footnote 273), Chaps. I-IV, pp. 1-90.

A critical study of methods of forecasting population growth has been made by: Leo Martin Chamberlain and A. B. Crawford, *Prediction of Population and School Enrollment in the School Survey*. Bureau of School Service Bulletin, IV (1932), No. 3. Lexington, Ky.: University of Kentucky. Pp. 27.

277 *Review of Educational Research*, II (December, 1932), 359-61; IV (February, 1934), 54-5; V (October, 1935), 337-43.

In the *Bibliography of School Buildings, Grounds, and Equipment*, see the section, "Adaptation of the Building to Specific Educational Needs," in Parts I, II, and IV. (See footnote 273.)

See the topic, "School Buildings and Equipment," in the Subject Index of the annual *Bibliography of Research Studies in Education*, issued by the U. S. Office of Education, for pertinent studies.

See the topic, "School Buildings—Designs and Plans," in the *Education Index*.

278 For references on financing the school-building program, see the *Review of Educational Research*, as follows: II (December, 1932), 361-3; IV (February, 1934), 55-7.

In the *Bibliography of School Buildings, Grounds, and Equipment* (see footnote 273), see the section on "Building Costs" and the three following sections, in each of Parts I, II, and IV.

Fred Engelhardt and N. L. Engelhardt, *op. cit.* (footnote 273), Chapters XVI-XVIII, pp. 388-482.

The Planning and Construction of School Buildings, op. cit. (footnote 273), Chapters XXXII-XXXIV, pp. 309-33.

See "School Buildings—Cost," in the *Education Index*.

upon the improvement of practices in the field. The latter are, of course, also dependent in part upon the insights and perspectives which the professorial group hold. The two are interrelated. It is only natural, therefore, that surveys which bring the best of educational thought (whether from the field or from universities) to bear upon practical problems will make a significant contribution to educational science; this, in turn, will have an influence upon field practices by being inculcated in the thinking of future teachers and administrators in training.

Caswell has emphasized this point of view. After discussing the purposes for which school surveys have been made and their observable effects upon the school systems, he states:[279]

> The importance of the movement may be by no means completely described by an analysis of . . . direct local effects. Educational progress owes a larger debt to the survey movement for its influence on the development of scientific standards and objective methods of measurement for use in the administration of schools. The survey has served to relate the work of the educational expert in schools of education and state departments to individual local school systems. The problems of the field have been brought to the professor of education, and educational theory and methods have been carried to the field. Through this interaction a considerable body of scientific administrative standards and methods of measurement has developed.

Undertaking a school survey. Not infrequently students undertake surveys of small cities or counties as Masters' theses.[280] If one does this, he should recognize that such a problem is likely to be larger than the average Master's thesis problem, and that he needs to be in a strategic position to carry it through. That is, he should be a superintendent, or a principal who is well known and who has the complete approbation and interest of the superintendent in his project. The experience of conducting a minor school survey should afford desirable training in the gathering of field data. It

279 Caswell, *op. cit.* (footnote 255), p. 81.

280 For examples, see the topic, "Surveys," in the annual *Bibliography of Research Studies in Education*, issued by the U. S. Office of Education. Theses can ordinarily be borrowed from university libraries by one's local school or public library, for inspection.

must, however, be recognized that any survey conducted by an individual student is likely to deal with only a limited number of aspects of the school system and will probably be relatively mechanical as regards discovering real difficulties or their fundamental causes. It would seem better for an institution to organize a group of students to undertake a certain school survey, with the staff members giving considerable time to supervising the work, in an effort to see that it is properly coördinated and directed to underlying problems. The matter of assigning thesis credit for such a group project should not prove an insurmountable problem.

The objective steps. Certain of the more obvious steps in carrying through a survey will be mentioned here. These are practically self-evident, but will be reviewed by way of systematization.

1. Preparation of plans. In undertaking a survey, one will make as careful plans as possible in advance, concerning the scope of his survey, the intensity of his study, the amount of time which should be devoted to each phase, when each step should be completed in order that he may finish in proper time, and the amount of money each step will require. Such general plans will be modified as the work progresses, but one must at least start out with a workable plan, and later modifications must be kept within the limits of possibilities.

2. Preparation of schedules. Data-gathering instruments have been discussed throughout the two chapters on the normative-survey method, both as to use and construction. One will need them in a survey. The extent to which schedules of various kinds are used will depend largely upon the kind of survey one is making. If one is making a survey of buildings, he will certainly use score cards of some kind, together with report forms on various aspects of utilization, etc. If one is studying pupil achievement, tests will be called for. If one is making a survey of schools over a large area, such as the survey of all the institutions of a certain kind in a state, he will undoubtedly have to rely upon reports secured

through specially prepared blanks.[281] In a city school survey, one may desire to have teachers answer a questionnaire; on the other hand, needed data may be available in the superintendent's office.

The Division of Field Studies of the Institute of Educational Research, of Teachers College, Columbia University, has prepared a systematic schedule of aspects of the school system to look for when its staff of workers goes into the field.[282] This schedule fills over one hundred pages. In similar fashion, but in different form, Cocking has prepared a checking list,[283] to be used by workers in making a school survey. This extends over several hundred pages.

3. Gathering data. This step represents the application or use of the schedules, or other data-gathering procedures, in the field. The reader is referred to the discussion of survey techniques, given earlier.[284] One should be prepared to discover many things from interviews, some of which he can record in his findings, and some of which he must regard as confidential. In this connection, tact and strict ethics are important.

4. Interpretation of data. This step is the same in all research. What do the findings really signify? One must examine carefully the contributing factors; he must go out into the field and observe; he must know more than simply what his data show, if he is to interpret them correctly. Of course,

281 See for example, *Report of a Survey of the State Institutions of Higher Learning in Indiana*, Charles H. Judd, Chairman. Indianapolis: State Board of Education, 1926. Pp. 124.

282 *Classification of Procedures to Be Followed in the Development of a School Survey.* Prepared by the Division of Field Studies, Institute of Educational Research, Teachers College, Columbia University, September, 1931. Pp. 135. Mimeographed.

283 Walter D. Cocking, *Checking List for a School Survey*, Nashville, Tenn.: George Peabody College for Teachers. Mimeographed.

284 Other techniques adapted to special purposes may be suggestive:

"A Self-Survey Plan for State School Systems," Parts I and II, *Research Bulletin of the National Educational Association*, VIII (1930), 53-88, 89-164.

F. W. Cozens, "The Technique of a School Survey in Health and Physical Education," *Research Quarterly of the American Physical Educational Association*, III (December, 1931), 3-20.

Walter B. Jones, "Self-Survey in Urban Universities," *Educational Record*, X (January, 1929), 51-8.

Earl L. Terman, "The Development and Application of National Educational Survey Techniques." Doctor's thesis. New York: New York University, 1929.

he must not read into his data things that are not there, but his interpretation must be made in the light of some understanding of the situation as it is.

5. Preparing the report. If the survey is made as a thesis, the report may follow along the usual thesis lines. If it is made for the school system, the report must be carefully prepared for a large and varied group of readers. One's technical details will fail to impress board members and the public; they will in fact tend to make such persons disregard the survey as impractical or academic. In writing such a report, one will consider the point of view of the person who is not trained in statistics or in education, but who nevertheless has strong interests and convictions in and about education. Write the report so that it will be convincing to such a reader.

6. Follow-up service. If the survey is made for the benefit of the school system and for the purpose of bringing about actual improvements where they appear to be needed, the survey staff should plan to keep in touch with the school system in order that stimulation and counsel may be available for carrying out some of the recommendations. In such a relationship, the services of the surveyors must of course be offered and not thrust upon the school system; after all, the operation of the local system is the responsibility of the local group and not of the survey staff. If one makes a survey as a principal working in the system, he probably should refrain from making comments after the survey is finished, leaving the practical application to the superintendent.

A survey as field research. In calling attention to the above steps which are relatively routine, there was no intention of suggesting that a survey should be a mechanical application of steps and techniques. Rather, the survey is to be regarded as a research problem worked out in the field. As such, one will proceed with the usual attitudes of discovery and successive refinement of purposes. One should avoid the frame of mind of descending upon a school system with his sched-

ules all made out, securing authoritative coöperation in getting them filled out, and then retreating to determine what he shall say about the schools. One must have some plans in advance, but at the same time he will expect to locate many of the pressing problems through interviews in the field. As in other forms of research, one will center attention on a problem, formulate a working hypothesis, gather data which will throw light on this hypothesis, interpret the data and evaluate his findings, and perhaps start over again to seek other data that will shed more light on the same or on a new hypothesis. In field work one cannot so readily repeat and follow up, since time generally does not permit; he should therefore spend sufficient time in the field at the beginning in order to secure orientation, in the hope of avoiding unprofitable studies.

Sears makes the following comments:[285]

> A survey is not an inventory and prescription, but a diagnosis and prescription. It does not focus primarily upon the schools, or upon the data, but, through an analysis of both, seeks to discover the real problems. These problems are almost invariably found to occur, not in isolation, but in combination. The identification of the fundamental problems is a major aspect of the survey attack.

The underlying program of a survey. The technique and steps of a survey have been discussed. The importance of adapting procedures to an increasing insight into field conditions has been pointed out. It seems appropriate at this point to discuss some of the fundamental considerations of the survey undertaking which will keep the staff oriented in carrying through its numerous activities.

Although the particular things that are done will vary with the locality and the kind of survey being made, there is a larger pattern of purposes which are probably appropriate for every survey. These are presented in the following paragraphs.

1. What is the purpose of the survey? Although the purpose

[285] Jesse B. Sears, in a personal letter to the authors.

will usually be implied or stated in rather general terms when an agency is requested to make a school survey, this purpose will need to be refined and crystallized before the survey is undertaken. This step is similar to that of working over a very general statement of a research problem until it becomes definite in its essential details and can be used as a guide to the worker. The survey staff will desire to know the specific problems which it is to attack, and whether it is to confine its attention to these or is to study related problems as they emerge. Even if the staff is advised that the survey is to be a comprehensive one, embracing all aspects of the school system, the survey staff will proceed cautiously at first until the true nature of the problems existing in the field begins to be apparent, and the purpose of the survey begins to assume more definite form.

2. What are the educational needs of the community? If a survey is to be fundamentally sound, its recommendations must be based not only on a sound general philosophy of education, but upon a detailed examination of the needs of a particular community. (If the survey is not a "locality" survey, the purposes of the institutions being surveyed may be substituted for the needs of the community, although even in such cases a question may be raised as to whether special institutions do not need to be considered in the light of other factors in the locality.) One cannot adequately appreciate the educational problems of a school system or properly understand the objective findings, until he has secured a comprehension of the total social situation existing in the locality. He must become acquainted with the social ideals of the people, their traditions, their habits of expressing themselves in their daily lives, and give these attention, along with his consideration of the larger objectives and social ideas of the people of the nation. The surveyor must envisage the whole cultural life of the people, including their various institutions and folkways, and study the actual and potential service of public education in this setting—without losing sight of the fact that this com-

munity is a part of the nation, and that education must serve common state and national purposes also.

To assume that public education is and should be the same throughout a state, or throughout the nation, is to imply that local groups have no right to a degree of individuality, by which they make unique contributions to the interesting and colorful pattern of national life, and it is to place a severe handicap on the service which education can render to the community in its many and varied aspects of life. One must see the educational needs of a nation and of a state; but he sees these only partially if he neglects the educational needs of the community, for the various communities, with their differences in social values, *are* the state and nation in a democracy.

3. How well are present practices meeting the needs? This phase of survey work is the evaluative one. Having comprehended the opportunity for education in this locality, and having gathered evidence of the actual service which the schools are rendering, the surveyor compares the two pictures. One will of course consider trends and the probable future situation, as well as the conditions at the instant. How well a survey staff can make this comparison depends on how thoroughly it has secured information on the needs and on the practices, and also on the ability of the surveyors to interpret these facts and to make distinctions which are of basic social significance. One needs a general understanding of human nature and a perspective which includes the standards and urges of all elements of the population, in order to see and to express properly the deviations of the current educational practices from the apparent opportunities. Let not one who has only a technical or theoretical education undertake such a task!

4. How efficient are present educational procedures? This question is clearly much narrower than the preceding one. It is concerned, not with what education should be doing, but with the detailed procedures of what it is doing. In other words, for the given expenditure of money and energy, are the returns

as large as they should be? This is the type of question which receives most consideration in surveys of the usual kind. In answering it, the surveyors will, of course, draw upon their own judgment, but they will lean most heavily upon comparisons of the normative-survey sort. That is, what are other communities putting forth in the way of effort, and for this amount of effort, what are the returns? The data for the local schools are compared with these other data showing conditions in other places. In making such comparisons, all of the cautions concerning gathering and interpreting data, which are mentioned at other places in this chapter and throughout this book, should be borne in mind. The comparison, even of objective facts, requires circumspection and judgment. A great variety of factors enters into every objective fact which must be considered whenever that fact is used.

5. What constructive measures can be undertaken to improve the contribution which the schools are making to life in that community? This, the final phase of the survey, is the most crucial. It utilizes the data and conclusions from all of the preceding phases of the work and sets these in a plan of progress which recognizes both the difficulties of making changes and the desirability of achieving certain new results. It calls probably for more insight than any of the preceding steps, for it must include them and interpret them in terms of a working program. It is human nature to resist change and to resent the implication of any shortcomings. The recommendations which are made must be presented in such a manner as not to end in a defensive reaction on the part of the local school group, but to stimulate a desire to achieve according to the larger opportunity which is pictured for them by the survey.

The appraisal of educational service. The problem of evaluating educational institutions has given rise to an important question of whether to rate the objective aspects of an institution, including some of its administrative provisions and practices, or whether to measure the educational attainments of its pupils. The two approaches are sometimes referred to as

securing static versus functional data, or as accounting versus measuring, or as concern over conditions versus outcomes. Each of the two methods has its advocates.

The measurement of pupils' educational outcome would seem to be the more rigorous approach. Apparently one is here dealing directly with the very purpose for which the institution exists, and any other approach is merely a makeshift. It should be pointed out, however, that few educational institutions would be willing to agree that they exist solely for the development of the knowledge and skills that are covered by attainment tests. The hopes and aspirations of presidents, deans, principals, and faculties are generally couched in much more inclusive terms. Available tests measure only a part of what these people are striving to develop and, according to many of them, not the most important part.

It must be said on the other hand that it is not fair to credit or charge the institution entirely with the responsibility for having developed the attainment of its pupils to the level that may be observed. Pupils differ widely when they enter an institution, and in ways which the institution usually cannot entirely eradicate. Many private institutions effectually select students who already possess in large degree the characteristics for which they desire to have the institution known. Institutions which do not control the extracurricular life of students cannot contribute as large or as certain an influence as those where students live under their regulations. It must be recognized that the character of the student's leisure-time activities may exert as strong an influence on his developments as do the hours of formal study and training. It is not within the limits of common reason to take general measures of attainment as final indices of the value of institutions.

Neither, on the other hand, does it seem wholly satisfactory to use measures of the more objective elements of an institution as the sole bases for determining its worth. There are many devices, services, and various provisions which are established with the *hope* that they will contribute to the desired develop-

ment of the students. Undoubtedly many do, but many fail because they are carried out mechanically or without proper perspective or interest. Many procedures, also, are established for the convenience and benefit of the administration, rather than directly for the welfare of the student group. It should be clear that the conditioning factors which an institution seeks to provide are not in themselves a sufficient guarantee of their own effectiveness.

As a matter of general logic, it would seem desirable to include evaluations of all of the elements in the situation which are significant indicators of good educational influence. One seeking a thorough rating of an institution should use tests of many different kinds for measuring certain attainments of the pupils; he should use check-lists, rating scales, or score cards for appraising many of the service provisions of the institution; and probably in addition to these two, he should seek other lines of evidence, such as reputation, subsequent success of students, the judgment of those who are used to inspecting and rating institutions, the insight of those who are "on the inside" with reference to what is actually going on in the institution, etc. All of the facts which he can gather should be regarded as throwing light on various aspects of the service of the institution and as playing some part in determining his final appraisal of the institution.

Attention may be directed to a number of procedures which are advocated or actually used in appraising educational service.[286] Check-lists have been prepared by Wade, the National Education Association, and Frederick and Schorling, for school systems or institutions in terms of their provisions and practices. A score card for the same purpose has been prepared by Mort and Hilleboe. The North Central Association [287] has

286 References given earlier in this chapter will not be repeated here. They may be located readily in the footnotes.

287 The standards of the North Central Association are adopted each year, usually without significant alteration. See, for example, the "Policies, Regulations, Standards, and Recommendations for Accrediting Secondary Schools," in the "Proceedings of the Commission on Secondary Schools," *North Central Association Quarterly*, X (July, 1935), 96-101, and "Standards for Accredited Institutions of Higher Education," in "Proceedings of the Commission on Institutions of Higher Education," *North Central Association*

generally used the method of appraising provisions, including such items as the pupil-teacher ratio, the library facilities, the endowment of current income per pupil, etc. Lundberg [288] lists a number of schedules for appraising social institutions and practices, which are based primarily upon objective elements that presumably contribute to service and tend to affect its quality.

Trimble [289] discusses both types of measurement, but definitely favors tests of attainment. H. P. Smith [290] used achievement tests, supplemented by ratings on work habits, attitudes, and personality, in studying the value of the junior high-school organization. In discussing guidance, Kefauver [291] reviews measures of various kinds which have been applied and concludes that a rigorous experiment, with measured results of guidance, is necessary before we know anything regarding its value. Such an experiment is essential, he points out, as a means of validating the other instruments or procedures which are commonly used. Such a contention may be reviewed by the reader in the light of the preceding discussion.

The score cards, rating scales, and index-number techniques all place reliance upon the conditioning factors, except as they may be applied to classroom activities of pupils. The new criteria, worked out by the North Central Association and by associated accrediting groups for the rating of secondary

Quarterly, VIII (June, 1933), 81-5. These standards are also published separately by the Association.

Standards for other years may be found by consulting the Index of the *North Central Association Quarterly*, or by referring in the *Education Index* to North Central Association of Colleges and Secondary Schools, sub-topic: The Commission on Secondary Schools, or, The Commission on Institutions of Higher Education.

For revised standards, see footnotes 292 and 293.

288 George A. Lundberg, *op. cit* (footnote 263).

289 Otis C. Trimble, "Comparisons of Two Methods of Measuring the High School," pp. 35-46 in *Twentieth Annual Conference on Educational Measurements*. Bulletin of the School of Education, Indiana University, X (December, 1933), No. 1. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 98.

290 Harry P. Smith, "The Relative Efficiency of the Junior High School vs. the Conventional 8-Grade Type of School," *Journal of Educational Research*, XXIX (December, 1935), 276-80.

291 Grayson N. Kefauver, "Proposals for a Program of Evaluation of Guidance," *School Review*, XLII (September, 1934), 519-26. See also G. N. Kefauver and H. C. Hand, "Evaluation of Guidance Programs," *Occupations*, XII (March, 1934), 106-14, Part 2.

schools [292] and higher institutions,[293] continue to emphasize practices and provisions, with some attention to pupil results.

As one source of evidence on the success of a seminar plan in the Teachers College of the University of Cincinnati, Pechstein secured the responses of students to a questionnaire.[294] In seeking to determine the value of the services of the Educational Research Bureau of Ohio State University, Charters [295] used an interesting variety of measures. He noted the objective accomplishments of the Bureau in terms of productions of the members, the number of Bulletins distributed, the number of persons served through using the special library of the Bureau, the opinions of students and faculty, the number of specific services rendered, etc.

Somewhat analogous to this problem of institutional rating is the problem of evaluating the services of teachers. Is this to be done in terms of measured results, or in terms of the

292 The North Central Association has had committees at work revising its standards of accrediting for both secondary schools and higher institutions. Six different accrediting organizations jointly undertook the study of appraising secondary schools, and this work is at this writing under way. See the following references:

"Toward the Reformation of Standards for Secondary Schools," *School Review*, XLI (December, 1933), 721-5.

George E. Carrothers, "Associations United to Study High School Standards," *Nation's Schools*, XIV (October, 1934), 31.

Walter Crosby Eells, "Coöperative Study of Secondary School Standards," *School and Society*, XLII (October 19, 1935), 544-5.

For other references on the revision of high-school standards, see the topic, "Cooperative Study of Secondary School Standards Committee," in the *Education Index*.

293 The revision of standards for higher institutions by the North Central Association may be traced in the following references:

G. F. Zook, "Work of the Committee on the Revision of Standards for Higher Institutions in the Association," *North Central Association Quarterly*, VII (December, 1932), 291-5.

George A. Works, "New Basis for the Accreditment of Higher Institutions," *Educational Record*, XVI (July, 1935), 321-30.

Evaluation of Higher Institutions: A series of monographs by the Committee on Revision of Standards for Higher Institutions of the North Central Association. Published by the University of Chicago Press. See for example, Vol. 7 by John D. Russell and Floyd W. Reeves, on *Finance*, 1935. Pp. 133.

See Russell, footnote 180.

For current references, consult the *Education Index*, topic: North Central Association of Colleges and Secondary Schools, sub-topic: Committee on Revision of Standards for Higher Institutions.

294 L. A. Pechstein, "University of Cincinnati Experimental Program in Seminar Instruction," *The Application of Research Findings to Current Educational Practices*, pp. 34-45. American Educational Research Association, Official Report of the 1935 meeting. Washington: National Education Association, 1935. Pp. 273.

295 W. W. Charters, "Measures of Research," *Educational Research Bulletin*, XI (October 12, 1932), 309-20.

teacher's qualifications and characteristics? The use of tests for evaluating instruction was discussed early in the preceding chapter. The rating of teacher activities was discussed in connection with "Rating Scales." Betts [296] gives an analytical discussion of the difficulties and the possibilities of evaluating teaching by studying teachers' traits, on the one hand, and by studying teachers' procedures on the other. As in other cases, we should probably look to each line of evidence for the light which it may contribute toward a complete picture.

Concluding statement. This chapter has continued the treatment of normative-survey methods and deals with the interview, observation, and survey-appraisal types. Survey testing, questionnaire inquiries, and documentary frequency studies were discussed in the preceding chapter. All of these methods are directed towards ascertaining what the prevailing conditions are, and how prevalent they are. That is, one may be interested in the average ability of pupils, the general practices of superintendents, the relative frequency of various practices with respect to report cards, the conditions found in the homes of pupils, the extent to which pupils engage in certain activities in different classrooms, the average estimate of the merit of a curriculum, the relative standing of state school systems, etc.

The treatment of the normative-survey method in these two chapters has not included all of the possible procedures for gathering data, but has dealt with those that are regarded as most important. Other modes of gathering data, which have not been explicitly treated are: (1) collecting specimens for study; [297] (2) observing field objects and conditions *in situ*, such as inspecting school buildings to determine the number that possess certain characteristics, or taking photographs of them; (3) making physical measurements of inanimate objects,

296 Gilbert L. Betts, "Problems in the Measurement of Teaching Ability," *The Application of Research Findings to Current Educational Practices*, pp. 166-73. Official Report of the 1935 Meeting of the American Educational Research Association. Washington: National Education Association, 1935. Pp. 273.

297 This procedure was referred to only incidentally in connection with documentary frequency studies, such as Heck's; for another example, see George E. Hill, "The Report Card in Present Practice," *Educational Method*, XV (December, 1935), 115-31. 443 report cards from school systems were collected and examined.

such as school sites, school seats,[298] room temperature, and ventilation; [299] (4) making physical measurements of children; [300] (5) copying data from original records; [301] and (6) securing informal, personal records and reports made upon request, such as diaries, autobiographies, personal experiences, introspective accounts, and other recollections.[302] Illustrations of these techniques may be found in the references just cited. All of these procedures and possibly others may be used in normative-survey studies. They may also be used in other types of research, and certain of them are referred to in other chapters.

The range of studies coming within the scope of normative-survey research is large. In field work, the bulk of the studies fall within this class. The type of information yielded by normative-survey investigations is in wide demand by practical workers. This type of approach does not produce fundamental laws, other than laws of distribution, and it is not concerned to any appreciable extent with analysis of cause and effect. It is, however, a basic type of approach in quantitative research, and all of the various techniques which it utilizes are likely to be employed as component steps in the more complex types of research, such as the experimental method, and the genetic, case study, correlational, and other methods which emphasize relationships. A thorough acquaintance with the procedures appropriate for normative-survey research will therefore afford an important background for the undertaking of research by other methods.

In this text research is classified on the basis of the purpose-

298 Henry Eastman Bennett, *School Posture and Seating*. Boston: Ginn and Co., 1928. Pp. 323.

299 See the studies referred to by H. W. Schmidt, "Heating, Ventilation, and Sanitation in School Buildings," Chapter II, pp. 344-61, in "The School Plant," *Review of Educational Research*, V (October, 1935), No. 4.

300 See the studies referred to by Helen L. Dawson and George D. Stoddard, "Physical Growth from Birth to Puberty," Chapter III, pp. 130-49, in "Mental and Physical Development," *Review of Educational Research*, III (April, 1933), No. 2.

301 This procedure has been assumed in the discussion of index numbers; see also the first technique (listed by Caswell) in the discussion of school surveys.

302 Data of this type were referred to in connection with a study by Blumer (footnote 174 of Chapter VII).

ful structures of the entire undertaking, rather than on the basis of techniques of gathering data. In the historical method, which was described first, one seeks to describe conditions as they existed in the past, sometimes attempting to account for them and to draw practical generalizations from them which may be applied to the present or future. In the normative-survey method, the purpose is to describe conditions (including human-response tendencies, such as ability, beliefs, values, etc.) as they exist. Although one will draw inferences of practical significance from such studies, he does not seek primarily to account for the conditions observed.

In the experimental method, which is discussed in the following chapter, one seeks to discover the relation between changes in one factor and consequent changes in another variable (the result), in order to deduce generalizations concerning causes and effects. The experimental method is one of the classical methods of science. In Chapter X, methods of studying more complex cause-and-effect relationships are discussed. These methods are especially appropriate for the study of social phenomena, where both the causation and the consequences are highly complex and cannot be observed as "single" variables.

Problems and Exercises

1. Some member of the class who is interested in attitude testing should try out the making of an attitude scale in a small way within the class. Select some topic of general current interest to the class, prepare a number of statements (say 20 or 30), and have about ten members of the class rank these. An analysis of the results should be discussed before the class.

2. What types of data-gathering procedures might be appropriate at one time or another in the process of "job analysis," as an approach to curriculum-making? Consider several different fields of training, and prepare a report illustrating the types of data and the procedures that would be appropriate for making the analysis. (See W. W. Charters, *Curriculum Construction.* New York: The Macmillan Co., 1923. See also, Hollis L. Caswell and Doak S. Campbell. *Curriculum Development,* Chapter X, "Selection of Subject-Matter," pp. 248-90. New York: American Book Co., 1935.) The assignment may be varied as to field or approach.

3. A committee of persons interested should judge the relative intelligence of the twelve children pictured by Goodenough and Anderson, *Experimental Child Study,* insert, p. 224. Follow through their experiment No. 24, pages 231-3. Report to the class the correlations found (see their pages 133-6).

4. Spend about two hours selecting and defining traits for a personality-rating scale. Report to the class why you rejected some characteristics and retained others. The scales of various persons or committees should be discussed in class.

5. Interested members of the class should secure data on the socio-economic status of some group of pupils in a convenient school, in accordance with one of the experiments outlined in Goodenough and Anderson, *Experimental Child Study,* pp. 234-44.

6. Let several members of the class independently score a convenient school building (perhaps the one in which the class meets), and compare the results of different scorers.

7. It is difficult to secure practice in interviewing without drawing heavily upon the time of others—and perhaps intruding upon their personal affairs. One may get a certain amount of practice by interviewing other members of the class, perhaps about the community in which they grew up, political views they are willing to express, difficulties they have had in school, etc. Appropriate topics will vary with the individuals. Also, one may interview elementary- or high-school children concerning their difficulties and modes of work; such contacts must be made with caution and tact and with the approval and advice of a regular teacher or counsellor of the child.

8. Analyze the data in any school-survey report approved by the instructor, and list the techniques by which such data were probably secured.

9. Examine the data in a state school-survey report, and draw up five to ten schedules (questionnaires or report blanks) that might be used to gather some of the data presented.

Selected References †

* Barr, A. S. *An Introduction to the Scientific Study of Classroom Supervision.* New York: D. Appleton and Co., 1931. Pp. 399.

———, and Rudisill, Mabel. *An Annotated Bibliography on the Methodology of Scientific Research as Applied to Education.* Bulletin of the Bureau of Educational Research, No. 13. Madison, Wis.: University of Wisconsin, June, 1931. Pp. 129.

* Bingham, Walter V., and Moore, B. V. *How to Interview.* New York: Harper and Bros., 1931. Pp. 320.

Bixler, H. H. *Check-Lists for Educational Research.* New York: Teachers College, Columbia University, 1928. Pp. 118.

† See also the footnotes in this chapter.

BOGARDUS, Emory S. *Making Social Science Studies.* (Third edition, revised.) Los Angeles: Jesse Ray Miller, 1925. Pp. 106.

CASWELL, H. L. *City School Surveys.* Teachers College Contributions to Education, No. 358. New York: Teachers College, Columbia University, 1929. Pp. 130.

CHARTERS, W. W. *Motion Pictures and Youth: A Summary.* New York: The Macmillan Co., 1933. Pp. 66.

———, and WAPLES, Douglas. *Commonwealth Teacher-Training Study.* Chicago: University of Chicago Press, 1929. Pp. 666.

COWLEY, W. H. *The Personnel Bibliographical Index.* Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1932. Pp. 433.

CRAWFORD, Claude C. *The Technique of Research in Education.* Los Angeles: University of Southern California, 1928. Pp. 320.

Education Index. Published monthly; cumulated at intervals during the year, at the end of each year, and every three years. Available in most libraries in the periodical room or reference room. Published by the H. W. Wilson Co., 950 University Ave., New York.

* FISHER, Irving. *The Making of Index Numbers.* Publications of the Pollack Foundation for Economic Research, No. 1. (Third edition, revised.) Boston: Houghton Mifflin Co., 1931. Pp. 538.

GOODENOUGH, Florence L., and ANDERSON, John E. *Experimental Child Study.* New York: The Century Co., 1931. Pp. 546.

* LUNDBERG, George A. *Social Research.* New York: Longmans, Green and Co., 1929. Pp. 380.

ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research.* New York: Henry Holt and Co., 1929. Pp. 448.

RICE, Stuart A., and Others. *Methods in Social Science.* Chicago: University of Chicago Press, 1931. Pp. 822.

* SEARS, Jesse B. *The School Survey.* Boston: Houghton Mifflin Co., 1925. Pp. 440.

SMITH, H. L., and (Chamberlain, Leo Martin, or Noffsinger, Forest Ruby.) *A Bibliography of School Buildings, Grounds, and Equipment,* Parts I-IV. Bulletin of the School of Education, Indiana University. Part I, IV (January, 1928), No. 3, pp. 326; Part II, IX (March, 1933), No. 2, pp. 182; Part III, IX (June, 1933), No. 3, pp. 130; Part IV, XI (March, 1935), No. 2, pp. 216. Bloomington, Ind.: Bureau of Coöperative Research. (Note: Parts II and III together extend the first volume to April, 1932, and Part IV includes material from April, 1932, to October, 1934.)

———, and O'DELL, Edgar Alvin. *Bibliography of School Surveys and of References on School Surveys.* Bulletin of the School of Education, Indiana University, VIII (September and November, 1931), Nos. 1 and 2. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 212.

* STRANG, Ruth. *The Rôle of the Teacher in Personnel Work.* (Revised and enlarged edition.) New York: Teachers College, Columbia University, 1935. Pp. 417.

SYMONDS, Percival M. *Diagnosing Personality and Conduct.* New York: The Century Co., 1931. Pp. 602.

——— *Psychological Diagnosis in Social Adjustment.* New York: American Book Co., 1934. Pp. 362.

* THOMAS, Dorothy S., and Associates. *Some New Techniques for Studying Social Behavior.* Child Development Monographs, No. 1. New York: Teachers College, Columbia University, 1929. Pp. 204.

———, and Others. *Observational Studies of Social Behavior,* Vol. I, "Social Behavior Patterns." New Haven, Conn.: Institute of Human Relations, Yale University, 1933. Pp. 271.

Topical Analysis of 234 School Surveys. Bulletin of the School of Education, Indiana University, III (March, 1927), No. 4. Bloomington, Ind.: Bureau of Coöperative Research. Pp. 111.

U. S. Office of Education. *Bibliography of Research Studies in Education.* Issued annually. To date the bulletin numbers are as follows: For 1926-1927, Bulletin, 1928, No. 22; for 1927-1928, Bulletin, 1929, No. 36; for 1928-1929, Bulletin, 1930, No. 23; for 1929-1930, Bulletin, 1931, No. 13; for 1930-1931, Bulletin, 1932, No. 16; 1931-1932, Bulletin, 1933, No. 6; for 1932-1933, Bulletin, 1934, No. 7; for 1933-1934, Bulletin, 1935, No. 5.

WAPLES, Douglas, and TYLER, Ralph W. *Research Methods and Teachers' Problems.* New York: The Macmillan Co., 1930. Pp. 653.

* YOUNG, Pauline V. *Interviewing in Social Work.* New York: McGraw-Hill Book Co., 1935. Pp. 416.

CHAPTER IX

THE EXPERIMENTAL METHOD

Introduction. Earlier chapters have dealt with two major approaches in attacking educational problems: analysis and interpretation of the evidence and experience of the past, in historical research (Chapter VI), and the canvass of practice and current conditions or the establishment of norms or central tendencies, in normative-survey research (Chapters VII and VIII). The present discussion is concerned with a third major method, experimental research, probably the most important of all from the strictly scientific point of view. Experimental research, whether conducted in classroom or laboratory, involves an attempt to control all essential factors save a single variable which is manipulated with a view to determining and measuring the effect of its operation. Obviously this procedure distinctly is different from the historical and survey methods.

In the subsequent discussion, first the historical development of the experimental method is traced briefly. Next the experimental method is defined in terms of the law of the single variable and the control of observation and other pertinent factors. Principles of group experimentation (one-group, parallel-group, and rotation-group) are outlined, with considerable emphasis on procedures used to equate groups. Consideration is given to laboratory experimentation where conditions may be more carefully controlled, with individual subjects and needed apparatus available, than in the classroom. The chapter ends with an attempt to evaluate the present contribution and to determine the future possibilities of the experimental method.

Brief history of the experimental method in psychology and in education. In the past lie a number of great experiments, the conditions and consequences of which history and

the historical method seek to reveal for the guidance of present-day educational and psychological workers. The preparation for experimental psychology was philosophical psychology in the work of Aristotle, Descartes, Leibnitz, Locke, Berkeley, Hume, Hartley, James Mill, John Stuart Mill, Bain, Herbart, and Lotze. The actual founding of an experimental psychology is represented by the work of Weber, Fechner, Helmholtz, Wundt, Brentano, Stumpf, and G. E. Müller, with later contributions by Ebbinghaus, Külpe, Mach, Avenarius, Titchener, Lipps, Galton, James, Hall, Ladd, Scripture, J. M. Baldwin, Jastrow, Sanford, Münsterberg, Royce, Cattell, Thorndike, Terman, Judd, Woodworth, Dewey, and other workers currently interested in experimental procedure as applied to the problems of psychology and education. Space is not available here for a statement of the contributions made by these workers to the experimental method. Such information is readily accessible in a number of excellent sources.[1]

In 1883 G. Stanley Hall "founded" at Johns Hopkins University "the first psychological laboratory in America," although James for several years previously had used space for experimental instruction at Harvard.[2] In 1887 Hall began publication of the *American Journal of Psychology* and in 1891 the *Pedagogical Seminary*, the first psychological journals in America, in which the early experimental studies appeared. He played a leading rôle in planning the American Psychological Association and served as its first president in 1892.

Controlled experimentation in education is indeed recent in origin, but in the pages of history one may find examples of attempts centuries ago to solve thought questions in education by means of trial and observation of results: Vittorino da Feltre

1 E. G. Boring, *History of Experimental Psychology*. New York: The Century Co., 1929. Pp. xvi + 700. Emphasizes European psychology and the work of individual psychologists; comprehensive, but not elaborate as to recent work.

J. C. Flugel, *A Hundred Years of Psychology*, 1833-1933. New York: The Macmillan Co., 1934. Pp. 384.

Gardner Murphy, *An Historical Introduction to Modern Psychology*. New York: Harcourt, Brace and Co., 1929. Pp. xviii + 470. Deals chiefly with recent work and is organized largely by topics rather than chronologically.

2 E. G. Boring, *op. cit.*, pp. 506-7.

(1378-1446) and Wolfgang von Ratke (1571-1635) in devising methods of teaching; Basedow's (1723-1790) application of the theories of Comenius and Rousseau; Pestalozzi's (1746-1827) schools at Stanz, Burgdorf, and Yverdun; and Herbart's (1776-1841) practice school in connection with his pedagogical seminar.[3] Certain pioneer experimental schools in this country attempted to evaluate pedagogical theory by trial under actual working conditions: the Oswego Primary Teachers Training School established by Edward A. Sheldon in 1861, Francis W. Parker's experimental school inaugurated in Chicago in 1883, and the Laboratory School of the University of Chicago founded by John Dewey in 1896.

Early attempts to use the experimental method in education were impeded by inadequate control of the educative factors involved and by the lack of instruments for measuring pupil capacity and achievement. The investigations of Rice between 1894 and 1897 marked the development of the concept of control of experimental conditions. The work of Galton, Cattell, Binet, Terman, and Otis provided measures of pupil ability for use in securing groups equivalent in terms of intelligence. Stone, Thorndike, Courtis, Hillegas, Buckingham, and Ayres pioneered the movement toward development of instruments for measuring pupil achievement, which have been used extensively in educational experimentation. It is only natural that the development of educational tests stimulated interest in experimentation under school conditions. Statistics has made its contribution to the experimental method through the work of Galton, Pearson, Yule, Spearman, Kelley, McCall, and others in terms of: (1) correlation techniques used to determine the validity and reliability of intelligence tests (employed to secure equivalence of groups) and of educational tests (used to measure gains in achievement); (2) statistics of errors (especially the "error of a difference" formula, useful in the in-

[3] W. S. Monroe and M. D. Engelhart, *Experimental Research in Education*, Chapter I. University of Illinois Bulletin, Vol. XXVII, No. 32. Bureau of Educational Research Bulletin, No. 48. Urbana, Ill.: University of Illinois, 1930. In the discussion of the experimental method the present writers are much indebted to this excellent source.

terpretation of differences in gains in experimentation); (3) the "experimental coefficient" as a criterion for testing the statistical significance of a difference, etc.[4]

Definition and characterization of the experimental method. Educational experimentation should be defined more specifically:[5]

> A child's achievement from a period of learning is the resultant of several educative factors. "Experimentation" is the name given to the type of educational research in which the investigator controls the educative factors to which a child or group of children is subjected during the period of inquiry and observes the resulting achievement. . . . In the simplest type of educational experiment the investigator seeks to evaluate the influence of some one educative or "experimental" factor on a single group of children. He must start the experiment with some measurement of the initial attainment of the children in the trait or ability to be influenced. He then subjects the group to the experimental factor, such as a particular type of drill material in arithmetic, for the duration of the experiment. At the end, the investigator applies a final test for the purpose of determining the gain in achievement that has resulted from the application of the experimental factor.

Expressed in the language of logic, the experimental method represents Mill's canon or principle of research which is known as the method of difference; that is, to note the effect of a single variable applied to one situation or group, but not applied to a comparable situation or equivalent group.[6]

> If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.

However, the interests and practical needs of the reader, as well as space limitations, render it inappropriate to enter into any extended discussion of the logic and philosophy of the

[4] *Ibid.*

[5] *Ibid.*, pp. 15-6.

[6] John Stuart Mill, *A System of Logic*, Book III, Chapter VIII. New York: Longmans, Green and Co., 1872.

experimental method, since good references are available.[7] It must be admitted, too, that the language of the logician and philosopher at times seems unnecessarily involved and abstract to be of most service in actual field situations. As a matter of fact, Mill's canon represents an ideal assumption which probably is never actually fulfilled in a concrete situation, certainly not in dealing with human beings in the social and biological fields where so many uncontrollable variable factors are involved. In such areas it is difficult indeed to conceive of different situations with all conditions absolutely identical except one circumstance or factor the effect of which is to be measured. Even in the field of physics it is being recognized that a great deal of previously unsuspected variability now exists. Therefore, early in this discussion it must be frankly recognized that the so-called law of the single variable is a theory and not an accomplished fact in any given educational investigation of the experimental type. Later in this chapter, numerous illustrations will be given of difficulties in controlling variables and of fallacious conclusions based on the assumption of only a single operating variable.

It follows from the definition of educational experimentation given earlier in this chapter that the major procedure involved, just as in experimental psychology and in all experimental science, is that of controlled observation, with an attempt to hold all factors constant except the single variable the effect of which is to be measured. Naturally, experimental procedure is considered the classical method of science and frequently has been urged as the ultimate methodological goal of any system

7 J. L. Childs, *Education and the Philosophy of Experimentalism*. New York: The Century Co., 1931. Pp. xx + 264. Deals with the philosophical and educational ideas of Pierce, James, and Dewey.

E. L. Clarke, *The Art of Straight Thinking*, Chapter VII. New York: D. Appleton and Co., 1929.

M. R. Cohen and Ernest Nagel, *An Introduction to Logic and Scientific Method*, Chapter XIII. New York: Harcourt, Brace and Co., 1934.

Columbia Associates in Philosophy, *Introduction to Reflective Thinking*, Chapter IV. Boston: Houghton Mifflin Co., 1923.

D. S. Robinson, *Illustrations of the Methods of Reasoning*. New York: D. Appleton and Co., 1927. Pp. xiii + 346.

F. W. Westaway, *Scientific Method*, Chapter XVII. London: Blackie and Son, Ltd., 1924.

of investigation, since, with conditions artificially controlled, stimuli may be presented and reaction secured without awaiting the occurrence of events in their natural environment over a relatively long period of time (as is necessary in history).[8]

However, it has been pointed out above that experimental procedure has distinct limitations in the social and biological fields where it is so difficult to control variable factors. Furthermore, one may be more interested in a careful analysis of the interrelationships of various factors as they operate normally under conditions that are reasonably typical than in using a procedure which may do violence to a natural situation by attempting to hold all factors save one constant. A method, described in Chapter X, with its analytical techniques of partial and multiple correlation, makes it possible to study the effect of a number of factors varying jointly. The experimental and correlational methods are complementary, although the former is more limited with respect to the type of problem which may be attacked. However, the significance of any investigational method, whether historical, normative-survey, experimental, correlational, or otherwise must be determined relatively in the light of the purpose and problem involved rather than in absolute terms.

Confusion frequently arises concerning the relation of uncontrolled observation, and testing or measurement, to experimental procedure. Uncontrolled observation and recording of the spontaneous behavior of children in a variety of situations, with no attempt to condition the type of response, are normative-survey or genetic rather than experimental in character; for example, a frequency count of the words used orally by one thousand six-year-old children in their homes and schools. However, uncontrolled observation shades into experimental procedure when external conditions surrounding the child are controlled by eliminating the presence of the observer (through use of a "one-way vision" screen),

[8] J. E. Anderson, "The Methods of Child Psychology," *A Handbook of Child Psychology*. (Second edition, revised.) Chapter I. Edited by Carl Murchison. Worcester, Mass.: Clark University Press, 1933.

selection and conditioning of the child's companions, use of an "infant cabinet," or even by maintaining environmental conditions such as teacher, children, and classroom constant.[9] Thus, most essential factors (teacher, pupils, etc.) might be kept constant, except the passage of time, and the accompanying growth or maturation observed at intervals and recorded in the form of a growth or learning curve. Since many such studies are of a genetic character, involving an analysis of the causal factors operating to produce change by way of growth or maturation, they are reserved for discussion in Chapter X. Some workers prefer to think of such genetic investigations, when extended over a long time span, as closely related to or involving the historical approach.[10]

The overlapping of research techniques may be shown by another example, drawn from the testing field, and the relation of testing to experimentation indicated. If intelligence testing or achievement testing is done for the purpose of ascertaining the capacity or accomplishment of the child in relation to other children or to a norm, the procedure is normative-survey rather than experimental. The testing done to equate groups of children for experimental purposes and to measure results at the end of the investigation may be considered of a survey character, but fits into the larger purpose or pattern of the experiment and properly may be regarded as a definite part of the experimental investigation. To use a different illustration, if an intelligence test is administered year by year to a given group of children who have lived under normal and uniform (controlled) conditions during the time involved, with maturation as the single variable operating, the resulting curve of mental growth is the product of an experimental procedure. A study of the accompanying age norms and of the factors operating to produce such growth takes on genetic and causal characteristics. Parenthetically, the great difficulties present in

9 G. D. Stoddard and Beth L. Wellman, *Child Psychology*, Chapter II. New York: The Macmillan Co., 1934.

10 For example, Catharine M. Cox, *Genetic Studies of Genius*, Vol. II. Stanford University, Calif.: Stanford University Press, 1926. Pp. xxiv + 842.

seeking to control or to make uniform the conditions surrounding the child over any extended period of time should be recognized at this point and reserved for later consideration in this chapter. Of course, viewed in a broad way, it is possible to think of the administering of any standard test (psychological or achievement) as an experimental procedure, since certain factors such as directions and classroom conditions presumably are controlled for purposes of observation of the performance of the child. The experimental factor may be thought of as the instruction which the pupil undergoes between testing periods, the effect of which is measured. However, this is a type of study which more appropriately than here has been discussed in Chapter VII in connection with normative-survey procedures.

The point of the preceding discussion is that there is no sharp line of demarcation between so-called observational, survey-testing, genetic, and experimental studies. Students who view the definition of the experimental method more broadly than is represented in the subsequent portion of the present chapter do no actual violence to the principles of controlled observation and the manipulation of an experimental factor by considering many observational, repeated survey-testing, and growth investigations as types of experimentation. However, the point of view of the authors and the functional and logical organization of research methods are represented more adequately by assigning these studies to the appropriate chapters mentioned above.

Obviously, the accuracy of observation has been greatly increased by standard tests, mechanical controls such as those used in the psychology laboratory (chronoscope, tachistoscope, color mixer, galvanometer, spectroscope, photographic equipment, etc.), repeated observations, and statistical techniques.[11] However, much important pioneer work has been done without elaborate equipment for experimentation, which indicates that the intellectual curiosity and ingenuity of the investigator are

11 A. G. Bills, *General Experimental Psychology*. New York: Longmans, Green and Co., 1934. Pp. xii + 620. The introduction includes a discussion of the assumptions, methods, and field of experimental psychology.

more important than ornate laboratories.[12] Galileo climbed the leaning tower of Pisa to make a practical test of the validity of the then common belief that a heavy body falls faster than a light one. While in his bath, Archimedes is said to have discovered that when a body is immersed in a fluid, it is buoyed up by a force just equal to the weight of the fluid displaced. Helmholtz said that after he had been working on a problem for some time, happy ideas for its solution usually came unexpectedly like an inspiration, and never while he was at his working table. While on foot in the mountains of Switzerland, far from his laboratory at Columbia University, Michael Pupin invented the Pupin coil, of such importance to the long-distance telephone. Darwin was able to recall the exact spot in the road, while riding in his carriage, when his theory of evolution occurred to him. James Watt was walking on a fine Sunday afternoon when he invented the condensing steam engine; later he had to make the steam cylinder and piston out of a surgeon's large brass syringe. When Pasteur went to his home town to study the diseases of wine in an effort to save this industry, he had to use the crudest of equipment: an old room that had been a café, apparatus made by the carpenter and tinsmith of the village, an open charcoal brazier with a pair of bellows instead of a gas burner, and water carried from the town pump. Yet here pasteurization was discovered, and the wine industry of eastern France saved. Charles Goodyear, experimenting on rubber in a New England kitchen, happened to bring a mixture of sulphur and rubber into contact with the hot stove, and thus discovered how to vulcanize rubber. He made some of his experiments in this field while confined in a Philadelphia jail as a common debtor.

Certain of the foregoing illustrations suggest that much of the success of experimentation depends on close and careful observation rather than on elaborate equipment, as is the case in any area of investigation.[13] Darwin attributed many of his

12 T. A. Boyd, *Research*, pp. 8, 27, 44, 55-62. New York: D. Appleton-Century Co., 1935.

13 *Ibid.*, pp. 82, 87-93.

own accomplishments to an ability to notice things which easily escape attention, and to observe them carefully. Franklin noticed that, contrary to accepted opinions, storms traveled in the opposite direction to the wind, or that northeasters sometimes reached Philadelphia before Boston; in this way modern meteorology is said to have originated. Although accident frequently plays a part in discovery, little benefit to the cause of science results unless intelligent observation is also involved. The French physicist, Becquerel, found that a little radium carried in his pocket made a spot on his skin like an ulcerated sore, thus suggesting the use of radium in the treatment of cancer. Edison was rolling between thumb and forefinger a piece of lampblack mixed with tar (prepared for use in his telephone transmitter), when it occurred to him that a thin spiral of this material might be a good filament for the incandescent lamp on which he had worked for two years. When tried, it worked, although the material was not good enough for filaments, but Edison was started toward a successful carbon-filament lamp. Prospectors who had been hunting for radium in Canada pitched camp in the evening after a fruitless day. Their fire melted away the snow, revealing moss that appeared to be eaten away by some agency. Curiosity and intelligently directed observation showed that a deposit of radium was beneath their feet.

General principles of group experimentation. Of course the conditions of the psychological and experimental-education laboratories make possible the use of elaborate techniques and complicated apparatus appropriate to experimentation with individual subjects. Most educational experiments in the field are conducted in the classroom where it is necessary to work with groups of children rather than with individuals. McCall's description of group methods of experimentation in education has been widely quoted: the one-group method, the equivalent or parallel-group method, and the rotation-group method.[14]

[14] W. A. McCall, *How to Experiment in Education*, Chapter II. New York: The Macmillan Co., 1923.

The one-group technique. A one-group experiment has been conducted when *one* thing, individual, or group has had *applied to* or *subtracted from it* some experimental factor or factors and the resulting change or changes determined or measured. For example, if a group of pupils takes equivalent forms of a standard reading test in order to determine the effect on their scores of varying mental attitudes induced by a different mental-set for each form of the test, a one-group procedure is involved. The pupils may take one form, using the regular printed directions accompanying the test. Scores on this form serve as a norm against which to check performance on other equivalent forms of the test when the experimenter has sought to induce specific mental attitudes such as encouragement or discouragement. In general, it is desirable, and even necessary in terms of significance of findings, to know the normal or expected performance of the group as a basis for comparison with results produced by application of the experimental factor. Thus, if a first grade is subjected to an experimental method of teaching reading for the entire school year, the results can be interpreted only in terms of normal or expected performance for a group of this given intelligence and home background while following a customary teaching procedure. However, it must be recognized that any attempt to estimate the performance of a given group as the result of a procedure never actually tried with the group in question is fraught with difficulties and possibilities for error.

The foregoing description of one-group experimentation suggests that it is the simplest of all experimental procedures and the most feasible for classroom use, although probably the least valid. With the factors of pupils, teacher, and school setting constant, the only variable present is the experimental procedure, and of course such change as takes place in the group or teacher with the passage of time and with maturation. These changes in the pupil which take place when different phases of the experimental factor are applied in sequence over a period of time involve at least four defects in the one-group

method.[15] As different forms of a standard test in reading are administered in the first grade at intervals of, let us say, one month or even one week, with an attempt to induce varying mental attitudes: (1) gains may be greater between earlier forms, since the typical curve of learning shows more rapid acceleration in the earlier stages of practice; (2) practice effect may operate in such a way as to increase scores on later forms of the test; (3) an attitude such as confidence or discouragement or a method of attack or study may carry over from one form to another; (4) the fact that the child is a given number of days, weeks, or months older, with a corresponding level of maturity and achievement reached, may affect performance or the significance of a gain on later tests.[16] For this hypothetical example, reading in the first grade has been chosen, so as to make the possible limitations of the one-group method especially conspicuous.

In summary, it may be said that the essentials of the one-group method are: (1) an initial test, the application of an experimental factor, and a check on results; (2) a second preliminary test, the application of another experimental factor, and a check on results; and (3) as many other cycles of preliminary testing, experimental procedure, and end testing as are desired.

The parallel-group technique. The parallel-group procedure represents an attempt to overcome the limitations of the one-group method, since two or more groups, as nearly equivalent

15 H. H. Abelson, *The Art of Educational Research*, pp. 141-2. Yonkers-on-Hudson, N. Y.: World Book Co., 1933.

16 Edward A. Lincoln, "The Equality of Units in Educational Measurement Compared," *Journal of Educational Research*, XXII (October, 1930), 197-202. The point of view is aptly stated as follows:

"An inch added to a man's stature is quite a different thing in value and meaning from an inch added to the end of his nose. Furthermore, the inch in stature has not always the same meaning. As already pointed out, it may represent only a month's growth in the days of infancy, while in late adolescence two years may be necessary to acquire it. Further still, an inch in stature means less to the individual of average height than it does to the short man who without it will be noticeable as a runt, or to the tall man who will become over-conspicuous because he has it. This difficulty is present in measuring inanimate things as well as living organisms. An inch on a transatlantic cable is very different from an inch on the weight beam of a sensitive balance. A pound of granite is different from a pound of gold. Even time units do not avoid this difficulty; a year in college is different from a year in jail."

as possible in all respects, are used at the same time. Under carefully controlled conditions, only a single variable is manipulated, namely, the factor which the experimenter varies for the two groups, whose effect he attempts to determine. To one group may be applied the experimental factor, with the parallel group serving as a control for comparative purposes, following a customary or non-experimental procedure. Or, different phases of the experimental factor may be applied to the two equivalent groups, although in such an instance, a third parallel group, following a non-experimental plan, is desirable to serve as a control for purposes of comparison. For example, one of two equivalent groups may take a standard test under conditions of discouragement, induced by the experimenter, while the second group uses only the customary directions accompanying the test. Or, the second group may take the test under a condition of encouragement and praise, which is another phase of the experimental factor of mental attitude; however, in this event a third parallel group using only the printed directions accompanying the test is desirable as a control. Of course the greatest difficulty in this method is to equate groups adequately.

It has been emphasized especially that indiscriminate use of the control-group technique impedes real progress in education due to the fact that: (1) invalid results become perpetuated in the literature where they influence the uncritical reader, and (2) the methodology of research may suffer through overstandardization of the control-group method. Suggestions for safeguarding this type of experimentation are as follows:[17]

1. Exercise care in organizing the investigation so as to give the control group a fair chance so far as the experimental factor is concerned.

2. Be certain that the type of training given the experimental and control groups constitutes an important factor experimentally.

3. Note various types of change and improvement which take place in the control group during the experimental period.

17 W. A. Brownell, "Some Neglected Safeguards in Control-Group Experimentation," *Journal of Educational Research*, XXVII (October, 1933), 98-107.

4. Examine critically the function and place of standard tests in the measurement of results.
5. Make the measurement complete and comprehensive.
6. Use sagacity and insight in the interpretation of measures.

The rotation-group technique. The rotation method involves the reversal of the groups at intervals, in terms of the procedures followed. This method is frequently used when parallel groups are not available or there is doubt concerning the equivalence of the groups, due to such factors as initiative, industry, or study habits which are very difficult if not impossible to control. For example, the parallel groups might take a second form of the same standard test with an exchange of the mental attitudes induced by the experimenter. The groups may be reversed as often as desired by the investigator. This procedure is illustrated in the diagram which follows:

Group	A	B
Method	x	y
Method	y	x
Method	x	y
Method	y	x

Again, three groups, not known definitely to be equal, might use at different times the following procedures, with the results for each plan combined and compared with the other methods at the end of the experiment. That is, the results for method x would be totaled for all three groups and compared with totals for methods y and z. However, even here, there must be reason to believe that the groups are equally capable of profiting from exposure to the same experimental factor. To use an extreme example, one would not compare groups of blind, deaf, and crippled children respectively. Obviously, there are other sequences in which the different methods may be taken up by the three groups as they proceed from one phase of the ex-

perimentation to another, for example, Group A may begin with either *y* or *z* instead of *x*.

Group	A	B	C
Method	x	y	z
Method	y	z	x
Method	z	x	y

The major possible limitation of the rotation method is the same as for the one-group method, carry-over effect from one experimental procedure to another, rendering it difficult to determine whether the score on a given form of the reading test mentioned above is caused solely by the attitude the experimenter seeks to induce or in part by a combination of attitudes transferring from earlier forms of the test. It will be recognized that use of equivalent groups adds to the validity and usefulness of the rotation procedure. Other limitations (previously listed) of the one-group method are represented in the rotation pattern (sketched above for the three groups) in that a given procedure was followed at three different time periods in the course of the experiment. The hypothetical examples of group experimentation given above are used only for illustrative purposes, with due recognition of difficulties present in attempting to induce and measure the effects of a given mental attitude.

An illustration of a more intricate method of rotating procedures, which aims to equalize practice effect and other similar variable factors, involves a ball-tossing experiment.[18]

Seventy-seven adult male students served as subjects. Sixty-six of these composed the six experimental groups, and eleven composed the control group. Each subject in the experimental groups was given sixty trials with each of the eleven instructions, or 660 trials in all. About seventy-five minutes were required for a

18 R. L. Hoke, "Factors Conditioning Efficiency in a Motor Skill," *Abstracts Graduate Theses in Education, 1927-1931, Teachers College, University of Cincinnati*, pp. 135-44. Cincinnati, Ohio: University of Cincinnati, 1931. Also *Journal of Experimental Psychology*, XV (June, 1932), 316-30.

subject to complete the experiment. In order to equalize practice effects and other similar variable factors, the counterbalanced order of giving instructions was used. The experiment was organized in six cycles for six groups of subjects. In each cycle were eleven subjects to correspond with the eleven instructions. Each group of subjects had its own sequence of instructions. All subjects went through the eleven conditions or instructions once, each in his own order. Subject 1 of the first group began with the first of the instructions (A), went through the second (B), third (C), and so on. Subject 2 began with the second (B) of the instructions, then took the third (C), and finally went through the first (A). This scheme was carried through for each group of subjects so that each instruction appeared equally often in each serial position. The order in which instructions were given the first two groups is as follows:

First Group of Subjects

Subject	Instructions
1	A B C D E F G H I J K
2	B C D E F G H I J K A
3	C D E F G H I J K A B
4	D E F G H I J K A B C
5	E F G H I J K A B C D
6	F G H I J K A B C D E
7	G H I J K A B C D E F
8	H I J K A B C D E F G
9	I J K A B C D E F G H
10	J K A B C D E F G H I
11	K A B C D E F G H I J

Second Group of Subjects

Subject	Instructions
1	J I H B G K F A C D E
2	I H B G K F A C D E J
3	H B G K F A C D E J I
4	B G K F A C D E J I H
5	G K F A C D E J I H B
6	K F A C D E J I H B G
7	F A C D E J I H B G K
8	A C D E J I H B G K F
9	C D E J I H B G K F A
10	D E J I H B G K F A C
11	E J I H B G K F A C D

TABLE XIII

ORDER OF MAZES AND CONDITIONS OF THE EXPERIMENT

Subjects	Order of Mazes															
	First				Second				Third				Fourth			
	I	II	III	IV	II	III	IV	I	III	IV	I	II	IV	I	II	III
A, AA	N	L	M	H												
B, BB	L	M	H	N												
C, CC	M	H	N	L												
D, DD	H	N	L	M												
E, EE					N	L	M	H								
F, FF					L	M	H	N								
G, GG					M	H	N	L								
H, HH					H	N	L	M								
I, II									N	L	M	H				
J, JJ									L	M	H	N				
K, KK									M	H	N	L				
L, LL									H	N	L	M				
M, MM													N	L	M	H
N, NN													L	M	H	N
O, OO													M	H	N	L
P, PP													H	N	L	M

N = no punishment; L = light; M = medium; H = heavy.

Another excellent example of the counterbalanced procedure, used to equalize variable factors, is found in Table XIII which is to be read in the following manner: [19] Subjects A and AA began the experiment by running maze I under a condition (N) in which there was no punishment, then ran maze II under light (L) punishment, maze III under medium (M) punishment, and maze IV under heavy (H) punishment. Subjects E and EE began the experiments by running maze II under the normal (N) condition in which there was no punishment, then ran maze III under light punishment, maze IV under medium punishment, and maze I under heavy punishment. Two series of experiments, each involving sixteen subjects were conducted.

A check-list for experimentation. A helpful check-list [20] of items to be considered in experimental work, with special reference to group procedure, based on McCall's discussion [21] of the problem, is available. Although the various items vary in their significance for experimental work, according to the type of situation involved, they are given in some detail for the sake of a reasonable degree of completeness.

EXPERIMENTAL METHODS

1. In any experimental study the total net change in the trait or traits in question produced by irrelevant factors must be negligible, or the amount of such change must be measured and discounted by the application of a control experimental factor.

2. The one-group experimental method is valid where the change produced by an experimental factor is not conditioned significantly by

19 James Vaughn and C. M. Diserens, "The Relative Effects of Various Intensities of Punishment on Learning and Efficiency," *Journal of Comparative Psychology*, X (February, 1930), 55-66.

Also see E. S. Robinson, "Methods of Practice Equilibration," *American Journal of Psychology*, XLI (January, 1929), 153-6. Discusses the following procedures:

1. Method of completed practice
1. Methods of uncompleted practice
   (*a*) Method of predicted learning
   (*b*) Method of the control group
   (*c*) Methods of counter-balanced order

20 H. H. Bixler, *Check-Lists for Educational Research*, pp. 15-21. New York: Teachers College, Columbia University, 1928.

21 W. A. McCall, *op. cit.*

any preceding factor, and where the change effected by each experimental factor is measurable in equal units.

3. The equivalent-groups method is valid where it is possible to equate groups.

4. The rotation method is valid where the change produced by an experimental factor is not conditioned significantly by any preceding experimental factor.

5. The experimenter should make plans for keeping an experimental log or record of events, with dates, and should include irrelevant factors and unusual conditions.

The Subjects

6. The experimenter should have a carefully thought-out plan for selecting the subjects, that is, the group to which the experimental factors are to be applied.

7. If it is proposed to use statistical formulas whose validity depends upon the assumptions of random sampling, the experimenter must take precautions to assure that these assumptions are met.

8. When the composition of the population to be studied is known, the sample must be so selected as to include all the essential elements.

9. When the composition of the population is unknown, the experimenter should select at random sample groups and continue selecting groups until comparison of the samples taken reveals a definite tendency for variations in one direction to occur as frequently as variations in another direction.

10. The method of sampling should be described in full so that the research may later be evaluated.

The experimenter, in selecting subjects for the experiment, must check on the following points:

11. The subjects must be appropriate to the experimental methods.

12. The subjects must be appropriate to the tests to be used.

13. The subjects must be appropriate to the experimental factors.

14. The subjects should be representative as to age, sex, grade, intelligence, etc.

15. The experimenter should select subjects who may reasonably be expected to be available throughout the period of the experiment.

16. The number of subjects must be sufficiently large to assure reliability of the results. Sometimes a preliminary trial experiment is needed to determine the approximate number.

17. The number of subjects must be sufficiently large to allow for losses or eliminations on account of absences from one or more tests, inability to pair, and other reasons. If there is a control group, it is usually desirable to select a much larger number of subjects for it than

will be finally needed, so that all members of the experimental group may be utilized in pairing.

The Materials of Experimentation

18. The materials must be appropriate to the subjects.
19. The materials must be appropriate to the experimental method.
20. The cost of the materials must be within reasonable limits.
21. The materials must be appropriate to the conditions under which the experiment will be conducted, such as the time available and the qualifications of the persons who are to use the materials.
22. The materials must not present irrelevant or variable factors that might invalidate the experiment.

The Place of the Experiment

23. The place or places in which the experiment is to be conducted must be typical of the situations to which the results of the experiment are expected to apply.
24. This representative character may be planned with reference to parts of a city, parts of a county or state, parts of the United States, etc.
25. The place and its environment must be appropriate to the experimental method and the experimental factors.
26. The place or its environment must not introduce irrelevant or variable factors that might invalidate the experiment.

The Time of the Experiment

27. The experimenter must determine whether the time of the day, of the month, or of the year is a significant factor in the experiment.
28. In deciding upon the time length of an experiment, the principle to be kept in mind is that one should aim to secure the maximum effect of the experimental factors with a minimum effect from irrelevant or variable factors.

Equating Groups

When groups are to be equated, one or more of the following bases may be used:

29. Random selection, that is, chance arrangement
30. General ability
31. Initial status in the experimental trait
32. Composite of several test scores
33. Rate of growth or change in the experimental trait

34. Multiple bases, such as chronological age, mental age, and initial status

CONTROL AND MEASUREMENT OF EXPERIMENTAL AND IRRELEVANT FACTORS

35. If tests are needed in the experiment, choose appropriate measuring instruments.

36. The experimental conditions or situations must be appropriate both to the problem and to the subjects.

37. The experimenter should have or obtain the authority necessary for the control of experimental conditions.

38. The experimenter should measure the amount of the experimental factors as accurately as possible.

39. The experimenter should measure the amount of change in the trait in question produced by the experimental factors.

40. The amount of change in the experimental subjects due to irrelevant factors should be eliminated, equated, or accurately measured and discounted.

Among the constant irrelevant factors, which may or may not be significant, are the following:

41. Maturing or growth of subjects.

42. Bias of experimenter or assistants.

43. Capability of assistants.

44. Enthusiasm or unwillingness of assistants.

45. Bias of the subjects.

46. Differences in time allowance.

47. Too short or too long a time allowance.

48. Differences in transfer of knowledge, enthusiasm, and the like, among subjects.

49. Bias of the tests.

50. Physical environment, such as temperature, home surroundings, and the like.

51. Unnatural conditions, or lack of adjustment of the subjects to the situation.

52. The experimenter must keep accurate, detailed, and dated records of the methods of applying the experimental factors, possible irrelevant factors, and other pertinent data.

53. The research worker should determine whether any other method, such as partial correlation, may be used to supplement or check on the experimental method.

Equating of groups and control of variable factors. It has been pointed out above that the most difficult problem in

controlled group experimentation is to insure the equivalence of parallel groups. Many gross errors have been made through ignorance and carelessness in attempting to form parallel groups, and in reaching conclusions based on comparisons between unequal groups. To say that pupils should study Latin in high school in order to succeed in college, simply because there is a positive relationship between college marks and the amount of Latin studied in secondary school, is to neglect probable differences in intelligence between Latin and non-Latin pupils. To compare absences in a given secondary school for the periods, 1915-1918, 1925-1928, and 1930-1933, assuming that the pupils, teachers, and environmental conditions represent three equivalent situations, violates virtually every principle of experimentation. Obviously, the pupils and teachers are not the same, even though the numbers are large enough to represent a random sampling of a relatively stable community. The conditions in a war period (1915-1918) with easy employment for youth and an influenza epidemic, in the "boom" period of prosperity (1925-1928) with its effect on employment and school attendance, and in a depression period (1930-1933) with a different effect on employment and attendance, with possible strengthening of compulsory education laws in the post-war period, are factors rendering the three situations far from comparable.

One would-be investigator who wished to compare two methods of teaching English in high school, in the first place, had only a dozen members in each group. The boys were placed in one group and the girls in another (a variable of sex). The girls were older than the boys by an average of nine months, and their mental age fourteen months higher. An attempt was made to compare the I.Q.'s of the two groups, rather than their mental ages, which of course was incorrect. In seeking to use other procedures, which to her were only names, pairing was attempted by matching the lowest pupil in one group with the lowest in the other group, etc., without regard to whether the scores were equal. The whole procedure suggests the tragedy,

and in some ways comedy, of errors represented when ignorant or careless persons attempt to use techniques and instruments with which they apparently are totally unacquainted. A teacher of science attempted to compare two instructional methods with three variables present: instructional method (the experimental factor, the effect of which he hoped to measure), teachers (a man and a woman), and pupils (a bright group and a slow group). Even the wisdom of Solomon could not determine which of these factors or what combination of variables produced the results secured.

A comprehensive outline of the variable factors to be considered in equating groups is available in Monroe and Engelhart's excellent discussion of this problem.[22]

I. Characteristics of pupils
   A. General intelligence in terms of point scores or of mental age
   B. Chronological age
   C. Previous achievement in the field of experimentation
   D. Study habits
   E. Personality traits (attitudes, ideals, and interests)
   F. Physical condition (health)
   G. Sex
   H. Race
II. Educative factors affecting pupil achievement
   A. Teacher factors
      1. Instructional techniques
         (*a*) Learning exercises
         (*b*) Motivation procedures
         (*c*) Directive procedures
         (*d*) Diagnostic procedures
      2. Classroom-management procedures
      3. Skill in carrying out instructional techniques and classroom-management procedures
      4. Zeal of the teacher with reference to experimental factor
      5. Personality traits
      6. Physical condition
      7. Sex
      8. Age
   B. General school factors
      1. Instructional materials (textbooks, library, maps, laboratory apparatus, etc.)

[22] W. S. Monroe and M. D. Engelhart, *op. cit.*, Chapter II.

2. Time devoted to learning activity
3. Characteristics of the class as a group
4. Size of class
5. Size of school
6. School organization
7. Administration and supervision
8. School building, especially lighting, heating, and ventilation

C. Extra-school factors
1. Participation in extracurricular activities
2. The pupil's home life
3. Community interest in and attitude toward school

The equating of groups is not so difficult or elaborate in practice as might appear from an examination of the eight pupil factors listed, in view of the fact that intelligence correlates positively with several of the other characteristics, although many times the relationship in terms of correlation is not very high. Although it is not possible to control all of the educative factors outlined above, in securing equivalence or in making approximate allowance for non-equivalence, at least the following must be considered: [23]

1. Instructional techniques
2. Skill in carrying out instructional techniques
3. Zeal of the teacher
4. Personality traits of teachers
5. Instructional materials
6. Time spent in learning activity

It will be recognized that the specific factors to be considered in equating groups depend on the nature of the experiment; in connection with the factors outlined above, obviously the experimentation involves some form of instructional procedure. In considering the effectiveness of different incentives for improvement of a cross-country track team, fleetness of foot and physical endurance would have to be considered in equating groups. In Table XIV are the factors considered important in studying class size in English. The experience of earlier work-

[23] *Ibid.*, p. 51

ers in a given area should prove helpful in selecting the factors to be controlled.

Although it is hardly possible to express in mathematical terms all of the extra-school factors involved, they should not escape the attention of the experimenter in planning the investigation and in interpreting results.

The items listed above emphasize actual measurement of the factors involved as a basis for equating groups. Some experimenters assume that given groups are equivalent because they were formed as a result of the operation of chance, which is a very questionable procedure in view of the small numbers and selective factors involved in the school and community settings for most educational experiments in the field.

Naturally, as many as possible of the foregoing factors should be used in forming parallel groups, rather than to depend solely upon a single measure such as intelligence. These factors may be combined into a composite score or considered separately in equating groups. If scores are combined, the weighting of the various traits must be considered carefully, since it is generally recognized that averages or composite scores may be the same for two quite different persons. If the traits are used separately in forming parallel groups, considerable shifting and elimination of pupils usually take place before satisfactorily equated groups result.

This statement implies that it is a more refined technique to pair pupils in the parallel groups than to depend solely on a comparison of the central tendencies and variabilities of the groups in question considered as a whole. One of the best examples of pairing is the use of identical twins in certain of the psychological studies.[24] Averages may cover up differences which are clearly apparent when the more analytical method of pairing is used for equating groups and for consideration of

24 Arnold Gesell and Helen Thompson, "Learning and Growth in Identical Infant Twins: An Experimental Study by the Method of Co-Twin Control," *Genetic Psychology Monographs*, VI (1929), 1-123.
G. D. Stoddard and Beth L. Wellman, *Child Psychology*, pp. 28-30. New York: The Macmillan Co., 1934.

relative performance. The highest pupil in Group A, in terms of some appropriate combination of the various equating measures employed, is paired with the highest pupil in Group B, if they are reasonably comparable, the second highest in Group A with his mate in Group B, etc. Of course, in each experiment a decision must be made with respect to the maximum difference allowable between the two members of a pair, in terms of the equating measures employed. Usually there are certain pupils in both groups who cannot be matched or paired closely, and for the purposes of the experiment their results may be disregarded, comparing only the performance of the paired individuals. Such a plan makes possible the use of classes without shifting pupils from their original sections.

Not only should the central tendencies of the groups be considered, but the variability of traits as well. Differences in performance between groups with equal central tendencies may result when the members of one group are clustered closely around the mean or median, while the traits of the other group are distributed over a much wider range. Of course, the technique of pairing mentioned above insures a similar variability and central tendency of scores for the equivalent groups. A rather refined statistical procedure for balancing parallel groups in terms of both mean scores and variability among scores in the groups has been worked out so that only a minimum of cases needs to be dropped to equalize the groups.[25] The statistical procedures to which reference is made here are discussed in Chapter XI. Psychological and achievement tests, as data-collecting instruments useful in equating groups and in measuring results, are considered in Chapter VII.

A good example [26] of the technique of equating groups, involving the pairing of pupils, is given in Table XIV. The paired group in the large class had the advantage in composition (.17), average I.Q. (.53), and reading ability (.04). The

25 P. J. Rulon and Charlotte W. Croon, "A Procedure for Balancing Parallel Groups," *Journal of Educational Psychology*, XXIV (November, 1933), 585-90.

26 Dora V. Smith, *Class Size in High-School English*, pp. 84-8. Minneapolis, Minn.: University of Minnesota Press, 1931.

TABLE XIV

AVERAGE I.Q., CHRONOLOGICAL AGE, AND ACHIEVEMENT SCORES OF THE PAIRED PUPILS IN THE LARGE AND THE SMALL CLASSES, SEPTEMBER 1926-1927

Pair	Size of Class	Average I.Q.	C.A.	Score			
				Reading	Grammar	Composition	Spelling
1.....	Small	136	163	128	77	6.1	130
	Large	142	157	128	85	5.6	127
2.....	Small	135	159	124	82	5.9	130
	Large	137	155	113	79	6.2	128
3.....	Small	131	165	108	90	5.7	133
	Large	127	161	110	84	5.7	134
4.....	Small	125	168	109	61	5.5	111
	Large	122	167	108	63	5.1	119
5.....	Small	123	157	109	72	6.6	123
	Large	126	155	103	61	6.5	102
6.....	Small	123	167	114	69	4.2	102
	Large	123	162	101	67	5.2	121
7.....	Small	123	158	114	76	6.3	108
	Large	119	159	101	46	5.3	126
8.....	Small	119	166	110	42	6.7	124
	Large	118	168	111	59	6.0	117
9.....	Small	117	159	91	74	5.1	128
	Large	120	159	80	76	5.5	124
10.....	Small	114	166	85	57	5.5	112
	Large	115	163	90	69	4.4	116
11.....	Small	114	169	100	82	5.5	125
	Large	114	173	85	70	5.9	125

small class surpassed the mated group in age (.29 months), in grammar (1.52), and in spelling (.81). In no case did the difference exceed the probable error of the means except in composition. From the standpoint of significance, the chances

TABLE XIV—Continued

Pair	Size of Class	Average I.Q.	C.A.	Score			
				Reading	Grammar	Composition	Spelling
12.....	Small	114	170	106	72	4.7	123
	Large	114	174	114	74	4.6	111
13.....	Small	113	173	85	45	5.1	123
	Large	109	178	94	51	4.6	111
14.....	Small	112	173	94	31	5.5	122
	Large	112	174	109	30	6.5	121
15.....	Small	111	162	76	50	4.1	131
	Large	113	171	75	55	4.7	116
16.....	Small	111	163	95	39	5.4	131
	Large	109	164	80	45	5.1	121
17.....	Small	110	168	71	77	4.0	113
	Large	114	163	90	52	5.8	121
18.....	Small	105	175	77	30	3.4	69
	Large	108	178	95	66	4.5	121
19.....	Small	103	167	88	71	4.3	127
	Large	108	158	83	70	4.7	116
20.....	Small	99	186	81	74	5.3	121
	Large	97	185	83	47	5.4	97
21.....	Small	96	182	65	60	4.1	109
	Large	98	186	78	50	5.3	104
Mean.....	Small	115.90	167.43	96.67	63.38	5.19	118.81
Mean.....	Large	116.43	167.14	96.71	61.86	5.36	118.00
Sigma.....	Small	10.53	7.26	17.09	17.15	.78	14.06
Sigma.....	Large	10.62	9.20	14.28	13.93	.63	8.83

that an equal difference would occur outside of these limits were even for chronological age, reading ability, grammar, and spelling. The chances for the differences in I.Q. and composition were 1.18 to 1.

A report of one experiment suggests a rather practicable technique for comparing teaching procedures without equating groups, where evidence is available concerning the relative abilities of the groups in question.[27] Thus, if an experimental group with a lower mental age, in spite of this handicap, equals or exceeds the performance of a control group, it speaks well for the experimental method of teaching, provided no other variable is present to explain this relatively good performance.

A suggestive method for determining the equality of groups, when data are not available for pairing pupils, follows:[28]

> Ideally, one should have sufficient information about each individual taking part in a control experiment to match pairs on the constants of their growth curves. Then, the only factors causing variations would be chance factors. In the absence of such ideal knowledge, however, it seems to me the use of four criteria will materially increase the certainty of results.
>
> A. Give a series of tests separated by intervals sufficient to permit a real growth in all subjects. At least three such tests should be given.
> B. Match pairs on achievement in Test 2 and growth from Test 2 to Test 3.
> C. Predict the scores that will be made on Test 4 in both groups. Deviations of actual scores from predictions measure the validity of the matching. Compare groups by distributions of individual growths. If predictions and scores do not agree, rematch the two groups, and again predict.
> D. As soon as the groups are proved equal by criterion C, introduce the experimental factor into the experimental group. Predict growth of control group.
>
> If now the control group makes the predicted score, the difference between experimental and control scores may safely be ascribed to the experimental factor. The variation of the actual from the predicted scores for the control group becomes a measuring stick for determining how much dependence may be placed on the differences between the experimental and control groups.

27 E. O. Melby and Agnes Lien, "A Practicable Technique for Determining the Relative Effectiveness of Different Methods of Teaching," *Journal of Educational Research*, XIX (April, 1929), 255-64.

28 S. A. Courtis, "Criteria for Determining Equality of Groups," *School and Society*, XXXV (June 25, 1932), 874-8.

Needless to say, I personally believe a fifth criterion essential. All scores should be made comparable by being expressed in maturation units before matching and tabulations. Under such conditions, scores would be truly comparable, intercorrelations would rise, and prophecy could be based upon the results with assurance.

The full import of the preceding paragraph may be clear only to those who are acquainted with the interest of Courtis, in formulating a biologic law of growth, with corresponding curves of maturation.[29]

In certain studies the investigator does not actually manipulate directly an experimental factor, after groups have been equated, but chooses the subjects from conditions of the present or past to involve reasonably controlled conditions and an experimental factor. For example, the experimenter may pair certain pupils, who have already attended for a period of years segregated schools for Negroes, with other pupils who have attended mixed schools (for white and colored children). The problem is to determine the effect of this variable (the type of school attended) on the achievement and attitudes of the pupils who are paired in terms of a variety of measures.[30] Obviously, the experimental factor has been operating over a period of years, long before the investigator decides to select equated groups and to measure the effect of the variable on the pupils.

Numerous examples of the various types of controlled group experimentation and of more detailed procedures for securing equivalent groups are available in two sources. A good summary statement of techniques for securing parallel groups,

29 S. A. Courtis, "The Derivation of Norms," *Journal of Experimental Education*, II (March, 1934), 237-42.

———, "The Prediction of Growth," *Journal of Educational Research*, XXVI (March, 1933), 481-92.

30 Mary A. R. Crowley, "A Comparison of the Academic Achievement of Cincinnati Negroes in Segregated and in Mixed Schools." Unpublished Doctor's thesis, Teachers College, University of Cincinnati, 1931. A summary may be found in *Abstracts Graduate Theses in Education, Teachers College, University of Cincinnati, 1927-1931*, pp. 64-97. Cincinnati, Ohio: University of Cincinnati, 1931.

Inez B. Prosser, "Non-Academic Development of Negro Children in Mixed and in Segregated Schools." Unpublished Doctor's thesis, Teachers College, University of Cincinnati, 1933.

especially in terms of feasibility and practicability in a classroom situation, follows: [31]

> No one of the techniques described may be called the best. The use of chance is the most feasible when one wishes to use very large groups. The use of ordinary school classes, whose degree of equivalence is later checked, is to be commended since it causes little change in the usual schoolroom conditions. That groups should be equivalent with respect to measures of general intelligence has become rather well accepted among research workers in education. More careful experimenters go even further and strive to secure groups which are identical on the basis of several criterion measures including intelligence test scores. Since the use of several criteria as bases makes selection difficult, the use of composite scores would seem an effective technique. The use of composite scores, however, implies weighing of criteria, and research is needed to determine appropriate weights. Until this has been done, it would seem best to pair pupils with respect to intelligence test scores and to check the equivalence of other criteria, such as chronological age, previous achievement in the field of experimentation, study habits, personality traits, and physical condition by comparison of means and standard deviations of measures which have been made of them. In addition, the groups should be checked for the purpose of determining whether or not they are approximately alike with respect to sex and race. If measures of traits other than intelligence are thus checked, it is frequently possible to make adjustments toward more perfect equivalents, or if adjustment is not possible, to make appropriate allowances for imperfections in equivalence, thus discovered, in formulating conclusions. Whatever technique of securing equivalence is used, and whatever traits are considered, they should be the ones most appropriate to the problem and to the conditions under which the experiment must be conducted. The degree of elaborateness must be balanced against the artificiality of conditions which it may create, the cost of tests, the time, the number of cases, and other factors.

Although more detailed discussion of the interpretation and reliability of differences in gains (involving probable error) between experimental and control groups, as well as of other statistical procedures (averages or central tendency, dispersion or variability, correlation, etc.) used in experimental studies,

31 W. S. Monroe and M. D. Engelhart, *op. cit.*
M. D. Engelhart, "Techniques Used in Securing Equivalent Groups," *Journal of Educational Research*, XXII (September, 1930), 103-9.

is reserved for Chapter XI, attention at this time should be directed to the importance of the first problem, namely, the significance of differences in gains.[32]

The preceding discussions of the significance of differences in gains should make it clear that caution must be exercised in interpreting a small difference and that the interpretation cannot be accomplished by the application of any formula or group of formulae. In general, it is necessary to inquire carefully and critically into the conditions of the experiment; then the best that can be done is to *estimate* the allowance that should be made for imperfections in the data. Since an estimate must be considered only an approximation, it follows that the interpretation of a relatively small difference in gains must be somewhat uncertain. When the difference is relatively large, definite conclusions may be justified, but even in this case they must be restricted to the conditions of the experiment.

Laboratory experimentation. Group experimentation, as described above, is ordinarily conducted in classrooms for the purpose of evaluating various methods of instruction and has distinct value in aiding teachers to choose between instructional procedures of varying effectiveness. However, it has been emphasized that this type of classroom investigation is necessarily more limited in its approach than the experimental analysis of learning and its underlying abilities. The latter type of experimentation is commonly conducted in the laboratory where conditions may be carefully controlled, suitable apparatus and equipment provided, and subjects studied individually.[33] Frequently, appropriate equipment must be devised to meet a given need.

Attention is directed to the fact that relatively few graduate departments of education have made genuine contributions to educational psychology and experimental education through the medium of analytical studies of learning in the laboratory:[34]

[32] W. S. Monroe and M. D. Engelhart, *op. cit.*, p. 75.

[33] F. N. Freeman, "The Place of Laboratory Experiment in Educational Research," *Review of Educational Research*, IV (February, 1934), 97-107.

[34] G. T. Buswell, "The Laboratory Method in Educational Psychology," *Elementary School Journal*, XXXII (May, 1932), 656-65.

The laboratory attack on educational problems is not new. It had its beginning in the laboratory which Wundt set up in Leipzig in 1878, but for some reason it has received much less attention in institutions for the training of teachers than have other approaches to the problems of education. The number of departments of education which are contributing seriously to the laboratory studies in educational psychology is notably small. To be sure, laboratory research is expensive, it is tedious, it of necessity must be limited to small numbers of cases. Nevertheless, it makes possible a type of minute analysis which no other method of study has provided. The primary function of the laboratory is to supply an analysis of the processes which must be carried on by the child in learning. The laboratory should supply to the teacher a method of understanding the mental processes of the child. Teaching is always intimately related to analysis. The teacher must give to the child an analysis of the processes to be learned which no beginner can supply for himself. It is only after a process has been learned that the learner is able to analyze it.

A more complete characterization of the laboratory method and its procedures, as compared with group experimentation, follows: (1) provides the chief basis for theorizing, for example, Gestalt psychology; (2) tends to deal with the simpler, more fundamental processes, as in the case of the examples summarized at some length on subsequent pages of this chapter; (3) may not be directly concerned with immediately practical problems and may be motivated only by the type of intellectual curiosity which is found in "pure" chemistry or physics; (4) may cross the boundaries of other sciences such as neurology, biology, and physiology; (5) utilizes a limited number of cases, not only because of practicability, but due to interest in the patterns of behavior, mechanisms of learning, and maturation, problems for which individual analysis and study are the only practicable approaches; (6) may establish conditions of an atypical nature in attempting to control variables rigidly, that is, in trying to free the subject of one set of interfering stimuli, he may be exposed to another set of conditions which makes both the situation involved and the attendant or resulting behavior unnatural (good examples of how the experimenter guarded against such a danger are found in the first laboratory study summarized on subsequent

pages); (7) is grounded in the belief that there are constants, universal principles, and uniform sequences in human nature, and that these transcend the generalizations which can be stated only in terms of statistical reliabilities (parallel-group experiments lead merely to statements of probability). This point of view returns to the first statement, namely, that laboratory research leads to theories, principles, and generalizations of large import, especially in such fields as the psychology of learning. Investigators who use large numbers in group-testing studies well may cultivate the analytical skills and insights of the laboratory worker, while the laboratory technician in turn may visualize to advantage some of the more practical and pressing problems in the field.[35]

A discussion of the place of the psychological laboratory in educational diagnosis includes an analysis of different types of laboratory diagnosis, which are given below.[36] (Principles and illustrations of educational diagnosis are presented in the next chapter.)

1. Laboratory studies of school activities involving skill
2. Diagnosis through the aid of time records
3. Diagnosis made through the photographing of eye-movements
4. Diagnosis aided by motion and sound films
5. Diagnosis by the aid of voice records
6. Diagnosis of emotional tension
7. Miscellaneous diagnostic symptoms studied in the laboratory

It seems desirable to summarize in some detail the technique of a laboratory study of the experimental type. An excellent illustration of educational experimentation of the laboratory type is the work in arithmetic, reading, and other school subjects at the University of Chicago. These experiments have utilized extensively the technique of photographing eye-movements, and in some respects represent a planned attack on a number

[35] The authors are indebted to Gordon Hendrickson of the University of Cincinnati for this apt characterization of laboratory procedure.

[36] G. T. Buswell, "The Place of the Psychological Laboratory in Educational Diagnosis," *Educational Diagnosis*, Chapter IX. Thirty-fourth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1935.

of school-subject areas through analytical laboratory methods and psychological diagnoses. For these reasons it seems advantageous to draw the detailed illustration from this laboratory rather than to use briefer scattered examples from a number of institutions. The research programs of certain other laboratories and universities, with special centers of interest, are represented in the bibliography of the present chapter and in other chapters dealing with normative-survey, genetic, causal-comparative, case, and correlation methods.

The extended illustration used represents the first experimental study of eye-movements in looking at pictures, a very complex problem involving the use of elaborate equipment. The laboratory technique employed, that of photographing eye-movements, is an excellent example of the gradual development of laboratory procedure and equipment, to which a number of experimenters have contributed. It should be emphasized that the only function of any laboratory instrument, however elaborate, is to refine the process of observation through control of conditions or through accuracy or permanency of recording. Data are of value not because they are secured by means of laboratory apparatus, but in terms of whether they provide valid evidence for the solution of the problem at hand. Therefore, the quality of scientific study is not in the instrument itself but in the way the apparatus and the resulting data are used to accomplish a desired end. Use of equipment, such as provides silent or sound films, or eye-movement photographs, for purposes of observation only, may be considered normative-survey in character, or in certain instances genetic (if the emphasis is on norms of growth and development at various stages), and is illustrated in the appropriate chapters (VIII and X). It is true that phases of a number of the eye-movement studies are of this observational-survey character, although the parts of the investigation reported in the succeeding paragraphs are definitely experimental in character, since the purpose and procedure were to note the effect on the perception of the subject as the result

of manipulating such experimental factors or variables as: presence and absence of color in pictures, silhouette and outline forms, partly finished and complete pictures, and various types of directions in looking at pictures.[37]

The method of securing a record of eye-movements consists in photographing a beam of light from a six-volt ribbon-filament lamp reflected first to the cornea of the eye from silvered glass mirrors and then from the cornea to a second set of mirrors, through a camera lens and a set of wedge prisms to a moving kinetoscope film. By means of the prisms back of each lens the beam of light from the eye is split into two beams, one of which is directed to a horizontally moving film and the other to a vertically moving film. In this way the movements of the same eye are recorded on both films. The direction of the pencil of light reflected from the cornea is changed with each movement of the eye. As the subject looks at a picture, a photograph is made which records the movements of the eye in a sharply focused line upon the two films. By means of a fan blade driven by a synchronous motor, the beam of light is interrupted thirty times per second between the lens and the film in such a manner that on the film the line of light appears as a series of dots, each dot representing one-thirtieth of a second of time. By counting the number of dots in each fixation pause it is possible to determine with precision exactly how long a person looked at each position in the picture. Only subjects were used whose vision was sufficiently normal to look at the picture without the use of spectacles.

The apparatus was built for the particular purpose of this experiment in the workshop of the laboratories in educational psychology of the University of Chicago. Basically the apparatus is a large camera built in such a way that the two films can be moved continuously during the process of photographing. The various lenses and mirrors are simply for the purpose of bringing to a focus on the film the reflection of the tiny spot of light from the cornea of the eye. The light which reflects on the eye originates under the table. It is passed forward through a series of lenses and then upward through two holes in the table, after which it strikes two circular mirrors and is reflected to the subject's eyes. Instead of facing the camera lens, as has been necessary with previous pieces of apparatus of this sort, the subject is placed at right angles to the camera which gives him an open field of vision of whatever size is needed. Small pictures can be placed as close as the normal reading distance of twelve inches, whereas larger pictures can be set back whatever number of

[37] G. T. Buswell, *How People Look at Pictures:* A Study of the Psychology of Perception in Art, pp. 10-6. Chicago: University of Chicago Press, 1935.

feet seems desirable. The provision of this larger field of vision adds a great deal of flexibility to the uses of the apparatus.

The subject sits in a specially constructed chair which can be raised or lowered to the proper height. When he is in position, the head-rest is lowered around the back of the subject's head in order to eliminate head movements. On the whole, the position is comfortable and, after a few seconds of adjustment, the apparatus causes the subject no inconvenience. A record of head movements is obtained for every picture by securing through a second lens on the apparatus a photograph of a beam of light reflected from a chromium bead on a pair of spectacle frames which the subject wears. The use of a head line, particularly for the vertical record, is absolutely necessary to insure precision in plotting the record.

The films are plotted by projecting them through a stereopticon lantern. The vertical and horizontal position of each fixation is recorded on a numerical scale, and these positions are then coördinated and marked on the picture. Points of reference for fitting the film record to the exact size of the picture were secured from initial fixations on four dots placed adjacent to each margin of the picture. For the complete investigation some 18,000 feet of film were used.

A fixation of the eyes, of course, covers an area rather than simply a point. There is no means of knowing exactly how large the area of clear fixation is. The dots showing the position of fixations should be interpreted as the central points of areas of clear recognition which shade off gradually into areas of peripheral vision.

In looking at a picture, just as in the process of reading, the eye moves in a series of quick jerks and pauses. The eye does not slide over the picture, as many people seem to think it does. The duration of the fixation pauses varies a good deal, a pause of 3 thirtieths of a second being very brief, one of 8 to 10 thirtieths being quite common, and pauses of more than 20 thirtieths of a second occurring only in approximately 5 per cent of the cases. These movements and pauses of the eyes may be noted by direct observation, but the movements are too rapid to be counted accurately and the pauses too brief to be timed without the use of special apparatus.

Photographic records of eye movements were obtained from two hundred individuals for the present investigation. Of this number twelve were elementary-grade children, forty-four were high-school pupils, and 144 were adult subjects. Of the adult subjects forty-seven were secured from the Art School of the Art Institute of Chicago and were persons who had from two to five years of special training in the field of art. Fourteen other subjects had made sufficient study of art to be classified as art students. The great majority of the remaining adult subjects were college or graduate students.

In the entire investigation fifty-five different pictures were used.

For one group of nine subjects photographic records were made from thirty-nine different pictures for each subject. Thirty-four subjects looked at twenty-one or more pictures each. For the remaining subjects fewer pictures were taken. However, the total number of completed records used in this report is 1,877. The only records discarded were those where the amount of head movement was so great as to render doubtful the plotting of the picture or where some ocular defect made the film record unreliable.

In view of the fact that some educational workers have failed to recognize the part played by eye-movement photography in laboratory experimentation, it should be emphasized again that this equipment is a partial means of controlling the conditions of the experiment carefully and of recording behavior accurately. Of course, an experiment must involve an experimental or variable factor which is manipulated, in addition to control of other essential conditions or factors, and it is this experimental factor which may not be present or may not be recognized in certain of the laboratory investigations. Because of this difficulty, it seems desirable to point out the experimental variable in certain other laboratory studies where the typical procedure was to present to the same subject in succession varying types of materials, or situations, or directions, and to note the resulting behavior. The same procedure was repeated with as many subjects as desired.

The relationship between observational-survey and experimental work is illustrated in a group of diagnostic studies in arithmetic where the eye-movements of the subjects were photographed in doing different types of examples in column addition.[38] By means of a dictaphone a time analysis of the steps and of the behavior of the subject was also made for each of the four fundamental operations in arithmetic. With the difficulties of pupils thus observed and diagnosed, remedial teaching (an experimental factor) was done, and the gain noted and compared with the expected gain of a normal group

[38] G. T. Buswell and Lenore John, *Diagnostic Studies in Arithmetic*, pp. 4, 14-6, 47-8, 83. Supplementary Educational Monographs, No. 30. Chicago: Department of Education, University of Chicago, 1926.

of pupils for a similar period of time. Of course, diagnostic case studies are not typically experimental and are reserved for discussion in Chapter X.

In another study, a psychological analysis of counting, the subjects counted stimuli (an experimental variable) in the forms of series of sounds, or flashes of light, or tactual impressions varying in rate and number from time to time.[39] In a training experiment, simultaneous sounds and flashes of light were presented, and the effect of this training (an experimental factor) noted in terms of increased ability to count flashes of light.

Yet another investigation, a study of the eye-movements in the various types of silent reading, included a series of experimental factors: (1) an increasingly difficult series of passages, (2) varying directions which changed the attention of the reader, (3) different types of analytical study, and (4) various types of reading material (English, English and foreign language mixed, and foreign language).[40]

Other illustrations of laboratory studies, psychological analyses, and classroom experiments. Since space does not permit additional detailed summaries of other laboratory studies, it must suffice to indicate where such information may be found. A year-book on educational diagnosis includes extended discussions of the way in which laboratory and experimental procedures have contributed to educational adjustment in the various school subjects and activities, and of how physical, intellectual, pedagogical, emotional, social, and environmental factors are associated with learning difficulty. In the present discussion of experimental work, the chapters (and individual contributions) dealing with arithmetic by Brueck-

[39] C. H. Judd, *Psychological Analysis of the Fundamentals of Arithmetic.* Supplementary Educational Monographs, No. 32. Chicago: Department of Education, University of Chicago, 1927. Pp. x + 122. Reviewed by E. R. Breslich, *School Review*, XXXV (June, 1927), 467-8.

[40] C. H. Judd and G. T. Buswell, *Silent Reading: A Study of the Various Types.* Supplementary Educational Monographs, No. 23. Chicago: Department of Education, University of Chicago, 1922. Pp. xiv + 160. Reviewed by W. F. Dearborn and D. A. Prescott, *Elementary School Journal*, XXIII (May, 1923), 709-11.

ner and with music by Seashore are of especial significance.[41] Reference may also be made to a series of experiments conducted at Columbia University.[42] Obviously, it is impossible to call attention to all of the significant experiments which have been conducted during the past decade or two at various institutions.

It will be recognized that the discussion of experimental research presented in this chapter is of necessity limited to a brief outline of the procedures involved. The investigator who would become proficient in experimental and laboratory techniques needs as a background detailed study of appropriate experiments such as were summarized above or are represented in the chapter bibliography under the names of: Buswell, Cattell, Charters, Freeman, Garrett, Gesell, Goodenough and Anderson, Hartshorne and May, Hudelson, Murchison, Monroe and Engelhart, Murphy, Schwesinger, Skinner, Starch, Thomas, Thorndike, Valentine, and Wood and Freeman. In general, these references are summaries of large numbers of selected experiments in a variety of fields rather than reports of a single study, and as such serve as guides to the reader who may turn from the summary to the full report of the original experiment as he desires.

In the section of the appendix dealing with needed research are lists of problems which have been recommended for experimental investigation, especially under the topic of educational psychology and measurement.

Evaluation of, and outlook for, the experimental method. It is probable that workers in education have been much too optimistic in their expectations that most of the major problems of teaching and learning are being solved by application of the experimental method. Too many so-called experiments,

41 L. J. Brueckner and Others, *Educational Diagnosis*, Chapters XIV, XXI. Thirty-fourth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1935.

42 E. L. Thorndike and Others, *The Fundamentals of Learning*. New York: Bureau of Publications, Teachers College, Columbia University, 1932. Pp. xviii + 638. Also see C. L. Hull, "Special Review of Thorndike's *Fundamentals of Learning*," *Psychological Bulletin*, XXXII (December, 1935), 807-23.

in equating groups and in interpreting results, have neglected the various factors described in the preceding discussion. Possibly quantity production has been emphasized to the partial neglect of quality.[43]

We teach our students to be scornful of tradition and mere observation and insist that all things must be subjected to the test of controlled experimentation.

This is undoubtedly a healthy attitude to take if education is to become a science but the constant reader of the present-day educational literature cannot in his critical moments help but be troubled by the imperfections and ambiguities of our measurements and the inconclusiveness of our sporadic experiments. When, for example, on such an important problem for educational theory and practice as the effect of equal practice on individual differences, whether equal practice increases or decreases them, we find out of twenty-four experimental studies twelve of them leading at least tentatively to the conclusion that differences are increased and twelve to the conclusion that differences are decreased, we cannot help wondering about our experiments and about the conclusions derived from them.

In view of the numerous problems of control, measurement, and interpretation in experimental research, the outlook for this method as a source of accurate generalization is not wholly optimistic, although its stimulating effect on teachers and pupils is significant. Monroe and Engelhart, after discussing the crucial difficulties of definition of the experimental factor and adjustment of other educative factors to it, control of non-experimental factors, measurement of achievement, and generalizing, characterize the outlook for experimental research in education as follows.[44]

When we consider the crucial difficulties encountered in experimental investigations, it is difficult to be very optimistic in regard to the improvement of research procedures so that the findings will be highly dependable. As we have indicated, there is evidence that experimental techniques are being improved, and it is possible to present a strong case in support of the statement that we are leaving the plateau period. It is more difficult to predict the future, but it seems doubtful

43 V. A. C. Henmon, "Measurement and Experimentation in Educational Methods," *Journal of Educational Research*, XVIII (October, 1928), 185-94.

44 W. S. Monroe and M. D. Engelhart, *op. cit.*, pp. 104-5.

whether we are justified in expecting that in time it will be possible to set up an experiment or a group of experiments that will yield definite and final answers to any question concerning the relative merits of a given educative factor. Some questions can be answered satisfactorily. A few have been answered. But for many questions, perhaps most questions, it is likely that we are not justified in expecting more than an "indication."

Controlled experimentation, however, is worth while. In addition to the dependable information that may be contributed, there are valuable by-products. Experimental investigations are stimulative. Experiments with the project method have stimulated a greater interest in this instructional procedure, and we know that under certain conditions it works.

An amplification of this point of view, based on an examination of a large number of experimental studies after the foregoing statement was written, reaches essentially the same conclusion.[45]

It is hazardous to predict the future, but a critical examination of a large number of experimental studies does not induce one to give an optimistic answer. In fact it seems appropriate to ask if there are any best methods of teaching. It appears reasonable that the effectiveness of a method may be conditioned to such an extent by a teacher's confidence in it and the zeal and skill with which she applies it that the method itself is a minor factor in teaching success. Furthermore, mechanized instruction does not represent our ideas of good teaching. We say that the superior teacher is resourceful and constantly adapts her instruction to the needs of her pupils as they are revealed from day to day. A method that is best to-day may not be best next week. A method that is best for one class may not be best for another. These hypotheses, which are supported by considerable experimental evidence, are not compatible with a list of methods ranked in order of merit. In other words it appears doubtful if the relative merit of comparable methods of teaching is a stable thing and a determination may be applicable only to a particular teacher and a particular teaching situation.

This conclusion raises the question of the value of experimental studies of methods of teaching. If we cannot expect to determine the relative merits of methods, what is the value of such research? Experimental inquiry during recent years has added to our understanding of the teaching process. A number of experiments have con-

[45] W. S. Monroe, "Controlled Experimentation as a Means of Evaluating Methods of Teaching," *Review of Educational Research*, IV (February, 1934), 36-42.

tributed to our understanding of the learning process. Considerable progress has been made toward identifying the factors that affect learning. We have learned something of the conditions under which certain methods are effective. In general, it may be said that experimental studies have contributed to more precise and critical thinking about methods of teaching. Experimental inquiry is likely to be stimulating to the teachers participating in it and hence may be valuable as a supervisory procedure. Hence, a strong argument may be advanced in support of experimental studies of methods of teaching.

It may be observed, however, that since the crucial difficulties of experimental research have been revealed, an investigator should not expect to receive recognition for his work unless he employs the best techniques for dealing with these difficulties. The experimental factor should be defined and restricted so that the findings may be interpreted with precision. The nature and scope of the pupil achievement to be measured should be specified. Attention should be given to the control of non-experimental factors, especially those relating to the teacher. Measuring instruments adapted to the requirements of the problem should be selected or constructed. The experiment should be continued for a period of time sufficient to reveal the effect of an extended application of the method. Finally, the experimenter should consider the dependability of the obtained difference with reference to the control of non-experimental factors and the possible presence of systematic errors of validity.

Douglass, after pointing out that the controlled experiment has not fulfilled the expectations of its proponents of a decade ago, discusses difficulties to be met in this type of investigation:[46]

1. The equating of pupils in small experimental groups cannot be done with any certainty of accuracy; therefore, where possible, hundreds rather than dozens of pupils should be used.

2. The teacher or teachers employing two or more methods to be studied should be equally skilful in the use of each.

3. Measurement of growth during the experimental period has stressed written subject-matter tests of a highly factual and detailed nature to the virtual neglect of concepts, ideals, attitudes, tastes, and general powers or skills.

4. Whatever units of measurement are employed, whether reduced to standard scores or scaled units, represent an approximation which renders any further statistical treatment useful only for obtaining good

46 H. R. Douglass, "Scientific Investigation of Instructional Problems," *Journal of Educational Research*, XXIX (October, 1935), 130-8.

estimates better than non-technical methods but not mathematically accurate.

5. The statistical technique necessary is often more complicated than any person, except the best trained research workers, is able to employ.

6. Interpretation of coefficients of correlation, probable errors of estimate, and other measurements of the efficiency of prediction is more complicated than most research workers and many statisticians think.

7. One may not assume confidently that the method apparently more effective for one teacher or group of teachers will be more effective for all teachers, or even for the majority of teachers or the same teachers, under conditions different from the experimental situation.

Concluding statement. This chapter has defined the ideal conditions for use of the experimental method in terms of the law of the single variable, although recognizing that rarely in dealing with human beings can all factors be held constant except the experimental variable. The problems involved in classroom and group experimentation have been considered at some length, with a frank admission of the real difficulties present in such investigations. A rather detailed illustration of analytical laboratory studies has been presented, as promising a solution to educational problems not susceptible of ready attack by group-testing methods.

Though recognizing the justice of the foregoing criticisms of past experimentation in education and the difficulties involved in applying experimental and laboratory methods to any social science field, education and psychology included, the writers wish to close this chapter with a note of optimism by a more extended statement of the stimulating effect experimentation may have on the educational worker.[47] This point of view is presented with full recognition of the fact that in all probability few classroom teachers, supervisors, or administrators will conduct refined and crucial experiments which provide valid evaluations of educational procedure.

[47] B. R. Buckingham, "The Public-school Teacher as a Research Worker," *Journal of Educational Research*, XI (April, 1925), 235-43.

Finally, their [experiments'] reaction upon the teacher spiritually must not be left out of account. The fresh point of view which research always engenders should not be denied to the teacher. The spirit of inquiry, of open-minded alertness to the problems which arise in teaching, will make the teacher free. It will lead him to seek problems and do something, even though it may be but a little, in their solution. Moreover, it will make him expert as a teacher and will make his calling more attractive. Indeed, when looked at from this point of view the teacher's occupation becomes fascinating. He has children to study—not stones, bugs, fossils or old manuscripts, but the most interesting of all possible materials—namely, human beings. Moreover, he has at hand human beings at their most engaging period—childhood and youth. And his children never grow old. In constant procession they present to him, always at the level of childhood, their innumerable interesting aspects. Yet each is different from the other—different in strength, talent, and character; different in origin, growth, and need. If teaching these children is to include studying them, the job of teaching takes on new meaning. Its scope is broadened. Its meaning is enriched. No other calling may then be compared with it. It is the great adventure.

Problems and Exercises

1. Select a completed experimental study, and characterize and evaluate it in terms of the principles of research discussed in this chapter, for example:
   (*a*) Laboratory or group classroom experiment
   (*b*) Control of variable factors
   (*c*) Isolation of the experimental variable
   (*d*) Adequacy of measurement procedures
   (*e*) Interpretation and significance of results
2. Choose an experimental problem which might well be made, and outline a plan for its solution, applying so far as possible the principles of experimental research developed in this chapter.

Selected References †

* Abelson, H. H. *The Art of Educational Research,* Chapters VIII-XI. Yonkers-on-Hudson, N. Y.: World Book Co., 1933.

* Almack, J. C. *Research and Thesis Writing,* Chapter VI. Boston: Houghton Mifflin Co., 1930.

* Bills, A. G. *General Experimental Psychology.* New York: Longmans, Green and Co., 1934. Pp. xii + 620. The introduction includes a

† Also see the bibliography at the end of Chapter I.

discussion of the assumptions, methods, and field of experimental psychology.

* BORING, E. G. *History of Experimental Psychology*. New York: The Century Co., 1929. Pp. xvi + 700. Emphasizes European psychology and the work of individual psychologists; comprehensive, but not elaborate as to recent work.

BREARLEY, H. C. "Experimental Sociology in the United States," *Social Forces*, X (December, 1931), 196-9. Describes the available techniques of investigation.

* BROWNELL, W. A. "Some Neglected Safeguards in Control-group Experimentation," *Journal of Educational Research*, XXVII (October, 1933), 98-107.

BRUCE, W. F. "The Relation of Experimentalism to Democracy in Education," *Educational Administration and Supervision*, XVIII (April, 1932), 241-9.

* BUCKINGHAM, B. R. *Research for Teachers*. New York: Silver, Burdett and Co., 1926. Pp. vii + 386.

——— "The Great Experiment," *Journal of Educational Research*, XVI (December, 1927), 375-8.

——— "The Public School Teacher as a Research Worker," *Journal of Educational Research*, XI (April, 1925), 235-43.

* BUSWELL, G. T. "The Laboratory Method in Educational Psychology," *Elementary School Journal*, XXXII (May, 1932), 656-65.

CASON, Hulsey. "An Outline of Experimental Psychology," *Psychological Bulletin*, XXXII (December, 1935), 792-806.

CATTELL, J. M. "Some Psychological Experiments," *Science*, LXIII (January 1 and 8, 1926), 1-8, 29-35.

CHAPIN, F. S. "The Problem of Controls in Experimental Sociology," *Journal of Educational Sociology*, IV (May, 1931), 541-51.

CHARTERS, W. W. *Motion Pictures and Youth: A Summary*. New York: The Macmillan Co., 1934. Pp. vii + 66. Summarizes the Payne Fund studies in this field.

* CHILDS, J. L. *Education and the Philosophy of Experimentalism*. New York: The Century Co., 1931. Pp. xx + 264. Deals with the philosophical and educational ideas of Pierce, James, and Dewey.

CLARKE, E. L. *The Art of Straight Thinking*, Chapter VII. New York: D. Appleton and Co., 1929.

COHEN, M. R., and NAGEL, Ernest. *An Introduction to Logic and Scientific Method*, Chapter XIII. New York: Harcourt, Brace and Co., 1934.

COURTIS, S. A. "Criteria for Determining Equality of Groups," *School and Society*, XXV (June 25, 1932), 874-8.

——— "Education—A Pseudo-Science," *Journal of Educational Research*, XVII (February, 1928), 130-2.

CRAWFORD, C. C. *The Technique of Research in Education*, Chapter II. Los Angeles: University of Southern California, 1928.

DENNIS, L. M. "University Research in the Experimental Sciences," *Journal of Chemical Education*, VIII (July, 1931), 1341-4.

DOUGLASS, H. R. *Modern Methods in High School Teaching*. Boston: Houghton Mifflin Co., 1926. Chapter XVI deals with the technique of controlled classroom experimentation.

DUNLAP, Knight. "The Experimental Methods of Psychology," *Pedagogical Seminary and Journal of Genetic Psychology*, XXIII (1925), 502-22.

——— "The Outlook for Psychology," *Science*, LXIX (February 22, 1929), 201-7. Discusses the laboratory method and research in psychology.

ENGELHART, M. D. "Experimentation as a Technique of Research," *Phi Delta Kappan*, XIII (August, 1930), 58-61.

——— "Problems and Techniques of Educational Research." Unpublished Doctor's thesis, University of Illinois, 1932.

* ——— "Techniques Used in Securing Equivalent Groups," *Journal of Educational Research*, XXII (September, 1930), 103-9.

FINNER, P. F. *An Introduction to Experimental Psychology*. New York: Prentice-Hall, 1935. Pp. vii + 268. Includes a treatment of experimental study of the individual and the group.

* FLUGEL, J. C. *A Hundred Years of Psychology*, 1833-1933. New York: The Macmillan Co., 1934. Pp. 384.

FREEMAN, F. N. *Experimental Education*. Boston: Houghton Mifflin Co., 1916. Pp. x + 220.

* ——— "The Place of Laboratory Experiment in Educational Research," *Review of Educational Research*, IV (February, 1934), 97-107.

FREEMAN, G. L. *Introduction to Physiological Psychology*. New York: Ronald Press Co., 1934. Pp. xviii + 580.

* GARRETT, H. E. *Great Experiments in Psychology*. New York: The Century Co., 1930. Pp. xii + 338. Describes various experiments in psychology.

GESELL, Arnold. *Infancy and Human Growth*. New York: The Macmillan Co., 1928. Pp. 418.

GESELL, Arnold, and Others. *An Atlas of Infant Behavior*, Vols. I and II. New Haven, Conn.: Yale University Press, 1934. Pp. 922.

* GOODENOUGH, Florence L., and ANDERSON, J. E. *Experimental Child Study*. New York: The Century Co., 1931. Pp. 546.

GRAY, W. S. "Need of Coöperation between Laboratory and Classroom," *Journal of Educational Research*, XXIX (February, 1936), 484-5.

GRIFFITH, C. R. "A Laboratory for Research in Athletics," *Research Quarterly of the American Physical Education Association*, I (October, 1930), 34-40.

HART, F. W. "Roboting Research," *School and Society*, XXXII (July 5, 1930), 19-21. Emphasizes that the experimental approach is not the only available technique in the solution of educational problems.

HARTSHORNE, Hugh, and MAY, Mark A. *Studies in the Nature of Character*, Vols. I, II, and III. New York: The Macmillan Co., 1928-30. Pp. xxii + 414 + viii + 306, 560, 504.

* HENMON, V. A. C. "Measurement and Experimentation in Educational Methods," *Journal of Educational Research*, XVIII (October, 1928), 185-94. A critical discussion of the difficulties involved and problems

presented in an experimental attack on problems of method; suggests the creation of research institutes in each of the school subjects for the direction of experimentation and the dissemination of information.

HUDELSON, Earl. *Class Size at the College Level.* Minneapolis, Minn.: University of Minnesota Press, 1928. Pp. 300.

KELLEY, T. L. *Scientific Method.* New York: The Macmillan Co., 1932. Pp. x + 234.

KLINE, L. W., and KLINE, F. L. *Psychology by Experiment.* Boston: Ginn and Co., 1927. Pp. xii + 340.

LINDQUIST, E. F., and COOK, W. W. "Experimental Procedures in Test Evaluation," *Journal of Experimental Education,* I (March, 1933), 163-85.

*MCCALL, W. A. *How to Experiment in Education.* New York: The Macmillan Co., 1923. Pp. 282.

MCCONN, Max. "Measurement in Educational Experimentation with Special Reference to the Progressive Education Association Project," *School and Society,* XXXIX (January 13, 1934), 33-41.

——— "Measurement in Educational Experimentation," *Educational Record,* XV (January, 1934), 106-19.

MELBY, E. O., and LIEN, Agnes. "A Practicable Technique for Determining the Relative Effectiveness of Different Methods of Teaching," *Journal of Educational Research,* XIX (April, 1929), 255-64.

*MONROE, W. S. "Controlled Experimentation as a Means of Evaluating Methods of Teaching," *Review of Educational Research,* IV (February, 1934), 36-42.

*———, and ENGELHART, M. D. *Experimental Research in Education.* University of Illinois Bulletin, Vol. XXVII, No. 32. Bureau of Educational Research Bulletin, No. 48. Urbana, Illinois: University of Illinois, 1930. Pp. 106. Discusses the historical development of the experimental method, requirements for controlled group experimentation, interpretation of differences in gains, experimental studies relating to supervised study. and the experimental method as a procedure in educational research.

*MURCHISON, Carl, ed. *The Foundations of Experimental Psychology.* Worcester, Mass.: Clark University Press, 1929. Pp. x + 908. Authoritative summaries, by twenty-three contributors, with extensive bibliographies, of the experimental literature on most topics in general psychology. Choice of rubrics and of contributors suggests an emphasis upon psychology as a branch of biological science.

*———, ed. *A Handbook of Child Psychology.* Worcester, Mass.: Clark University Press, 1931. Pp. 712. Second Edition, Revised, 1933. Pp. xii + 956. Both volumes contain authoritative summaries, with extensive bibliographies, of the scientific literature on major topics in child psychology. Chapter I deals with the methods of investigation in child psychology.

*———, ed. *A Handbook of General Experimental Psychology.* Worcester, Mass.: Clark University Press, 1934. Pp. xii + 1126. Authoritative summaries, by twenty contributors, with extensive bibliographies, of the experimental literature on adjustive processes and receptive (sen-

sory) processes. An amplification and revision of a large portion of the *Foundations of Experimental Psychology*.

*———, ed. *A Handbook of Social Psychology*. Worcester, Mass.: Clark University Press, 1935. Pp. xii + 1190.

MURPHY, Gardner. *An Historical Introduction to Modern Psychology*. New York: Harcourt, Brace and Co., 1929. Pp. xviii + 470. Deals chiefly with recent work and is organized largely by topics rather than chronologically.

*———, and MURPHY, L. B. *Experimental Social Psychology*. New York: Harper and Bros., 1931. Pp. xiv + 710. A systematic summary of the experimental literature of social psychology.

ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research*, Chapter XVII. New York: Henry Holt and Co., 1929.

RAGSDALE, C. E. *Modern Psychologies and Education*, Chapter XVII. New York: The Macmillan Co., 1932.

RANKIN, P. T. "The Technique of the Large Scale Experiment," *Journal of Educational Method*, VIII (June, 1929), 499-504.

ROBINSON, D. S. *Illustrations of the Methods of Reasoning*. New York: D. Appleton and Co., 1927. Pp. xiii + 346.

SCHWESINGER, G. C. *Heredity and Environment*. New York: The Macmillan Co., 1933. Pp. xii + 484. A systematic summary of the experimental evidence on the heredity-environment problem.

SKINNER, C. E., GAST, I. M., and SKINNER, H. C. *Readings in Educational Psychology*. New York: D. Appleton and Co., 1926. Pp. 834. A sampling of more than 600 selections from both the theoretical and the experimental literature, with emphasis upon the former.

SMOKE, K. L. "The Experimental Approach to Concept Learning," *Psychological Review*, XLII (May, 1935), 274-9.

*STARCH, Daniel. *Educational Psychology*, Chapters XIV, XV. New York: The Macmillan Co., 1927. These two chapters review and criticize numerous experiments on transference of training.

*STODDARD, G. D., and WELLMAN, Beth L. *Child Psychology*, Chapter II. New York: The Macmillan Co., 1934.

TAIT, W. D. "Science and Education," *Scientific Monthly*, XXIX (August, 1929), 132-6. Emphasizes the experimental method in determining principles of educational method.

*THOMAS, Dorothy S., and Associates. *Some New Techniques for Studying Social Behavior*. Child Development Monographs, No. 1. New York: Teachers College, Columbia University, 1929. Pp. x + 204. A treatment of the laboratory method as utilized in the nursery school for the study of the social activity of children.

THORNDIKE, E. L., and Others. *Adult Learning*. New York: The Macmillan Co., 1928. Pp. 336.

TROW, W. C. *Scientific Method in Education*. Boston: Houghton Mifflin Co., 1925. Pp. xii + 160.

*VALENTINE, W. L. *Readings in Experimental Psychology*. New York: Harper and Bros., 1931. Pp. 606. Forty-seven relatively long readings selected from recent contributions to technical periodicals.

WENGER, M. A., and WILLIAMS, H. M. "Experimental Studies of Learn-

ing in Infants and Preschool Children," *Psychological Bulletin,* XXXII (April, 1935), 276-305. Includes ninety-nine references.

WESTAWAY, F. W. *Scientific Method,* Chapter XVII. London: Blackie and Son, Ltd., 1924.

* WHITNEY, F. L. *Methods in Educational Research,* pp. 76-90. New York: D. Appleton and Co., 1931.

WILBUR, R. L. "The Anticipation of Future Needs," *Educational Record,* XI (April, 1930), 45-54. Emphasizes that the problems of democracy and education are to be solved by science and the experimental method rather than by votes and legislation.

WOOD, B. D., and FREEMAN, F. N. *Motion Pictures in the Classroom.* Boston: Houghton Mifflin Co., 1929. Pp. 392.

WRIGHTSTONE, J. W. "Constructing an Observational Technique," *Teachers College Record,* XXXVII (October, 1935), 1-9. Describes controlled-observation techniques for obtaining measures of certain social performance factors or ways of behaving.

* Columbia Associates in Philosophy, *Introduction to Reflective Thinking,* Chapter IV. Boston: Houghton Mifflin Co., 1923.

"Difficulties Encountered in Conducting School Experiments," *School Review,* XXXVII (February, 1929), 93-4. Mentions inability to foresee the situation, difficulty with reference books, and parents' inability to control children.

Nature and Nurture: Their Influence upon Intelligence and Their Influence upon Achievement. Twenty-seventh Yearbook of the National Society for the Study of Education, Parts I and II. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. x + 466, xiv + 398.

Supplementary Educational Monographs. Chicago: Department of Education, University of Chicago. This series includes a number of analytical laboratory studies, emphasizing especially the eye-movement technique.

CHAPTER X

OTHER METHODS OF RESEARCH—ESPECIALLY ADAPTED TO THE ANALYSIS OF COMPLEX CAUSAL RELATIONSHIPS

Introduction. In the immediately preceding chapters, three methods of educational research have been discussed, namely, the historical, the normative-survey, and the experimental methods. In addition to these three well-known types, there are a number of other research procedures which have been developed: (1) the causal-comparative method, (2) the correlation method, (3) the case-study method, and (4) the genetic method.

These methods of investigation have developed in response to the need for means of research suited to the study of the complex phenomena of biology, economics, sociology, psychology, and education. They represent in each instance an important attempt to supplement the older and more widely known types of research by offering new modes of procedure, or new combinations of old procedures, adapted to the study of the many new kinds of problems which these relatively modern sciences have introduced. These newer methods of research represent important developments in the study of complex problems of education. In fact, they may offer more promise for penetrating research than some of the older methods.

Although the four procedures discussed in this chapter do not introduce any new means of gathering data, they do involve new purposes in the collection of data, with new patterns of treatment. While each method shares certain of its procedures with other methods of research, each contributes a distinctive approach to the study of the problems of education. The causal-comparative method, which should be more widely known, will be discussed first.

THE CAUSAL-COMPARATIVE METHOD

Definition of the causal-comparative method. The causal-comparative method of research seeks to establish causal relationships by comparing the circumstances associated with observed effects and by noting the factors present in those instances in which a given effect occurs or does not occur. The method may stop with a study of the likenesses and differences in the conditions attending either the occurrence or non-occurrence of some phenomenon or may be extended to a comparison of the circumstances surrounding both the instances in which the phenomenon does and does not occur. Typically it does not go as far as the correlation method which associates a given amount of change in the contributing factors with a given amount of change in the consequences, however large or small the effect. The method always starts with observed effects and seeks to discover the antecedents of these effects.

The causal-comparative method differs from historical research (which may also be directed towards the establishing of causal relationships), in that it deals with current situations. It differs from normative-survey research in that the latter is concerned chiefly with status, rather than with the antecedents of educational effects. It differs from experimental procedure in that the latter carefully controls its variable factors, whereas the causal-comparative method makes observations under normal or field conditions. One might, in fact, be justified in calling the present procedure the "uncontrolled experimental" method, except that, according to customary usage, the term *experimental* implies controlled rather than uncontrolled conditions.

The causal-comparative method is admirably adapted to many types of field studies seeking to establish causal connections where, for some reason or other, experimentation in the conventional sense is not feasible. This may be the case because of the impracticability of performing extensive social experiments or of holding all of the important factors constant. For example, problems of school support, character development,

the effectiveness of health education, and the like do not lend themselves to rigorous experimentation. A second type of situation, to which experimental procedures are not readily applicable, is the study of the interrelationships of factors as they exist under natural conditions, in contrast to the artificially controlled conditions entailed by experimentation. As previously emphasized, any distortion of natural conditions may introduce, or eradicate, factors and relationships which significantly alter one's findings. A third situation for which experimentation is not adapted arises when one is more interested in discovering the antecedents of a particular case than in discovering or verifying a large generalization concerning such antecedents. This may be the situation, for example, in studying the factors contributing to a high cost of education in some locality, or in ascertaining why unit costs of two school systems differ.

Illustrations of causal-comparative research. Many applications of this method are recorded in educational literature. For example, Barr [1] used this procedure in studying characteristic differences in the teaching of effective and ineffective social-studies teachers. One purpose of the investigation was to discover why some teachers succeed and others fail. The investigator began the study by selecting, on the basis of carefully chosen criteria, superior and inferior teachers. He then observed carefully and systematically a large number of characteristics of these different teachers, to determine what elements entered into and rendered the teaching good or poor. Finally, the investigator compared the data that he had collected relative to each teacher to discover elements common to effective and ineffective instruction. From such a comparison it was possible to list characteristic differences between the teaching performance of good and poor teachers, at least in the specific field of instruction under investigation.

1 A. S. Barr, *Characteristic Differences in the Teaching Performance of Good and Poor Teachers of the Social Studies*. Bloomington, Ill.: Public School Publishing Co., 1929. Pp. viii + 127.

In an earlier application of this research method, Freeman [2] studied the motor factors which contributed to excellence in penmanship. Using motion-picture equipment, he photographed the arm and finger movements of various persons, representing a writing expert, a good adult writer, two poor adult writers, and children. From an examination of these pictures, Freeman was able to identify movements made by good and poor writers, and thus to describe the movements that tended to cause one to become a good or a poor writer.

Freeman supplemented this research by subjecting his findings to an experimental test in terms of their effectiveness as teaching aids. As suggested by the preceding study, the recommendations were further tested with groups of children who made marked gains in speed and form as compared with groups taught hand-writing in the usual fashion. The insights gained from the causal-comparative study, therefore, proved effective in contributing to better teaching. This two-type study affords an interesting illustration of the use of one method to check upon the practical utility, and perhaps the validity, of the findings of another method.

Baker [3] employed the causal-comparative method to study typical differences between bright and dull pupils. In the preface to his report, he purposed "to go behind the scenes of testing and interpret, if possible, the differences in general intelligence in terms of the psychology of learning." He analyzed the mental and physical activities of the pupils, comparing the elements common to the group of bright pupils and those common to the group of dull pupils but absent from the activities of the bright pupils. This process enabled him to draw distinctions between the characteristic behavior of the two groups. He was particularly interested in the way children learned school subjects.

[2] Frank N. Freeman, *The Handwriting Movement:* A Study of the Motor Factors of Excellence in Penmanship. Chicago: University of Chicago Press, 1918. Pp. xvi + 169.

[3] H. J. Baker, *Characteristic Differences in Bright and Dull Pupils:* An Interpretation of Mental Differences, with Special Reference to Teaching Procedures. Bloomington, Ill.: Public School Publishing Co., 1927. Pp. viii + 118.

Numerous other studies employing the causal-comparative method have been made. The reader may be interested in the following as further illustrations: Brown [4] investigated the unevenness of abilities in dull and bright children; Wilson [5] studied differences in their learning; Carroll [6] analyzed their generalizations. The social rating of the best and poorest high-school pupils was investigated by Sangren,[7] while Upshall [8] and Pressey [9] ascertained differences between good and poor students at the college level. Scates [10] examined the records of college students who had been dismissed for poor work and were subsequently readmitted, in an effort to identify elements characteristic of those who were finally successful and of those who were unsuccessful after their return. Watson [11] studied the possible areas of difference between students for whom predictions of outstanding success or failure were made. Mead [12] made an investigation of the qualities of merit possessed by superior and inferior teachers.

Other studies have been directed to the analysis of the characteristics of a single group only, such as a high group or a low group. For example, Flemming [13] investigated the signifi-

4 A. W. Brown, *The Unevenness of Abilities in Dull and Bright Children.* Teachers College Contributions to Education, No. 220. New York: Teachers College, Columbia University, 1926. Pp. vii + 112.

5 F. T. Wilson, *Learning of Bright and Dull Children.* Teachers College Contributions to Education, No. 292. New York: Teachers College, Columbia University, 1928. Pp. 56.

6 Herbert A. Carroll, "Generalization of Bright and Dull Children: A Comparative Study with Special Reference to Spelling," *Journal of Educational Psychology,* XXI (October, 1930), 489-99.

7 P. V. Sangren, "Social Rating of Best and Poorest High School Students," *Journal of Educational Psychology,* XIV (April, 1923), 209-14.

8 C. C. Upshall and Harry V. Masters, "Differences Between Good and Poor Students Chosen on the Basis of College Entrance Test Scores," *Educational Administration and Supervision,* XIX (October, 1933), 507-10.

9 L. C. Pressey, "What Are the Crucial Differences Between Good and Poor Students?" *Research Adventures in University Teaching,* pp. 4-10. Bloomington, Ill.: Public School Publishing Co., 1927.

10 Douglas E. Scates, "Selective Admission and Selective Retention of College Students at the University of Chicago," Chapter V, "A Study of Dismissed and Readmitted Students," pp. 251-352. Doctor's thesis. Chicago: University of Chicago, 1926. Pp. 383.

11 Gladys H. Watson, *An Exploration of Some Possible Areas of Difference Between Students for Whom Predictions for Outstanding Success or Failure Are Made.* New York: Teachers College, Columbia University, 1931. Pp. 99.

12 A. R. Mead, "Qualities of Merit in Good and Poor Teachers," *Journal of Educational Research,* XX (November, 1929), 239-59.

13 E. G. Flemming, *Predictive Value of Certain Tests of Emotional Stability as Applied to College Freshmen.* Archives of Psychology, No. 96. New York: Columbia University, 1928. Pp. 61.

cance of certain mental, physical, and character traits for success in high school, by noting those traits that were exhibited by the successful high-school pupils. In similar fashion O'Brien [14] examined the records of failing high-school pupils to find common characteristics; Reavis [15] observed the factors contributing to poor attendance in rural schools. Van Denburg [16] studied the causes of elimination of pupils from the public schools in New York City, and Turney [17] analyzed factors other than intelligence which affect success in high school.

While such studies as these may be regarded as falling under the causal-comparative method, they do not, however, follow the method through to a complete and rigorous application. That is, instead of examining the characteristics of the contrasting groups to make certain that factors which the observer considers distinctive really do not occur in equal degree in the opposite group, these studies depend upon a comparison with what the observer regards as normal. The degree to which the conclusions are valid, therefore, depends upon the success with which the observer can judge what is normal and what is peculiar to a special group, after he has observed many characteristics. Studies of this type should be regarded as exploratory and suggestive rather than as final.

Comparative education. It is interesting to note that the field of comparative education may be approached from the point of view of causal-comparative analysis. That is, instead of merely studying the ways in which the school systems of various nations differ, one may go further and set these

14 Francis P. O'Brien, *The High School Failures:* A Study of the School Records of Pupils Failing in Academic or Commercial High School Subjects. Teachers College Contributions to Education, No. 102. New York: Teachers College, Columbia University, 1919. Pp. vii + 97.

15 George H. Reavis, *Factors Controlling Attendance in Rural Schools.* Teachers College Contributions to Education, No. 108. New York: Teachers College, Columbia University, 1920. Pp. 69.

16 Joseph K. Van Denburg, *Causes of the Elimination of Students in Public Secondary Schools of New York City.* Teachers College Contributions to Education, No. 47. New York: Teachers College, Columbia University, 1911. Pp. iv + 206.

17 A. H. Turney, *Factors Other Than Intelligence Which Affect Success in High School.* Minneapolis: University of Minnesota Press, 1920. Pp. 135.

differences in relation to their antecedents which lie in the social and political philosophy of the people. Sandiford [18] notes typical differences in the school systems of England and Germany and relates them to basic attitudes of the people. Thus German education is described as highly systematized and organized on the basis of a national administration, while the English system is relatively individualistic, local, and unorganized, with much overlapping. The thinking of the two nations recognizes different criteria and accepts different goals. Kandel [19] further traces variations in educational organization and practice to the political, social, and cultural forces which also shape other aspects of national life. In approaching the study of comparative education in this way, one is making a study of current conditions by drawing upon contemporary and past factors that have contributed to these conditions. The causal-comparative method is thus closely related to the historical-comparative method; it is appropriate for the same type of analysis, but is concerned with the explanation of conditions observable at the present time rather than with conditions in the past.

Mill's canons of agreement and double agreement. The logic underlying the causal-comparative method was set forth in the nineteenth century by John Stuart Mill, in his first and third canons of logic. Mill called these canons the principle of agreement and the principle of double agreement. The first one may be stated as follows: "If two or more instances of the phenomenon under investigation have only one circumstance in common, that circumstance may be regarded as the probable cause (or effect) of the phenomenon." [20] There are three aspects of this statement which are of considerable interest. First, it admits the complexity of causal relationships by indicating that one cannot determine simply from observing the

18 Peter Sandiford and Others, *Comparative Education:* Studies of the Educational Systems of Six Modern Nations. London: J. M. Dent and Sons, Ltd., 1918. Pp. x + 500.

19 I. L. Kandel, *Comparative Education.* Boston: Houghton Mifflin Co., 1933. Pp. xxvi + 922.

20 F. W. Westaway, *Scientific Method:* Its Philosophical Basis and Its Modes of Application, pp. 203-5. (Third edition.) London: Blackie and Son, Ltd., 1924.

associated occurrence of various conditions (any one or a group of which may be regarded as "the phenomenon under investigation"), which factors are causing others, and which conditions are resulting from others. The *direction* of causation must be inferred from observation and analysis of other elements of relationship than simply occurrence together.

The second aspect of the statement to be commented upon is that it is put in idealized form. That is, it calls for "*only one* circumstance in common." As pointed out in the preceding chapter in connection with experimentation, it is impossible in practical situations to have only one variable factor; there are countless factors contributing to every situation. All that can be expected is to control the most important factors. Similarly in the application of Mill's canon of agreement, we cannot hope ever to find a single element (in addition to the "phenomenon under investigation") which is constant from one situation to another. Such general factors as time, space, mass, reaction, energy, and many others pervade all situations, either in effective or potential form, and it is highly idealistic to speak of "only one" circumstance in common. What we do therefore, as in experimentation, is to give attention to those circumstances which appear most likely to be significant for our purposes, and to note their occurrence or absence.

A third important aspect of the statement is that it is not made in absolute form; it says merely that the circumstance identified as present in various situations "may be regarded as the *probable* cause." As a matter of fact, when used alone, this canon is not to be regarded as rigorous logic. It must be supplemented by the third canon, that of double agreement. For example, if one notes only those factors which are universally present (within the range or scope of his observation), he may find that many are not true causes at all, but are immaterial in differentiating between one phenomenon (result) and another. For example, if one is studying good teaching, he may find that all of the teachers he observes are women, that they teach during daylight hours, that they teach in a particular

state, etc. One can guard against unwarranted conclusions to a certain extent by extending his observations to situations that vary in as many ways as possible, but use must be made of the principle of double agreement in order to be more certain.

Mill's third canon extends and completes the logic of his first canon, so far as strict logic goes. This third canon points out that, in order to isolate factors which are more probably causes, one must find those which are *absent* when the phenomenon (result) does not occur. That is, referring to the illustration in the preceding paragraph, one may discover that such factors as sex, time and place of teaching, etc., occur in instances of poor teaching in the same manner as in instances of good teaching. Therefore, they are not significant causes of good teaching, because they are not absent in all cases where good teaching does not occur.

Mill's canon of double agreement is stated as follows: [21]

> If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances (in the same department of investigation), in which it does not occur, have nothing in common save the absence of that circumstance, the circumstance in which alone the two sets of instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.

As observed in connection with his first canon, the direction of causation cannot be determined simply from association, and again the statement is made in highly abstract, idealized terms, for circumstances do not exist singly. This element of idealization is also introduced in the present canon in a negative form, for it assumes situations in which the phenomenon (result) does not occur that "have *nothing* in common" with the situations where the phenomenon does occur, except "the absence" of some factor. For any practical purpose such abstractions must be modified to recognize the presence of many common elements in all situations, and the statement must be

21 *Ibid.*, pp. 207-8.

interpreted as applying to factors which are of most significance.

Applications to causal-comparative research. For the purpose of guiding practical research of the causal-comparative type, Mill's canons may be summarized as stating that causes, or indispensable elements of causes, of a given observed result may be ascertained by noting elements which are invariably present when the result is present, and which are invariably absent when the result is absent. One may make the application of this principle concrete in his thinking by regarding good teaching as a "result," or "phenomenon," and poor teaching as the absence of the result or phenomenon (i.e., as the absence of good teaching). A high quality of legibility in specimens of handwriting may be regarded as the *presence* of a result or phenomenon (probably caused by the common circumstance of a certain combination of arm, wrist, and finger movement), while illegible instances of handwriting may be considered as the *absence* of the phenomenon (legibility) and correspondingly the absence of the causal factor (the given combination of arm, wrist, and finger movement). The various studies mentioned earlier in this chapter afford practical illustrations of the application of this logic.

In carrying out this type of research in full, there are three important steps in the logic to be met. First, one will gather data on factors (circumstances) present in cases where the given result occurs, discarding those elements which are not universally present. Second, one will do the same thing for cases where the given result does not occur. Third, one will compare his two sets of data and, in effect, subtract the second set from the first set. Or, if one is interested in causes of the result *not* occurring, he will eliminate from both of his lists those elements common to the two. If his observations have extended over a sufficiently wide range of circumstances, he may conclude that the factors remaining in his two lists are respectively causes of the result's occurrence and of its non-occurrence.

In addition to these steps of logic, many others must be included in the administration of actual research. For example, if one is studying teaching, he must have some means of identifying good or poor teaching. The establishing of criteria for such identification is a step that often causes considerable difficulty.

Limitations of Mill's canons and of causal-comparative research. The first limitation of this research method is that it is essentially dichotomous. Both results and causes are thought of as either occurring or not occurring, whereas in reality they both may occur in a great many degrees. That is, we do not have merely good teaching and poor teaching, but we have in the main average teaching (the average is usually the most prevalent condition), with the quality of teaching shading upward and downward from this average by very fine degrees. The causal-comparative method does not recognize these various degrees in the presence or absence of phenomena, but considers only those instances that are recognized as good or bad, poor or excellent, etc. All other degrees of excellence or performance are disregarded. Thus a dichotomy in the phenomenon (the result) is assumed by this method.

Likewise a dichotomy is assumed for each of the factors or circumstances noted. The element is either present or absent. In actuality, factors are always present in some degree, and this degree may usually vary from zero to a very strong significance by fine degrees. The full recognition of *degrees* of existence in both results and contributing factors is achieved by the correlation method, which of course has its own characteristic limitations, as analyzed later in this chapter. There is one way in which causal-comparative research may approximate degrees in the conditioning factors, and that is to note the number of instances in which they occur. That is, instead of assuming that a factor is either present in full force or else absent entirely, one assumes that the importance of a factor may be indicated roughly by the proportion of instances in which it is present. This type of reasoning does not require

that a factor be present in *all* cases where the result occurs, nor absent in *all* cases where the result does not occur, but rather recognizes that a factor may be a cause to a certain degree if it is present *in more cases* where the result occurs than where the result does not occur. This type of reasoning was not contemplated by Mill's canons, but constitutes a useful present-day extension of his conception of this method of research and is supported by modern statistical methods.

A second limitation grows immediately out of the first one. It is that the method, particularly when applied strictly, will not reveal all of the causes. If one notes only causes which are invariably present when the result occurs and invariably absent when the result does not occur, he is overlooking all of the causes which contribute in a moderate degree to the occurrence of the result. This may be serious if one expects to make practical applications of his conclusions. When the element of frequency of occurrence and the concept of partial or contributing causes are introduced, the method becomes more sensitive and will reveal many more of the factors which enter in as causes. It does not, however, give any evidence of the interrelation and interdependence of these causal factors. That is, to what extent is a given factor contributing in its own right to a result, and to what extent does this factor contribute simply because some other factor is acting upon it and making it behave in a certain way? The analysis of interdependence and uniqueness in the contribution of factors must be left to partial correlation methods (to be discussed shortly), in combination with a logical analysis of structural relationships.

A third limitation of the causal-comparative method arises from the fact that it necessitates observation of many cases arising from a large variety of circumstances. If the variety is not sufficiently great, one may draw erroneous conclusions. This requirement of variety means that the method is not well adapted to the study of an individual case, such as discovering the reasons why a pupil cannot read well. For such purposes the diagnostic case-study procedure is appropriate; but diag-

nosis will depend upon insights and generalizations growing out of experimental, causal-comparative, normative-survey, and other types of investigation. Each research method is valuable for certain purposes and relatively worthless for others; an important part of understanding the value of any method lies in knowing its limitations so that it will not be used where ineffective or misleading.

Good ideas and careful observation required. The causal-comparative method of research in its early stages is essentially one of analysis. Out of the totality of elements which are present in any situation, one has to select certain ones for observation. To think of all of them is next to an impossibility, for they are countless. Many elements are at present too subtle to be sensed directly and too fleeting to be identified; some of them may be significant, and others may be immaterial. In selecting factors (elements) to observe, one must use his best judgment. Factors which he excludes intentionally or unintentionally cannot enter into his conclusions, except in so far as they may be reflected in other factors that are partially influenced by them. The importance of an analytical comprehension of the field to be studied should be apparent. The construction of one's list of factors is closely related to the preparation of observational and other schedules, and the making of appropriate categories, discussed in Chapters VII and VIII. It is a problem that requires insight, thought, and careful work. Upon this step depends much of the ultimate quality of the research.

Having decided upon a list of factors to study (which, in practice, will only be completed after preliminary testing), attention shifts to the care with which these factors are to be observed. We mean to include here all forms of observation, in the scientific sense, embracing measurements of all kinds and mechanical or indirect observation as well as direct. One will use whatever technique is appropriate to the gathering of each kind of data which he desires to secure.

Accurate and meticulous observation is particularly important in research which is seeking causes, since factors present

in small amounts may be of large significance. The most striking illustrations can be drawn from the field of physiology. For example, vitamins are present in foods in such minute amounts that up until recent times they were not known to exist. Hormones are secreted into the blood stream by the endocrine glands in such minute quantities that they were overlooked until recently. Yet vitamins and hormones are so important in the everyday well-being of the individual that they may be ranked among the essential elements controlling physiological metabolism. The human body will react to some of these substances in a dilution of one part in one million. At present it is not known whether there are factors of such minute proportions in one's environment which affect him psychologically to the same extent that vitamins and hormones do physiologically; the answer to such a question must await future developments. Similar refinements in other fields do, however, serve to keep one alert to the possibility of discovering significant influences emanating from factors which are observable only in very small quantities. To detect the presence of minute elements which may be important, one must use measuring instruments that are correspondingly refined, and he must employ a penetrating analysis that is equal to the problem to be solved.

Care in interpretation of findings. The causal-comparative method is directed toward the discovery of antecedents or factors contributing to observed effects. It should be made emphatic that the inferring of causes is an extremely difficult and precarious matter, especially in social fields where relationships are so complex that it is nearly impossible to determine definite causes. Most persons will need to revise greatly their notion of causes, for they must not think of absolute causes but of factors which enter into a complex pattern of interrelationships so as to contribute their influence (much or little) toward or against the eventuation of a certain condition. Any result is the resolution, for that particular time, of the interplay of many diverse forces. Just as there are negative

forces, from the standpoint of a particular accomplishment, so factors which enter in to keep a result from being "more so" must be regarded as causes, just as well as factors which act, for that particular occasion, in a positive way to keep the result from being "less than" it is.

Factors present in all or most of the cases observed, regardless of the occurrence of the given phenomenon (result), cannot necessarily be regarded as negative factors. They may be simply essential factors, for any degree of the result. Mathematicians have long distinguished between necessary conditions and sufficient conditions. Many conditions are necessary for conventional teaching of any kind, to refer again to the illustration that has been used, but these conditions which are common to all forms of conventional teaching are not sufficient to cause superior teaching. They may, nevertheless, be regarded as causes, being essential for teaching of the usual type. On the other hand, some of them may actually be retarding influences, or negative causes, so far as good teaching is concerned. This will depend on one's philosophy of instruction; there are a number of educators who feel that there are many elements in conventional teaching which tend to prevent the best teaching. The universality of elements or factors cannot therefore be taken as an indication that they are or are not negative, or that they are or are not necessary conditions. Other types of investigation, including careful analysis, and experimentation, are important aids in furthering insight into causal relationships.

Perhaps one further distinction in causal relationships should be mentioned. There are factors which are generally conducive to a certain result but which do not *necessarily* contribute to this result. For example, the amount of money expended per pupil by a school system does not necessarily affect the quality of instruction, but indirectly does so. That is, the system which spends more can probably have better buildings, better equipment, more adequate instructional supplies, and better trained teachers. Again, the amount of training

which teachers have is itself not necessarily related to the quality of instruction, but may be so related. Such factors are to be regarded as *conducive* causes, rather than *direct* causes. They increase (or decrease) the probability of a certain result, without contributing directly (perhaps we might say, organically) to the production of this result. They are, however, to be regarded as falling within the category of causes. Many factors belong to this type and add to the difficulty of identifying causes, as well as increasing the general confusion concerning the nature of causes.

One will recall from his high-school or college chemistry the phenomenon of catalysis. There are certain chemical reactions that take place only, or more readily, in the presence of a catalytic agent. This agent may not enter into the reaction directly, in a chemical way, and so far as is known it is not necessarily changed by the chemical reaction which takes place; yet it is an important and sometimes an essential factor in bringing about a certain result. The classification of such causes is problematical; in some instances they may be regarded as simply conducive causes; in other instances as necessary causes, in which case they should probably be regarded as direct causes; and yet their structural or functional relationship to the action which takes place is varied and uncertain.

Finally, it should be noticed that any given result may usually be produced by a number of different combinations of causes. For example, good teaching may consist of any number of patterns of contributing factors. A teacher may be somewhat weak in certain respects but strong in others, while the next teacher may have other patterns of strengths and weaknesses, and they may, on the whole, be equally good. Or, various teachers may give their pupils essentially the same type of experiences through the use of different means. Turning to a physiological example, we may point out that different persons may eat very different foods and yet be equally well nourished. One must ordinarily be careful to avoid the inter-

pretation that his discovery of certain causes precludes the possibility that other sets of causes might be found which would be just as efficient, or more so, in producing the result observed. In these comments, there is no intention of denying the possibility of discovering fundamental causes, which are unique and indispensable; for example, diet must contain certain basic elements in order to be nourishing; but causes, in the form of factors that are usually identified in studies, are not the fundamental ones which are unique and indispensable, but are rather intermediate forms that occur in great variety and contain in different combinations the fundamental elements. Thus, many different forms of good teaching (as recognized by a single educational philosophy) may differ widely and yet may be good because they contain, in various and somewhat hidden forms, the elements (whatever they may eventually be found to be) fundamental to effective and wholesome learning on the part of pupils.

THE CORRELATION METHOD

Description of the correlation method. The correlation method is of modern origin,[22] but is already ranked high among the important research methods in education. It enables one to approach the problems of causal relationships in terms of degrees of both the contributing and the dependent factors, rather than in terms of the dichotomies upon which one must rely in the use of the causal-comparative method. It enables one to attack problems for which only experimental procedures have heretofore been available, and to deal with these problems in terms of many variables at once rather than in terms of a single variable at a time. The advantages of this attack are many and important; its significance is still being explored. The correlation method means in general that with certain types of problems it is not necessary to depend upon strict

22 Helen M. Walker, *Studies in the History of Statistical Method*, Chapter V, "Correlation," pp. 92-141. Baltimore: Williams and Wilkins Co., 1929. Pp. 229.

experiments, with their attendant difficulties in control of factors, for an analysis of causal relationships; furthermore, it offers certain theoretical advantages over the experimental technique in addition to the practical advantages, in that it reflects the simultaneous variation of many factors rather than studying the variation of a single factor when all the others are held constant (inoperative). This means that reality can be more directly approximated in one's data. There is considerable ground for saying that the correlation method means to social science what the laboratory method does to physical science.

Perhaps it should be stated here that by "correlation method" we do not mean simply the calculating of coefficients of correlation between data which may be in hand; this is simply a mathematical problem, which will be discussed more fully in the next chapter. We refer rather to an approach to a research problem which gathers data on many variables (factors) and analyzes their relationships to some result, and to each other, in terms of the tendency of these relationships to become a single-valued function. The full concept of correlation can be grasped only after a statistical study of its nature, secured from courses in statistics, or educational measurement, or from reading appropriate texts.[28] There will be no attempt to explain the statistical nature of correlation here, other than to say that all degrees of relationship may be represented, from perfect functionality (predictability), down to no observable tendency for two factors to vary together. The correlation method of research utilizes the correlation technique of analysis, but it also embraces the larger elements of a fundamental methodological approach to the solution of a research problem.

[28] Charles W. Odell, *Statistical Method in Education*, Chapter VIII, "An Introduction to Correlation," pp. 143-50, and Chapter IX, "The Computation of the Coefficient of Correlation," pp. 151-87. New York: D. Appleton-Century Co., 1935.

Karl J. Holzinger, *Statistical Methods for Students in Education*, Chapter IX, "Linear Correlation with Quantitative Series," pp. 141-76. Boston: Ginn and Co., 1928. Pp. 372.

Mordecai Ezekiel, *Methods of Correlation Analysis*, Chapters III-V. New York: John Wiley and Sons, Inc., 1930. Pp. 427.

Measuring the strength of association. Correlation is directed primarily toward measuring the degree to which variation in one factor, or set of factors, is associated with variation (in the same or in the opposite direction) in another factor. If this correspondence in the variation of two factors is perfect (in certain mathematical respects), then we have perfect correlation, indicating complete functionality, and the set of data representing variations in one factor can be expressed as a mathematical function of the data representing variations in the other factor. If, at the other extreme, there is no tendency toward systematic correspondence in the variations of the two factors, as measured, then there is zero degree of correlation, and one cannot tell anything more about one factor from a knowledge of the other factor than if he knew nothing about the latter factor. There are of course all degrees of relationship ranging between these extremes. Perhaps it should be stated that negative correlation may represent a high degree of functionality, but indicates that corresponding movements of the two factors tend to be in opposite directions instead of in the same direction.

Many important investigations of association are made by means of simple correlation. An interesting example is to be found in Maller's study [24] of the relationship between progress through elementary school in New York City, and various social and economic factors in the neighborhood from which the children came. He discovered that in some schools less than 5 per cent of the pupils were retarded, whereas in other schools the per cent was over 50. Maller correlated this rate of progress for a school with various other measures of the neighborhood. He found, for example, that the average intelligence of the pupils had a relationship of .70 with progress. (The correlation coefficient ranges from zero to 1.00 or — 1.00 as perfect positive or negative correlation; it is customarily written to two decimal places, but it *must not* be read as per

[24] J. B. Maller, "Economic and Social Correlatives of School Progress in New York City," *Teachers College Record*, XXXIV (May, 1933), 655-70.

cent.) The economic status of each school neighborhood was secured from certain census data; this had a correlation of .53 with school progress. Economic dependence of families, as indicated by records from social agencies, bore a relationship of —.50 with school progress. The rate of juvenile delinquency, obtained from court records, gave a correlation of — .43. Birth rates also showed a negative relationship, — .30 Death rates correlated —.34. Infant mortality varied enormously from neighborhood to neighborhood; it yielded a correlation of —.46. The correlation of these six economic and social factors, together (by the technique known as multiple correlation) with school progress, was .81, which is high.

It is interesting to note that a composite of these six factors representing the pupils' environment is more closely related to their progress through school than is their intelligence (which yielded a correlation of .70). Some of the practical conclusions which may be drawn from such a study are of tremendous significance for educational administration and instruction. A few of Maller's statements (footnote 24) will be quoted:

> The marked correlations between school accomplishment and factors of the environment indicate that the wide variability among the schools of the city is due chiefly if not entirely to differences in the nature of the pupils enrolled in the various schools rather than to differences in the quality of instruction in those schools. . . . A school located in a "poor" neighborhood . . . will have a slow rate of progress. To demand that such a school live up to an arbitrary norm is about as justified as demanding that all pupils be of equal height. The degree of progress to be expected of a given school should not be based upon an arbitrary standard but upon the nature of the pupils and the social and economic background of the neighborhood.
>
> When the background factors are considered, it appears that some schools whose records show rapid progress are nevertheless below the expected level, while other schools whose rate of progress is slow are actually exceeding the expected level of progress. To insist upon a standard rate of accomplishment in the latter schools is unfair to the pupils and the teachers. To be satisfied with such accomplishment in the former schools is unjust to the pupils as well as to the taxpayer. Both instances are common misapplications of democratic principles.

Further illustration of this use of correlation will not be given here, but the reader is referred to the "Illustrative Materials" under The Correlation Method, in the Selected References at the end of this chapter. See the studies by Gates, Line and Glen, Oates, St. John, and H. T. Tyler. One may also consult the topics, "Correlation (Statistics)," "Correlation of Abilities," and "Correlation of School Subjects," in the current or large cumulated volumes of the *Education Index* for many more studies based upon correlation.

Prediction of scholastic success. One of the interesting and important uses of correlation is to predict the occurrence of certain phenomena in a certain degree. The possibility of doing this grows out of the establishing of relationships in the past which are assumed to continue to hold. If, for example, a certain relationship has been found to exist between intelligence and success in school, the prediction may be made that a certain pupil, having a given intelligence level, will have a given degree of success in school. There are, of course, certain cautions in connection with prediction, which every statistician knows, and which others should be aware of. The prediction is only an average prediction; it is based on the *average* degree of success of many persons in the second characteristic (as school success) all of whom had a given level of measurement in the first characteristic (as intelligence). Many of the individuals in that small portion of the total group of individuals studied will of course not be at the average in the second characteristic, and the same thing holds true for the individuals for whom predictions may be made—many of them will not run true to the average. But predicting on the basis of average performance, together with a statement of the amount of variation from this prediction that is usually found, is the procedure which is connected with this use of correlation.

The correlation method has had extensive use in education for prediction. One important field of application has been the estimation of scholastic success. Knowing the relationship

between average school marks, let us say, and marks in history, the most probable mark of a pupil in history can be estimated from a knowledge of his average marks. Perhaps more frequently studies of predictability are based on the relation of work in a higher institution to work in a lower institution. Investigations of the relationship between college success and high-school success are regarded by colleges as important, because they throw light on the use of high-school marks in admitting students to the higher institutions. Such analyses have been made in large numbers. For example, Scates [25] studied the relationship between the high-school marks of pupils who entered the University of Chicago over a three-year period and the quality of their work in the first year at the University. He found a correlation of .61 for students from high schools in Chicago and a correlation of .55 for students from high schools outside of Chicago. The relationship for three Chicago high schools was above .70. Further, the probability of success in the University was calculated for students who might be admitted at different levels of high-school averages.

Odell [26] made a similar investigation from a different angle.

25 Douglas E. Scates, "Selective Admission and Selective Retention of College Students at the University of Chicago," Chapter I, "Admissions from Chicago High Schools," pp. 1-75, and Chapter II, "Admissions from High Schools Out of Chicago," pp. 76-106. Doctor's thesis. Chicago: University of Chicago, 1926. Pp. 383. A summary of the first chapter is published as "A Study of High-School and First-Year University Grades," *School Review*, XXXII (March, 1924), 182-92.

26 This study, in its various aspects, is reported by Charles W. Odell in four bulletins of the Bureau of Educational Research, University of Illinois, as follows: *Conservation of Intelligence in Illinois High Schools*, Bulletin No. 22, 1925. Pp. 55. *Are College Students a Select Group?* Bulletin No. 34, 1927. Pp. 45. *Predicting the Scholastic Success of College Freshmen*. Bulletin No. 37, 1927. Pp. 54. *Predicting the Scholastic Success of College Students*. Bulletin No. 52, 1930. Pp. 43. The third one of these four (Bulletin No. 37), contains the material bearing most directly and completely on the subject discussed in the present text. The fourth one reviews the third one and gives data on interrelationships of college subjects.

A review of literature on correlations with college success is given by David Segel, *Prediction of Success in College*. United States Office of Education Bulletin, 1934, No. 15. Washington, 1934. Pp. 98. Bibliography of 135 references. This is the most comprehensive and detailed review in this field. Summaries of findings of previous studies are given in Part II, pp. 57-98.

A briefer summary will be found in Chapter II of Odell's third bulletin (No. 37). Another source of information is: Clifford Woody (Chairman), *Quantitative Measurement in Institutions of Higher Learning*, Chapters III and IV. Eighteenth Yearbook of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1930.

He studied pupils who graduated from high schools in the state of Illinois and who later attended colleges anywhere in the country. He also found a correlation of .55 between general high-school average and freshman average. He continued his analysis further and found relationships between high-school subjects or groups of subjects and individual subjects in college, and between age and intelligence and freshman work. The correlation of freshman average with age was —.23, and with intelligence was .38. By combining intelligence with high-school average, the total (multiple) correlation with freshman college work was increased from .55 to .58. These results were based on about 2,000 students. Odell included a number of interesting variations in his general study, which are reported in the bulletins cited. He reviews the important investigations made up to that time (1927) and includes studies of the relation between elementary-school and high-school work.

A similar type of attack has been made on the estimation of a student's aptitude for work in a particular course or subject field. Such estimates have been made from general scholarship marks, and from marks in previous similar studies. Tests of various kinds have also been used. For example, one may make certain predictions for individual subjects from general intelligence measures, and he can usually do somewhat better from tests especially constructed to measure aptitude for that particular field of work. Such tests are usually known as "aptitude" or "prognostic" tests and are commercially available.[27]

For other studies in the field of predicting scholastic success, see the references at the end of the chapter, by Clem, Flemming, Gates, Krieger, Rogers, Segel, St. John, Toops, and

27 References to bibliographies and to current sources of information on tests were given in footnote 11 of Chapter VII. See also, the *Education Index*, topics: "Prognosis Tests," and "Aptitude Tests." References to aptitude measurement in general, including vocational uses, were given in footnote 38 of Chapter VII.

As a commentary on prediction one may be interested in the article by Howard Easley, "On the Limits of Predicting Scholastic Success," *Journal of Experimental Education*, I (March, 1933), 272-6.

H. T. Tyler. See the *Education Index,* under topics: "Prognosis of Success," with various subtopics; "Student Selection," with appropriate subtopics; "Student Achievements," with subtopics; and "Aptitudes." See, in the same source, various school subjects, with subhead, "Prognosis of Success" and also the annual U. S. Office of Education *Bibliography of Research Studies in Education,* under the topic, "Prognosis of Success."

Prediction of teaching success. Another field of prediction which has been explored by means of correlation is the reliability with which teachers can be selected. Because of the importance, to the success of education, of securing teachers who will do effective teaching and fit in well with their environment, investigations of this problem have been numerous. The correlation of subsequent teaching success with factors which can be ascertained in advance of appointment is one phase of the general problem of teacher selection—probably the phase that has been attacked most scientifically

Studies of the possibility of teacher selection which are based on correlation are summarized in the *Review of Educational Research,*[28] and, less completely, by Yaukey and Anderson.[29] Barr [30] reports an extensive recent study using a number of bases of prediction and a composite criterion of teaching success. Coefficients of multiple correlation (based on several factors combined), were secured as high as .70, which is considerably above those usually found.

28 T. L. Torgerson, "The Measurement and Prediction of Teaching Ability," Chapter II, pp. 261-6, in "Teacher Personnel," *Review of Educational Research,* IV (June, 1934), No. 3. See also p. 282 of this issue.

R. H. Eliassen, "Teacher Selection and Placement," Chapter IV, pp. 83-5, in "Teacher Personnel," *Review of Educational Research,* I (April, 1931), No. 2.

For a Bibliography on this subject, see Gilbert L. Betts and Others, *Selected Bibliography on the Education of Teachers,* pp. 50-2. Vol. I, National Survey of the Education of Teachers. Office of Education Bulletin No. 10, 1933. Washington: Office of Education, 1932.

29 James V. Yaukey and Paul L. Anderson, "A Review of the Literature on the Factors Conditioning Teaching Success," *Educational Administration and Supervision,* XIX (October, 1933), 511-20.

30 A. S. Barr, "The Measurement of Teaching Ability," *Journal of Educational Research,* XXVIII (April, 1935), 561-9.

See also, William H. Lancelot and Others, *The Measurement of Teaching Efficiency* New York: The Macmillan Co., 1935. Pp. 237.

The selected references (Illustrative Materials) at the end of this chapter list studies of this problem by Coxe, Jacobs, Knight, Krieger, Kriner, Morris, Somers, Ullman, and Whitney. Tiegs [31] and Deffenbaugh and Zeigel [32] give a review of the whole field of teacher selection. Other references will be found in the *Education Index*, under the topics, "Teaching—Prognosis of Success," and "Teachers—Selection and Appointment." See also, for other sources, the annual United States Office of Education *Bibliography of Research Studies in Education*, the topics, "Prognosis of Success," and "Teachers—Appointment and Tenure."

Prediction of population. Another field that is of great practical importance to school administration is the estimation of the population—or more specifically, the estimation of the school population—for some years to come. Such estimates must be made as the basis for planning school-building programs,[33] and the figures that are decided upon find expression in the size of buildings which are erected. Mistakes, or errors in judgment, are costly, whether the estimate is under or over the situation as it actually develops later. It is of considerable importance therefore that a technique be used which is as sound as possible.

Engelhardt and Engelhardt [34] classify the methods that have been used under four heads, as follows: (1) personal judgment; (2) analogy, or comparison with the rate of growth which other similar cities have shown; (3) multiple-factor method, which includes many economic and social factors taken as indexes of growth; and (4) mathematical methods, which include fitting curves by mathematical means to the past growth of the city and projecting these curves forward.

31 Ernest W. Tiegs, *An Evaluation of Some Techniques of Teacher Selection*. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. 108.

32 W. S. Deffenbaugh and William H. Zeigel, *Selection and Appointment of Teachers*, Chapter V, "Methods of Collecting Information about Prospective Teachers," pp. 41-74. National Survey of Secondary Education, Monograph No. 12, U. S. Office of Education Bulletin, 1932, No. 17. Washington, D. C.: 1933. Pp. 115.

33 For references on school-building programs, see footnote 273 of Chapter VIII.

34 N. L. Engelhardt and Fred Engelhardt, *Planning School Building Programs*, Chapters I-IV, pp. 1-90. New York: Teachers College, Columbia University, 1930. Pp. 574.

The third method may employ the correlation technique, as a means of studying its accuracy, selecting the most promising factors, and making forecasts.

Engelhardt and Engelhardt offer critical comments on these several methods. The most crucial critical examination of them has been made by Chamberlain and Crawford,[35] who compare various estimates with subsequent actual developments. This whole field offers many opportunities for further study. Other references were given previously [36] and will not be repeated here.

Correlation in fundamental research. Correlation is of very great importance in research concerned with fundamental methods and procedures. For example, in the construction of research tools, such as tests and other data-gathering instruments, correlation is an essential technique for checking upon their validity and their reliability. By validity is meant the extent to which the device actually does what it purports to do. Validity is customarily checked by correlating the results of the procedure with other indexes of the thing which it is desired to measure. Of course difficulty is generally encountered in securing a valid criterion (the other indexes), but usually progress can be made in this direction, and in some cases the check is entirely satisfactory. Reliability means the degree to which the procedure can be guaranteed to give consistent results; it also is checked by correlating the results of an application of the device or procedure, with a second application. There are variations of this technique, involving use of the Spearman-Brown prophecy formula, which will be found developed in courses in statistics, and sometimes in educational measurements, and in textbooks on measurement.

In recent years considerable work has been done in the direction of analyzing psychological characteristics (such as abilities) so as to reveal the fundamental constituent ele-

[35] Leo M. Chamberlain and A. B. Crawford, *The Prediction of Population and School Enrollment in the School Survey*. Bulletin of the Bureau of School Service, Vol. IV, No. 3, March, 1932. Lexington, Ky.: University of Kentucky. Pp. 27.

[36] See footnote 276 of Chapter VIII.

ments. The assumption in this work is that any response tendency of the individual can be broken up into elements, somewhat in the manner that chemists have broken up ordinary substances into simple elements. According to the basic concept in the work, these elements are identified when measures are found which do not correlate with other measures. That is, zero correlation with other factors is taken as evidence of uniqueness in the factor, and it is therefore regarded as fundamental and elemental. A Committee on Exploratory Study of Unitary Differential Traits,[37] under the chairmanship of Thorndike, has been at work for some time, with a subvention from the American Council on Education.

There has been a large quantity of fundamental work done in this field by various individuals. Spearman[38] worked out the first basic theory, using tetrad differences, deriving a general factor called *g*, and calling his attack the "factor theory." Kelley,[39] Holzinger,[40] Hotelling,[41] Thurstone,[42] and Wil-

37 For details see "National Deliberative Committees in Education," p. 162, *Research Bulletin of the National Education Association*, XII (September, 1934), No. 4.

38 Charles Spearman, *The Abilities of Man*. London: Macmillan and Co., Ltd., 1927. Pp. 415. (This is not his earliest work, but rather presents a matured development of his point of view.)

See the series of articles by Spearman on "The Factor Theory and Its Troubles," *Journal of Educational Psychology*, XXIV (October, 1933) to XXV (May, 1934).

See references in the *Education Index* or the *Psychological Index* under Charles E. Spearman, for many other articles.

39 Truman L. Kelley, *Crossroads in the Mind of Man*. Stanford University, Calif.: Stanford University Press, 1928. Pp. 238.

Truman L. Kelley, *Essential Traits of Mental Life*. Cambridge: Harvard University Press, 1935. Pp. 145.

40 Karl J. Holzinger, *Statistical Resumé of the Spearman Two-Factor Theory*. Chicago: University of Chicago Press, 1930. Pp. 43. (Planographed.)

Karl J. Holzinger and Frances Swineford, "Uniqueness of Factor Patterns," *Journal of Educational Psychology*, XXIII (April, 1932), 247-58.

Spearman-Holzinger Study of Unitary Traits. Preliminary reports were issued in 1935 to the extent of five sections. Report No. 5 is "Introduction to Bi-Factor Theory." Chicago: Department of Education, University of Chicago.

For other works by Holzinger see references under his name in the *Education Index*.

41 Harold Hotelling, "Analysis of a Complex of Statistical Variables into Principal Components," *Journal of Educational Psychology*, XXIV (September-October, 1933), 417-41, 498-520.

42 L. L. Thurstone, "Multiple Factor Analysis," *Psychological Review*, XXXVIII (September, 1931), 406-27.

———, *A Simplified Multiple Factor Method and an Outline of the Computations*. Chicago: University of Chicago Bookstore, 1933. Pp. 25. (Planographed.)

———, *The Theory of Multiple Factors*. Ann Arbor, Mich.: Edwards Brothers, 1933. Pp. 65. (Planographed.)

———, "The Vectors of Mind," *Psychological Review*, XLI (January, 1934), 1-32.

———, *Vectors of Mind*. Chicago: University of Chicago Press, 1935. Pp. 206.

son [43] have been active in this field in America, introducing various techniques. Tryon [44] and Thomson [45] have probably been the chief critics of the various theories and methods proposed. The work to 1934 has been well reviewed by Flanagan,[46] who applies the Hotelling technique. A few applications are mentioned in the *Review of Educational Research*.[47] Further references will be found in the *Education Index* and in the *Psychological Index* by consulting the authors mentioned, and in the former under the topics, "Statistical Methods," "Factor Analysis," and "Correlation (Statistics)." Many references of course appear in the works named. In general this literature is difficult reading and is suited to advanced students. It is cited here for the benefit of those who wish to devote special attention to it. A derivation of the Spearman theory has been given by Line and Hedman [48] which should be comprehensible to the mathematically-minded student after a course in statistics.

This field probably represents the most important application of correlation to date, from the standpoint of pure theory.

Cautions in the interpretation of correlation coefficients. The interpretation of a given degree of correlation, as indi-

[43] Edwin B. Wilson, "On Hierarchical Correlation System," *Proceedings of the National Academy of Science*, XIV (1928), 283-91.

———, "On Overlap," *Proceedings of the National Academy of Science*, XIX (1933), 1039-44.

———, and J. Worcester, "The Resolution of Four Tests," *Proceedings of the National Academy of Science*, XX (1934), 189-92.

[44] Robert C. Tryon, "Multiple Factor vs. Two Factors as Determiners of Ability," *Psychological Review*, XXXIX (July, 1932), 324-51.

Consult the *Psychological Index* for other works by this writer.

[45] Godfrey H. Thomson, "A Hierarchy Without a General Factor," *British Journal of Psychology*, VIII (September, 1916), 271-81.

———, "A Worked Out Example of the Possible Linkages of Four Correlated Variables on the Sampling Theory," *British Journal of Psychology*, XVIII (July, 1927), 68-76.

———, "Some Points of Mathematical Technique in the Factorial Analysis of Ability," *Journal of Educational Psychology*, XXVII (January, 1936), 37-54.

For other works by this writer consult the *Psychological Index*.

[46] John Clemans Flanagan, *Factor Analysis in the Study of Personality*. Stanford University, Calif.: Stanford University Press, 1935. Pp. 103. (Planographed.) Bibliography of 110 references, many of which are on techniques. See especially Chapter II, "A Brief Survey of Available Factor Analysis Techniques," pp. 10-27.

[47] "Psychological Tests," *Review of Educational Research*, V (June, 1935), 232.

[48] W. Line and H. B. Hedman, "A Simplified Statement of the Two-Factor Theory," *Journal of Educational Psychology*, XXIV (March, 1933), 195-220. Bibliography of forty-three references, on the Spearman technique.

cated by a correlation coefficient that has been calculated, is a step that properly devolves upon considerable statistical familiarity with the mathematics of the procedure and the data used. A number of aspects of the interpretation can, however, be presented to call to the attention of the reader the more important considerations, and to indicate their general nature.

First, correlation coefficients do not represent per cent. They are not a per cent *of anything;* they are, instead, pure mathematical numbers. Second, they are probably not to be interpreted in a linear sense. That is, a coefficient of .80 is probably not to be regarded as twice as high as a coefficient of .40. The scale indicating the significance of changes in the coefficient depends upon the particular interpretation one desires to use. Several mathematical functions have been derived for the purpose of interpreting the coefficient (r), among which may be mentioned the coefficient of alienation and the coefficient of determination. According to the former, r must equal .87 before it can be regarded as a "half correlation," or half way from zero to perfect correlation, and according to the second function r must equal .71 to be half as high as possible. If some other function of r were used for purposes of interpretation, it would probably give still another value.

Third, the ordinary correlation procedure assumes that the data will be linear when plotted; that is, will cluster along a trend line that is straight rather than curved. There are methods of calculating correlation for curved relationships,[49] although they are not commonly used. If the relationship is curvilinear, the ordinary coefficient of correlation (known as the Pearson product-moment coefficient) will give a lower indication of functionality than can be obtained by other measures.

[49] Mordecai Ezekiel, *Methods of Correlation Analysis,* Chapter XIV, "Determining the Way One Variable Changes when Two or More Other Variables Change, Using Curvilinear Regressions," pp. 187-219. New York: John Wiley and Sons, Inc., 1930. Pp. 427.

Karl J. Holzinger, *Statistical Methods for Students in Education,* Chapter X, "Non-Linear Correlation," pp. 177-89. Boston: Ginn and Co., 1928. Pp. 372.

Charles W. Odell, *Statistical Method in Education,* Chapter XIV, "The Ratio of Correlation," pp. 250-9. New York: D. Appleton-Century Co., 1935. Pp. 457.

Fourth, errors of measurement, if variable and if not correlated with the magnitude of the measurements, will lower the observed (calculated) value of *r*.

Fifth, the size of the correlation coefficient depends in no small degree upon the *range* of the measurements which are used in its calculation. That is, a higher correlation will be found between the mental age of pupils and their chronological age if we extend the data over say eight grades of elementary-school work than if we use the data from a single grade, because the range of both mental and chronological ages is greater over several school grades than in a single grade. On the other hand, the correlation between intelligence quotients and marks on school work will not be appreciably raised by including more school grades, because neither of these characteristics is necessarily increased by extending the range of grades included. In fact the degree of correlation found might be lowered by including more grades.

Sixth, allowance must be made for a sampling variation in the magnitude of *r*. For example, the range (variation) in the intelligence quotients of the second-grade pupils should, theoretically, be the same as the range in grades 2 to 6 put together into a single group. Practically, however, variations will be caused by *chance* factors. An allowance for variation in the resulting coefficient which is calculated must be made because of chance factors that affect the original data. This is provided for by the measure known as *probable error*, a magnitude calculated to include half of the variations which are likely to occur because of chance factors. It will be discussed further in the following chapter.

Seventh, there are various special conditions that must be noted. For example, if the two traits (characteristics, or factors), that are being correlated happen to be ratios with a common denominator, such as age of pupils, the resulting correlation coefficient will probably be spuriously high for ordinary purposes, although it will not be too high as an indication of the relationship between the *ratios*. That is, it must not

be used as an indication of the relationship between the numerators.

Perhaps as an eighth and final warning, it might be said that series of data in biological and social sciences frequently are not good (completely representative) measures of what they are presumed to measure, so that the relationship found, though true within the limits of sampling fluctuation for the data used, may not represent at all well the relationship between the factors which one desires to study.

Discussions of the interpretation of correlation are available in several places. Odell [50] gives a lucid, readable, systematic treatment. Holzinger [51] presents a briefer but pointed discussion. Monroe and Stuit [52] give perhaps the most extended and systematic treatment, taking the problem up from the standpoint of purposes. Barr [53] has pointed out certain pitfalls in the use of correlation. Odell [54] has prepared an earlier bulletin on this subject. One will find other treatises in statistics textbooks, and in articles listed in the *Education Index* under the topic, "Correlation, (Statistics)."

Inferring causation. This section may well belong to the preceding discussion, for one of the cautions in the interpretation of correlation is that it does not in itself show causation and cannot be so interpreted. As we have noticed previously, causal relationships must be established on the basis of an analysis which reveals a structure of relationships that will support the inference of causation. Once this causal connection has been established, the correlation coefficient may indicate the degree to which a factor or set of factors are effective in contributing to the result.

50 Odell, *op. cit.*, Chapter X, "The Interpretation of the Coefficient of Correlation," pp. 188-208.

51 Holzinger, *op. cit.*, pp. 163-7.

52 Walter S. Monroe and Dewey B. Stuit, "The Interpretation of the Coefficient of Correlation," *Journal of Experimental Education*, I (March, 1933), 186-203.

53 A. S. Barr, "The Coefficient of Correlation," *Journal of Educational Research*, XXIII (January, 1931), 55-60.

54 Charles W. Odell, *The Interpretation of the Probable Error and the Coefficient of Correlation*. Bureau of Educational Research Bulletin, No. 32. Urbana, Ill.: University of Illinois, 1926. Pp. 49.

Barr quotes Tschuprow [55] to the effect that one might correlate the size of the fire-fighting equipment sent to a city fire and the amount of loss from different fires and conclude (if he interpreted his correlation mechanically, in terms of causes) that, since small fire machines did less damage than large ones they should be sent to all fires. Freeman and Holzinger [56] show that if one is not careful, he will be saying that such factors as the quality of school work and the level of the intelligence quotient *cause* a child to be a certain age.

Holzinger points out the source of the difficulty in the following statement: [57]

All statistical data are affected by a multiplicity of factors which may obscure the meaning of the relationship found between two observed variables. For example, the correlation between high-school and university grades . . . was .612, a result doubtless due in a large measure to the mentality of the student. Many other factors, however, such as his age, sex, nationality, health, ambition, methods of study, regularity of attendance, and personal appearance, as well as the type of examinations and reaction of the instructors, doubtless contribute also to the observed correlation. Scholarship as measured by marks is thus a variable made up of a large number of other variables, and the correlation found is of doubtful meaning so far as causes are concerned.

Odell makes the following statement: [58]

It should be emphasized that not only does a coefficient, even a high one, offer no proof at all that one of the two variables causes, or directly affects, the magnitude of the other, but also it does not justify the conclusion that some cause or set of causes operates directly on both. The only conclusion justified by the coefficient itself is that if it is possible to trace causal influences far enough back, enough of them will be found to account for the degree of relationship indicated by the coefficient.

55 Barr, *loc. cit.*

56 Frank N. Freeman, *Mental Tests*, pp. 448-50. Boston: Houghton Mifflin Co., 1926. Pp. 503.

See also the more extended discussion in Karl J. Holzinger and Frank N. Freeman, "The Interpretation of Burt's Regression Equation," *Journal of Educational Psychology*, XVI (December, 1925), 577-82.

57 Holzinger, *op. cit.*, (footnote 49), p. 164.

58 Odell, *op. cit.*, (footnote 49), p. 192.

These two quotations warrant careful reading. They present a point of view concerning the successive causation of factors by other factors which is characteristic of the thinking of the mature statistician, but difficult for the beginner to grasp.

For the purpose of isolating the effects of some of these secondary factors, a technique generally known as partial correlation [59] is available. It has various names for special forms, including part correlation, semi-partial correlation, net correlation, and joint correlation. This general branch of correlation gives it the extreme analytical power which it possesses. That is, the influence of many factors upon each other can be separated so that the relationship of any one of them with the general resulting variable (commonly called in statistics the *dependent* variable) can be determined when this relationship is freed from the influence of any or all of the remaining factors studied.[60] There are definite pitfalls in partial correlation to be watched, even more than in simple (called *zero order*) correlation, for all of the former elements are present and are augmented by the fact that the analysis is one which follows along preconceived mathematical lines rather than along the structural lines of the actual relationships, and the partialling out of influences may not be entirely accurate.[61]

The principal purpose of partial correlation is to obtain a more analytical measure of causation. We must always remember that the fact of a structural or organic relationship must first be proved before we say that any factor causes or contributes to the causation of another; the correlation technique in any form is appropriate only for measuring the *strength* of this relationship. One of the interpretations of this

59 Odell, *op. cit.*, (footnote 49), Chapter XV, "Partial Correlation," pp. 260-82.
Holzinger, *op. cit.*, (footnote 49), Chapter XV, "Partial and Multiple Correlation," pp. 283-316.
Ezekiel, *op. cit.*, (footnote 49), Chapters X-XVI, and XX-XXII.

60 Jack W. Dunlap and Edward E. Cureton, "On the Analysis of Causation," *Journal of Educational Psychology*, XXI (December, 1930), 657-80.

61 Barbara Stoddard Burks, "On the Inadequacy of the Partial and Multiple Correlation Technique," *Journal of Educational Psychology*, XVII (November-December, 1926), 532-40, 625-30.
See also, for a resumé, Odell, *op. cit.*, (footnote 49), pp. 278-9.

degree of relationship that seems to be becoming more widespread is the conversion of the correlation coefficient into a statement of the number of elemental factors which two variables have in common. That is, under certain assumptions, a correlation of .50 indicates that one-fourth of the factors determining the values of the two traits being correlated are joint factors, common to both traits.[62] Whether the assumptions are justified cannot be stated at the present time. A method which aspires to indicate the per cent that each of a number of factors contributes to a resulting variable makes use of *path coefficients*. There has been considerable discussion of this method in the literature, but its underlying logic is complex and its application is uncertain.[63] Introduced by Fisher,[64] the technique known as *analysis of variance* offers other means for causal interpretation. For those who prefer to be conservative, however, all of these interpretations in terms of per cent of causation will appear to be mathematical artifacts which do not necessarily parallel closely the actual facts of relationship. More mature analysis and more penetrating research may shed greater light on their value.

THE CASE-STUDY METHOD

General characteristics and use of the case method. A third method for the analysis of complex causation is the case-study procedure. A good introductory statement of its characteristics and use follows:[65]

62 Henry E. Garrett, *Statistics in Psychology and Education*, pp. 291-8. New York: Longmans, Green and Co., 1926. Pp. 317.

63 Odell, *op. cit.*, (footnote 49), pp. 276-7. Gives a brief description of path coefficients and references to the leading literature.

64 R. A. Fisher, *Statistical Methods for Research Workers*, Chapter VII, "Intraclass Correlations and the Analysis of Variance," pp. 190-227, and Chapter VIII, "Further Applications of the Analysis of Variance," pp. 228-62. London: Oliver and Boyd, Fourth edition, revised and enlarged, 1932. Pp. 307.

George W. Snedecor, *Calculation and Interpretation of Analysis of Variance and Covariance*. Ames, Iowa: Collegiate Press, Inc., 1934. Pp. 96.

W. B. Kemp, "Some Methods for Statistical Analysis," *Journal of the American Statistical Association*, XXIX (June, 1934), 147-58.

65 F. N. Maxfield, "The Case Study," *Educational Research Bulletin*, IX (March 5, 1930), 117-22.

It is becoming generally recognized that in dealing in any practical way with human relationships and adjustments there is considerable advantage in developing a case-study technique. The term is well known in the practice of medicine and of law. The physician includes in the study of his "case" the history of the patient's previous development, his health, and so on, and also makes a careful inventory of present conditions and symptoms. Recently a medical case study has come to include definite quantitative and qualitative data on bacteriological and physiological findings. The social worker recognizes, too, the fundamental significance of case study and the case record in dealing with the complicated relationships of family situations or child welfare.

This practical use of case-study technique has extended to many other lines of professional and business activity. The salesman is encouraged to make a careful case study of each prospect to whom he expects to sell. Data in regard to his business, credit, and trade policies are recorded, to be sure; but also items regarding his personality, attitudes, and interests. Individual case studies of each member of a state legislature may be as important to a lobbyist for a large industrial corporation as the technical schedules of his own business. Chain stores are not placed at random but on the basis of careful studies of individual locations.

The public schools, faced with the problem of mass education, have only gradually come to recognize the necessity for case studies of individual pupils. The needs of the obviously exceptional child, the blind, the deaf, and the seriously mentally defective, have been recognized, as well as those of the truant. Until recently, and even now in a majority of school districts, the other so-called "normal" children have been assumed to be homogeneous. Yet, recognition of the usefulness of case-study technique in avoiding economic waste, in reducing retardation and maladjustment in school progress, and in preventing miscarriage in vocational preparation and guidance is gaining ground. The work of the medical inspector, the attendance supervisor, and the psychologist is being correlated and made effective by the school nurse and the visiting teacher who work with a case-study technique.

Desirable characteristics of a satisfactory case study are: completeness of data, validity of data, continuity, confidential recording, and scientific synthesis (which is as much prognostic as diagnostic).[66] A variety of blanks or forms for use in recording case histories may be found in the references in the chapter bibliography dealing with case work, especially the

[66] *Ibid.*

volumes by Lundberg and Reavis. Such forms suggest the type of information collected in case studies.

A case is a particular one of a kind which may be considered a basic unit for study.[67] The case may be one human being under investigation or an episode in his life, or it might be conceivably a nation, a race of people, or an epoch in history. The cases with which social workers are apt to be concerned are individuals, families, neighborhoods, and communities. The cases with which ethnologists, anthropologists, and historians work are more likely to be non-civilized tribes, culture groups, historical epochs, and politically organized populations.[68] In educational research, cases are most commonly individual persons, communities, and institutions. The case-study method has been frequently employed in education in studying problem cases, maladjusted pupils, and scholarship difficulties. It is obviously an important source of educational ideas.

In addition to use of the case method for investigation of particular or individual instances of phenomena, it may be employed in studying the general characteristics of phenomena of any given class, as for example, case studies of the scholarship difficulties of secondary-school pupils, the teaching difficulties of beginning teachers, elements of likenesses and differences in school communities of some particular sort, etc. If the case method is to be used in the discovery of relationships thought to hold true for particular classes of conditions, then care must be taken to collect comparable data relating to the several cases investigated. Obviously, if one is to generalize about the uniformities common to a number of instances of some phenomenon, his generalizations must be based upon uniform data. One of the marked limitations of many of the published case studies is that the data are incomplete and fragmentary, each report containing, in the main, merely those items which happened to impress the investigator most at the

67 Howard W. Odum and Katherine Jocher, *An Introduction to Social Research*, pp. 230-4. New York: Henry Holt and Co., 1929.

68 Franklin H. Giddings, *The Scientific Study of Society*, p. 95. Chapel Hill, N. C.: University of North Carolina Press, 1924.

time of the observation. Data collected under such conditions are ordinarily not very valuable for the development of valid generalizations about educational phenomena.

Statistical techniques are available for analysis of data secured in connection with the process of group diagnosis. It is also possible to make statistical analyses of groups of individual case studies. Workers who consider case and statistical procedures antagonistic, or mutually exclusive, overlook the fact that case studies become of significance scientifically only when classified or summarized in some way so as to cause the uniformities to stand out and to group themselves into general patterns or types.[69]

When the case-study method is to be employed to analyze the common antecedents of conditions (a procedure discussed in connection with causal-comparative research), one must first make a number of individual case studies of the phenomena under investigation: problem cases, cases of scholarship difficulties, delinquencies, etc. Then, if the data have been collected in a manner to make them comparable, one may employ either of two methods in studying their common factors. If the principle of agreement (discussed in connection with causal-comparative research) is employed, one chooses for special analysis merely those instances of the phenomenon in which the effect under investigation is observed to be present, either not at all or in some marked degree. The analysis of the data, as has been pointed out, consists of comparing the instances in which the observed effect does and does not appear, for common likenesses and differences in their antecedents. If the correlation method is employed, one may use cases, not merely at the extremes of the distribution of the effect under observation, but all instances in which the effect may be present in any amount whatsoever. Coefficients of correlation may be calculated for any number of traits especially chosen for investigation. Both the principle of agreement and the correlation

[69] G. A. Lundberg, *Social Research*, p. 175. New York: Longmans, Green and Co., 1929.

technique lead to generalizations relative to the common antecedents of the phenomenon under investigation.

The steps involved in making case studies. To secure a fairly accurate conception of the case-study method, some analysis of the problem solving or logical steps employed in this type of research appears necessary. The steps in thinking which characterize this investigational procedure are ordinarily given as follows:[70] First, either by direct observation or measurement, the status of the phenomenon under investigation must be determined. This is necessary, because when one comes to analyze the antecedents of some observed effect, one studies them, not without regard for the amounts of the effect observed, but conjointly. If the case study is to end in the comprehension of a particular instance of some phenomenon singled out for special investigation, then the measurement of status is merely an aid to the identification of the particular condition under investigation, as for example, a maladjusted pupil, a "run-down" school system, or an unsuccessful school superintendent. Of course, one may base his judgment about the status of the case under study upon incidental observation, but if one expects to use the data eventually, as is so frequently true, as a basis for some sort of a remedial or adjustment program, then one will ordinarily desire some more accurate measurement of the object under investigation. If one wishes to employ the principle of agreement to compare the circumstance common to a number of instances of some particular condition, such as those already referred to, then of course he must determine the status of the phenomenon with sufficient accuracy to know that it is actually present or absent, as the case may be. If the correlation method is to be used in the analysis of the data relating to a number of cases in which the phenomenon is present in varying amounts, then

[70] The case-study method is a form of systematic diagnosis employing both the longitudinal and cross-sectional view of phenomena to discover how they came to be. The mental steps are identical with those of the better known diagnostic methods generally employed by field workers in the scientific study of classroom instruction: A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, pp. 116-89. New York: D. Appleton and Co., 1931.

the accurate measurement of the elements under investigation is essential. The first step then, in making a case study, is to determine the status of the phenomenon undergoing study.

The second step in a case-study investigation is the collection of data relative to the circumstances associated with the phenomenon under investigation. Since it is desirable that the collection of data arise out of something more than mere random observation, one will ordinarily attempt to guide this process by some more or less definitely formulated hypothesis relative to the antecedents that most probably limit the given condition. To secure a fairly accurate conception of the case-study method, one needs to understand how these hypotheses arise. From a study of the history of the case and a knowledge of similar cases, gained from diverse sources, one comes to some sort of a judgment about the antecedents of the particular effect under observation. To reach such a judgment, one examines carefully the present behavior or status of the case and its historical background for symptoms of the antecedents ordinarily known to be associated with such cases. Just what these symptoms and conditioning factors are will have been determined by previous experience and research with similar cases, symptoms, and antecedents. In making a case study one must identify as present in a particular instance of some condition what is known to be true of such a phenomenon in general. If one were investigating, for example, a problem case in discipline, he would know from previous experience and investigation that problem cases in discipline may arise from many causes. They may result from conditions found in the *school environment*: too easy or difficult tasks, repeated failure in class work, special deficiencies, personality conflicts with the teacher, and poor school environment; conditions found in the *home environment*: conflicts between mother and father, the attitude of parents toward the child, the relations of the child to other children in the family, and faulty home training; and conditions found in the *child's play life:* inability to compete with others on equal terms, timidity, unfortunate experiences

and companionship, special disabilities, etc. From a survey of these many probable causes of disciplinary difficulties, the investigator must come to some judgment as to the most probable antecedents of the case under investigation.

Thus, combined in this single step of diagnostic thinking are many special applications of the scientific method. In the first place, the approach is historical in character; one attempts to understand the present status of the phenomenon by seeing how it came to be. In the second place, one's judgments about the probable relationships involved are the products of past experiences and researches with similar cases, symptoms, and antecedents, arrived at by means of incidental or systematic observation, or both. In this respect the case-study method is the meeting point of the particular and the general, the personal and the scientific. In the third place, all judgments about the antecedents of the case under investigation are hypothetical until actual measurement and adjustment have shown otherwise.

The third operation in making a case study involves checking for the presence or the absence of the antecedents thought to apply to the situation under investigation. This step is necessary if the thinking about the given condition is to proceed beyond the hypothetical stage. In the illustration given above, if a careful survey of the situation and its past history reveals that the most probable cause of the disciplinary difficulty under study is the school's failure to adjust its program of instruction to individual differences, then the investigator will want to ascertain, as a part of the process by which the validation of the diagnosis is made, whether the supposed neglect on the part of the school really exists. In ascertaining this fact the worker may rely upon direct observation, objective tests, or any other of the many means of measurement at his disposal. The successful completion of this step may involve the measurement of many different kinds of materials, products, and processes. If the condition supposed to exist is absent then one must return to a new study of the case; if it is

present, one may proceed to a further validation of the diagnosis by making the necessary adjustment in the instructional program and observing the effect.

The fourth step in making a case study, if the diagnosis is to be rendered valid, involves the adjustment of the circumstances associated with the object of study, in some manner judged necessary to improve the situation. Although this fourth phase may be thought of as something distinct from the first three steps, the diagnosis cannot, however, be considered complete until the conditioning circumstances supposed to explain the case have been removed and the effect or effects observed. If several adjustments have been suggested by the diagnosis, and if one desires to know the potency of each particular factor, then one must modify a single circumstance at a time, with all others held constant, as suggested by the law of the single variable.

The fifth and final step in case work, as in all educational diagnosis, involves the remeasurement of the phenomenon under investigation to ascertain what changes, if any, have been produced in its status by the modifications made. If the change is a positive one, and in an amount thought significant, then the diagnosis can be judged correct.

The preceding review of the steps in making a complete case study emphasizes the process of educational diagnosis and remedial procedure in applying not only the results of case-study research, but also the findings of other investigational methods. That is, educational diagnosis is considered a way of utilizing or applying results secured from any or all of the various types of research rather than a distinct method of investigation. The principles and practices of educational diagnosis [71] are thoroughly analyzed in the current literature, as

[71] H. J. Baker and Virginia Traphagen, *The Diagnosis and Treatment of Behavior-Problem Children*. New York: The Macmillan Co., 1935. Pp. 393.

L. J. Brueckner and Others, *Educational Diagnosis*. Thirty-fourth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1933. Pp. x + 524. This year-book deals with the factors associated with learning difficulty (physical, intellectual, pedagogical, emotional, social, and environmental); the principles and techniques of educational diagnosis and treatment; diagnosis and remedial treatment in the various fields of educational responsibility and instruction (reading, Eng-

well as illustrated at some length in the bibliography of this chapter.

Use of data-gathering procedures in case studies. There are three important points at which measurements are employed in case study: (1) in determining the present status of the case in all of its important aspects under investigation, (2) in determining the presence and absence of the presumed antecedents of conditions whose status is found unsatisfactory, and (3) in determining the status of the various aspects of the case after the necessary adjustments have been made. These uses of measurement will involve the evaluation of many different kinds of products, processes, and conditions, and the employment of many different types of procedures and instruments, such as tests, rating scales, check-lists, interviews, questionnaires, etc. (as discussed in Chapters VII and VIII). In many instances research of this type will involve new instruments of measurement and extensive programs of informal objective measurements. If the inferences drawn from such investigations are to be worth while, they will, of course, need to be based upon accurate data.

Insight and principles of relationship in case-study investigation. As outlined above, the terminal point of the second step in case study or diagnostic thinking is a hypothesis concerning the probable causes of the unsatisfactory status of the phenomenon under investigation. The importance of having clear ideas in framing hypotheses has already been emphasized in Chapter IV, dealing with the formulation and testing of hypotheses. The soundness of one's ideas depends upon the factors of training, experience, and capacity for this type of thinking. The ultimate test of one's ideas is by making the adjustments in the antecedents of the phenomenon implied by

lish, arithmetic, social studies, science, health education, behavior disorders, speech, vocational interests and aptitudes, music, art, leisure-time activities, and creativeness); and the administration of a program of diagnosis and remedial instruction.

P. M. Symonds, *Diagnosing Personality and Conduct*. New York: Century Co., 1931. Pp. 602.

———, *Psychological Diagnosis in Social Adjustment*. New York: American Book Co., 1934. Pp. 362.

the diagnosis and by remeasuring the conditions later for evidences of positive changes in status. In this respect, the case-study method follows the pattern of investigation already identified as the steps of a complete act of thought or of problem solving.

An interesting aspect of the case-study method involves the use of previously derived principles of relationship in the formulation of hypotheses concerning the probable causes of the unsatisfactory status of the phenomenon under investigation. The worker may use all of his own past experiences, and as many of the experiences of others as are available through direct personal contact or are recorded in history, experimental science, and philosophy. If phenomena similar to that under investigation have been subjected to previous study, the worker may have access to a large body of verified knowledge which he may employ in the formulation of hypotheses, even though such principles of relationship may not be fully applicable to the particular situation under investigation by the case-study method.

Publication of case materials and desirable trends. The situation with reference to the publication of case-study materials might be greatly clarified, if the investigator understood that the case-study method may serve two purposes: (1) to determine the antecedents of some particular instance of a phenomenon, and (2) to discover the circumstances common to a number of instances of some condition. The first type of case-study should be reported to indicate that it has served the intended purpose. The report should contain evidence concerning the initial status of the phenomenon under investigation, a statement of the symptoms observed, the conclusions drawn, evidence concerning the supposed antecedents of the unsatisfactory status of the condition under investigation, the remedial adjustments made, and the observed effects. One might, of course, ask why one should ever publish individual case studies. Although it is true that case studies of a particular phenomenon were designed first of all to improve some given condition, they

may, however, provide suggested procedures for those who deal with similar problems and thus, if published, further the scientific study of education. In this respect reports of the case study of particular phenomena are important. A report of case studies, made for the purpose of studying the circumstances common to several instances of some particular educational condition, should present a schedule of the antecedents studied, the amount of each factor present in each particular situation, a record of whether the antecedent was or was not judged to be the determining factor in each specific situation, the adjustments made, and the results secured.

Much of the preceding discussion of the case method has emphasized the correction of conditions of maladjustment, but it should be realized that a desirable forward step would be to make case studies of normal and well-adjusted individuals or situations the basis for guidance in preventing maladjustments.[72] This procedure is in keeping with a trend toward preventive medicine rather than corrective medicine. An excellent illustration of the way in which the case method (as one of several research procedures) has been applied to the study of bright children is the Stanford *Genetic Studies of Genius*, described in the next section of this chapter. Numerous other examples of the case method occur in the chapter bibliography.

THE GENETIC METHOD

Purposes and general characteristics of the genetic method. A fourth method which is used frequently in the study of complex causation is the genetic approach. The case method, as compared with the genetic approach, ordinarily involves a shorter segment of the life span of some subject, cultural group, community, or institution, studied primarily for the purpose of

[72] Elsie M. Smithies, *Case Studies of Normal Adolescent Girls*. New York: D. Appleton and Co., 1933. Pp. x + 284. The title is not entirely accurate, since the cases reported involve maladjustments such as: self-distrust, physical disability, exhibitionism, volitional retardation, depression, insecurity, environmental pressure, parental dominance, shame, and inferiority fear.

discovering cause-and-effect relationships. The genetic method is applied principally to long-time investigations of biological phenomena where the purpose is primarily that of studying the change, growth, and development in these phenomena. The case-study method tends to be limited to the study of the atypical individual or situation, while the genetic method is more generally concerned with the study of normal life processes. Both methods are used to analyze cause-and-effect relationships, although in some instances the genetic method may be devoted primarily to developmental norms.

Although some educational geneticists disclaim any interest in cause-and-effect relationship and maintain that their sole function in the conduct of genetic studies is to record developmental changes over a considerable period of time, this is a limited concept of the possibilities of the genetic approach. Without minimizing the importance of the normative function of the genetic method, which has been discussed in Chapter VIII, the authors may insist that this procedure be employed in the study of cause-and-effect relationship. The situation referred to is similar to that found in the field of history where many historians also insist that their sole function is that of preparing a faithful record of past events, and that it is the duty of some other group to make the appropriate applications of these facts to present-day problems and conditions. This position may be defensible from a technical point of view, but it is subject to two very definite limitations. In the first place, if such records are to be employed in a practical way, they must contain the information needed in solving present and future problems. It is only by identifying the problems of the present and imagining the problems of the future that the historians or geneticists may choose those facts of most worth from the abundance of materials at their disposal. There is considerable discussion in the field of genetic psychology at the present time, for example, about records and what type of information should be collected. The answer to such questions about records will be found, if the data are to be col-

lected for some practical purpose either present or future, only by the careful study of the uses to which these facts may be put. A second limitation of the "faithful-record" concept of genetic psychology or education is that we dare not entrust the generalization of genetic data to those not trained in genetic methods, to persons who lack acquaintance with the data themselves.

In the literature of education and psychology one finds ample evidence that many geneticists have concerned themselves, not merely with the "record" aspects of their field, but with important cause-and-effect relationships. A review [73] of 433 studies in the field of mental and physical development, dealing with mental growth from birth to puberty, mental and physical development in adolescence, physical growth from birth to puberty, and relationships in physical and mental development, includes many genetic investigations extending over a period of years and reveals attempts to deduce causal relationships from these developmental studies, for example, between: environment and growth of intelligence, heredity and mental development, race and mental growth, sex and growth. dentition and growth, and between various anatomical, physiological, motor and metabolic factors. Gesell uses as a subtitle for his book, *The Mental Growth of the Pre-School Child*, the highly significant phrase, "A System of Developmental Diagnosis." [74] Although the volume abounds with normative data, Gesell appears always to be thinking about the *use* of the data, and in the fourth and final part of his study he finally introduces an extended discussion of developmental diagnosis. Without minimizing the preparation of accurate records of biological events, because these data are, after all, the foundation of all genetic consideration of such phenomena, the authors wish to emphasize the importance of the genetic method in the study of

73 G. D. Stoddard and Others, "Mental and Physical Development," *Review of Educational Research*, III (April, 1933), 81-181.
See also G. D. Stoddard and Others, "Mental and Physical Development," *Review of Educational Research*, VI (February, 1936), 1-152. Includes 631 references.

74 Arnold Gesell, *The Mental Growth of the Pre-School Child*. New York: The Macmillan Co., 1925. Pp. x + 447.

cause-and-effect relationships and in developmental diagnosis. In this latter emphasis will be found a fundamental unity which characterizes the various methods of research discussed in this chapter.

Two types of the genetic method. In the first place, the genetic method may be used in the repeated observation or measurement of the same child or the same group of children over a period of years. In following the same child, the investigation becomes an extended case study, as it were. In the second instance (with a group of children), the study may become a series of parallel case studies, not conducted so much to understand the individual case as to discover common likenesses and differences among particular classes of children. In each of these instances the genetic method may serve a variety of purposes: to secure a faithful record of past biological events in the developmental history of individuals or groups; to discover cause-and-effect relationships, principles of development, and common likenesses and differences in the developmental history of individuals or groups of persons; to determine changes in interests, capacities, and abilities from one age level to another for either individuals or groups of persons; and to secure age-grade norms of development for groups of children. In the attainment of these purposes the genetic approach may employ a variety of other methods of research: the historical, the normative-survey, the experimental, the causal-comparative, the case, and the correlation methods, but in so doing it maintains its position as a distinct method of research by reason of its purpose, pattern of organization, and total structure of methodology.

In reality, a limited number of investigations have followed the *individual* child over a period of years, although such a procedure is of great value and is being applied increasingly in the laboratories and clinics for child study. A more common type of genetic study in the past has been to compare simultaneously the stage of development reached by different age-groups of children. The possibility for erroneous conclusions

in attempting to identify genetic stages of development by using different age-groups of children at the same time may be illustrated. For example, it is known that the so-called adolescent spurt of growth in height does not commence in all children at the same age.[75]

> In girls the usual time falls between the ages of eleven and fourteen. Some girls aged thirteen years will be in the midst of the rapid growth period, while others will not have entered it, and still others will have passed beyond it. To take the average increment and say that it is typical for thirteen-year-old girls is misleading. A preadolescent girl should be expected to have a much smaller increment of growth than one who is passing through the period of most rapid growth. Mental growth is no doubt characterized by similar, but subtler complications.

Though it is true that with the more common cross-sectional method of selecting a sampling, trends between groups may be studied, the longitudinal approach,[76] "whereby children are brought in for repeated measurements or experiments over a long period of time, holds certain values which are lost in the cross-sectional scheme. The longitudinal or genetic approach simplifies the statistical problems immensely and may result in certain unique discoveries."

In addition to standardized tests of various types, some ingenious techniques of measurement and recording have been developed for the use of investigators who are studying growth, especially in the field of physical development: stereoscopic photographs, measurement of the mass of the body and its segments by water displacement, X-rays, etc.[77]

Examples of genetic studies. Among the studies dealing with mental and physical development summarized in the *Review of Educational Research,* specific mention may be made of the works of Terman, Gesell, and Baldwin, which provide

75 G. D. Stoddard and Others, *op. cit.*, p. 85.

76 G. D. Stoddard, "Methods of Research in Child Psychology," in "Methods and Technics of Educational Research," p. 70, *Review of Educational Research,* IV (February, 1934), 1-119.

77 G. D. Stoddard and Others, "Mental and Physical Development," *Review of Educational Research,* III (April, 1933), 81-181.

good illustrations of the genetic type of investigation.[78] In certain respects these are also case studies.

This type of research may be made more realistic by reviewing briefly the Stanford *Genetic Studies of Genius*. This series of investigations illustrates effectively the way in which a number of research methods may be combined to accomplish a given purpose. In these genetic studies, data were secured through historical, normative-survey, causal-comparative, correlation, and case procedures, as parts of the total genetic approach, and applied to developmental and growth problems.

First Illustration [79]

The purpose of the study was to determine the traits which characterize children of marked intellectual ability. The gifted children were selected on the basis of nomination and tests, the work being carried out with great care and thoroughness by a staff of trained assistants. As the expense involved made it necessary to confine the selection to the largest cities, the gifted children were distinctly of the urban type. A staff of trained workers administered physical and mental tests, made medical examinations, and secured character and personality ratings for gifted children and a control group. The net result was that the gifted children equaled or excelled the normal control group in physical growth and general health as well as in the various scholastic and social ratings. In brief, the gifted child appears to be an all-round individual, contrary to the common opinion that intellectual precocity goes with physical defect and social instability.

Second Illustration [80]

This book describes the methods, and presents the findings, of an attempt to estimate the I.Q.'s of three hundred geniuses born between

78 B. T. Baldwin, *The Physical Growth of Children from Birth to Maturity*. University of Iowa Studies in Child Welfare, Vol. I, No. 1. Iowa City, Iowa: University of Iowa, 1921. Pp. 412.

Arnold Gesell and Others, *An Atlas of Human Behavior*, Vols. I and II. New Haven, Conn.: Yale University Press, 1934. Pp. 922.

Arnold Gesell, *Infancy and Human Growth*. New York: The Macmillan Co., 1928. Pp. 418.

L. M. Terman and Others, *Genetic Studies of Genius*, Vols. I, II, III. Stanford, Calif.: Stanford University Press, 1925, 1926, 1930. Pp. 648, 842, 508.

79 Lewis M. Terman and Others, *Genetic Studies of Genius*, Vol. I. Stanford University, Calif.: Stanford University Press, 1925. Pp. xvi + 648. The present summary statement is adapted from a review by K. J. Holzinger, *Elementary School Journal*, XXVI (January, 1926), 387-90.

80 Catharine Morris Cox, *Genetic Studies of Genius*, Vol. II. Stanford University, Calif.: Stanford University Press, 1926. Pp. xxiv + 842. The present summary statement is adapted from a review by C. S. Hobson, *School Review*, XXXV (April, 1927), 316-8.

1450 and 1849. The biographies of the geniuses selected for the study were searched for early indications of superior mental ability and for significant environmental influences. Two periods in the life of each subject were studied: (1) childhood and youth to the age of seventeen and (2) early manhood or womanhood from the age of seventeen to the age of twenty-six. The social standing of other members of the family and the early activities of the subject himself were considered significant in rating the genius. His performance as represented by the data in his biographies was compared by each of four judges with the age norms of the Stanford-Binet test. From such a comparison, the I.Q. that would most reasonably account for the early activities disclosed by the biographies was determined for each of the two periods in the life of the genius. The editor explains that the I.Q.'s thus found belong to the biographical data rather than to the subject.

To secure an estimate of the I.Q. of the subject, the author considered the reliability of the data, the reliability of the age norms of the Stanford-Binet test, and the reliability of the individual judges. Reliability was based on only partly objective standards. Coefficients of reliability were computed mathematically. The two I.Q.'s ascribed to the data on any particular genius were then corrected by the use of the coefficients of reliability, and a "Corrected I.Q. Estimate" was made for him.

A sampling of one hundred subjects was taken for a special study of the significant environmental influences on the character traits of geniuses. Each subject was rated on sixty-seven character traits. Each trait was made explicit by a brief description. A reliability coefficient of the ratings on the character traits was calculated for each subject. A comparison of ratings with I.Q.'s was made to determine the significance of traits of character other than brightness in accounting for genius.

The first 219 pages of the book are devoted to an analysis of the problem, a description and justification of the methods used, descriptions of the subjects chosen, explanations of the statistical procedures involved, and a presentation in full of the findings. The remainder of the book is devoted to brief case studies of all the subjects, "A Case Study in Full," "Excerpts from the Early Writings of Young Geniuses," and the indexes.

THIRD ILLUSTRATION [81]

The volume is divided into three parts. Part I reports the results of a second survey of the thousand children described in Volume I;

[81] Barbara Stoddard Burks, Dortha Williams Jensen, and Lewis M. Terman, *Genetic Studies of Genius*, Vol. III (The Promise of Youth: Follow-Up Studies of a Thousand Gifted Children). Stanford University, Calif.: Stanford University Press, 1930. Pp. xiv + 508. The present summary statement is adapted from a review by Margaret Cobb, *Elementary School Journal*, XXXI (April, 1931), 628-9.

Part II consists of case studies, accounts of individual children which illustrate their possibilities under different conditions; Part III deals with the literary ability of some members of the group who from an early age have been interested in writing.

The first two chapters in Part I explain the tests and procedures used. The chapters following deal with intelligence; educational progress and achievement; school marks and honors; scholastic and vocational interests; social, personality, health and home tests and ratings; family statistics; and follow-up reports of the original high-school and special-ability groups.

Part II consists of a series of fascinating case studies, illustrating cases of brilliant school achievement; drop in intelligence and in school achievement; reactions to various degrees of acceleration in school; effect of high intelligence on social relations of children; and the conquering of, or failure to conquer, environmental difficulties by children of superior endowment. There are also included case studies of twins and of siblings, both like and unlike in their high intelligence; of children who presented problems of behavior and personality, including one youthful suicide; of children of great musical ability; of young collectors and scientists; a babyhood study; and other high lights.

Part III is an interesting application of the methods of the study reported in Volume II (The Early Mental Traits of Three Hundred Geniuses) to a study of the best literary productions of these California children. In this connection it was found necessary to make a rating scale for judging superior juvenile writings. By use of this scale the youthful writings of various great writers from Milton to Holmes were rated along with the best of those of the California young people. Seven of the California children (all girls) and twenty-five of twenty-eight great writers had, as children, produced highly superior work. The scale itself is presented with sample passages and the ratings given them, and it is followed by case studies of the seven girls and of the ten great writers whose early lives had not been included in Volume II. No other characteristic of these young writers could be said to predict ability to write, actual accomplishment in writing being the only reliable predictive measure.

It is suggested that another survey be made ten years hence. Much might be learned from a survey once every ten years during the lifetimes of these California children whose "promise of youth" is now so thoroughly on record. We need to know what portion of it will be fulfilled and how much more nearly it might have been fulfilled under wiser treatment in home and school.

Concluding statement. It has been the purpose of this chapter to discuss a number of the methods of educational research

which are particularly adapted to the analysis of complex causal relationships. These are the causal-comparative, correlation, case-study, and genetic methods. They present new and important procedures for studying educational problems. These methods are particularly useful in the investigation of phenomena under uncontrolled conditions and hence are peculiarly fitted for the study of problems in biology, psychology, economics, sociology, and education. The causal-comparative method starts with observed effects and seeks to determine the causal factors involved. It compares different situations by noting the factors which are present in those instances that produce a given result, and which are absent in other situations that fail to produce this result. The correlation method makes it possible to approach the problems of complex causal relationships in terms of degrees of both the contributing factors and the resulting or dependent factors. It enables the investigator to deal with a number of variables at the same time rather than to be limited by the law of the single variable as in experimental work. Although the case-study procedure was developed to investigate individual cases, it may be used in the analysis of general phenomena or conditions pertaining to a given class or group. The case-study method, when systematically applied to the analysis of general phenomena, has certain advantages over the other research procedures and may make important contributions to the science of education. The genetic method is important in that it presents longitudinal or developmental views of biological aspects of education. It is significant that a recent text in psychology [82] is written from the genetic point of view, covering the behavior of human beings from the prenatal period to old age, and that an important body of research studies [83] dealing with the developmental aspects of even the prenatal period has accumulated.

[82] Florence L. Goodenough, *Developmental Psychology:* An Introduction to the Study of Human Behavior. New York: D. Appleton-Century Co., 1934. Pp. xvii + 619.

[83] Carl Murchison, ed., *A Handbook of Child Psychology.* (Second edition, revised, 1933.) Worcester, Mass.: Clark University Press, 1931. Pp. 712. Pp. xii + 956. Extensive bibliographies and summaries of the literature in this field. A discussion of the genetic method in psychology with special reference to prenatal life may be found on pp. 31-5.

Problems and Exercises

1. Select one example of each type of research described in this chapter, with a date of publication not more than two years old at the time this exercise is undertaken, and describe the problems and procedures briefly.
2. Choose one of the studies used in the preceding exercise and evaluate it in terms of the principles developed in this chapter.
3. Select some important group of genetic studies, such as those directed by Terman at Stanford or by Gesell at Yale, and identify the different research procedures employed as phases of the genetic approach.
4. Select a problem which might well be attacked by the causal-comparative method, and outline briefly an appropriate research procedure for dealing with it.
5. Examine three simple (zero order) correlations in different studies (such as in the illustrative material at the end of the chapter), and attempt to analyze the two traits that are correlated in each case, in order: (1) to determine what factors may lie back of the traits used so as to be responsible for (increasing, or lowering) the correlation between the traits, and (2) to determine whether there is any justification for regarding one trait as in part the cause of the other, and why.
6. The various research methods recognized in this text have now all been presented. Examine six theses (presumably those on file in your institution) to see what method or methods have been used in each case, and classify the various studies on the basis of the predominant method, describing the study enough to justify your classification.

Selected References †

1. THE CAUSAL-COMPARATIVE METHOD

a. General References

Almack, J. C. *Research and Thesis Writing:* A Textbook on the Principles and Techniques of Thesis Construction for the Use of Graduate Students in Universities and Colleges, Chapter VIII. Boston: Houghton Mifflin Co., 1930. Pp. xviii + 310.

* Barr, A. S. *An Introduction to the Scientific Study of Classroom Supervision,* Chapter IV. New York: D. Appleton and Co., 1931. Pp. xxv + 399.

* Fowler, Thomas. *The Elements of Inductive Logic.* (Third edition, corrected and revised.) Oxford: The Clarendon Press, 1876. Pp. xxvii + 360.

† See also the footnotes in this chapter.

* McCALL, William A. *How to Experiment in Education,* Chapters IX-X. New York: Macmillan Co., 1923. Pp. xiv + 281.

* MILL, John Stuart. *A System of Logic, Ratiocinative and Inductive:* Being a Connected View of the Principles of Evidence and Methods of Scientific Investigation. London: Longmans, Green and Co., 1884. Pp. xvi + 622.

ROBINSON, Daniel Sommer. *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method. New York: D. Appleton and Co., 1930. (Second edition.) Pp. xviii + 393.

THOMAS, Dorothy Swaine, LOOMIS, Alice M., and ARRINGTON, Ruth E. *Observational Studies of Social Behavior,* I. New Haven, Conn.: Institute of Human Relations, Yale University, 1933. Pp. xvii + 271.

* WESTAWAY, F. W. *Scientific Method: Its Philosophical Basis and Its Modes of Application.* (Fourth edition, revised and enlarged.) London: Blackie and Son, Ltd., 1931. Pp. xviii + 522.

b. Illustrative Materials

BAKER, H. J. *Characteristic Differences in Bright and Dull Pupils:* An Interpretation of Mental Differences, with Special Reference to Teaching Procedures. Bloomington, Ill.: Public School Publishing Co., 1927. Pp. viii + 118.

BARR, A. S. *Characteristic Differences in the Teaching Performance of Good and Poor Teachers of the Social Studies.* Bloomington, Ill.: Public School Publishing Co., 1929. Pp. viii + 127.

BOYNTON, Paul L., and MCGAW, Bonnie H. "The Characteristics of Problem Children," *Journal of Juvenile Research,* XVIII (October, 1934), 215-22.

BROWN, A. W. *The Unevenness of Abilities in Dull and Bright Children.* Teachers College Contributions to Education, No. 220. New York: Teachers College, Columbia University, 1926. Pp. vii + 112.

CARROLL, Herbert A. "Generalization of Bright and Dull Children: A Comparative Study with Special Reference to Spelling," *Journal of Educational Psychology,* XXI (October, 1930), 489-99.

FREEMAN, Frank N., and Others. *The Handwriting Movement:* A Study of the Motor Factors of Excellence in Penmanship. Supplementary Educational Monographs, Vol. II, No. 3. Chicago: University of Chicago Press, 1918. Pp. xvi + 169.

FLEMMING, Cecile White. *A Detailed Analysis of Achievement in the High School:* Comparative Significance of Certain Mental, Physical, and Character Traits for Success. Teachers College Contributions to Education, No. 196. New York: Teachers College, Columbia University, 1925. Pp. xi + 209.

HEIDBREDER, E. F. "Problem Solving in Children and Adults," *Journal of Genetic Psychology,* XXXV (December, 1928), 523-45.

MEAD, A. R. "Qualities of Merit in Good and Poor Teachers," *Journal of Educational Research,* XX (November, 1929), 239-59.

MORRIS, E. H. *Personal Traits and Success in Teaching.* Teachers College Contributions to Education, No. 342. New York: Teachers College, Columbia University, 1929. Pp. 75.

OBRIEN, Francis P. *The High School Failures:* A Study of the School Records of Pupils Failing in Academic or Commercial High School Subjects. Teachers College Contributions to Education, No. 102. New York: Teachers College, Columbia University, 1919. Pp. vii + 97.

PRESSEY, L. C. "What Are the Crucial Differences Between Good and Poor Students?" *Research Adventures in University Teaching*, pp. 4-10. Bloomington, Ill.: Public School Publishing Co., 1927.

REAVIS, George H. *Factors Controlling Attendance in Rural Schools.* Teachers College Contributions to Education, No. 108. New York: Teachers College, Columbia University, 1920. Pp. 69.

SANGREN, P. V. "Social Rating of Best and Poorest High School Students," *Journal of Educational Psychology,* XIV (April, 1923), 209-14.

SHANNON, J. R. *Personal and Social Traits Requisite for High Grade Teaching in Secondary Schools.* Terre Haute, Ind.: State Normal Press, 1928. Pp. 112.

STONE, C. W. *Arithmetical Abilities and Some Factors Determining Them.* Teachers College Contributions to Education, No. 19. New York: Teachers College, Columbia University, 1908. Pp. 101.

TURNEY, A. H. *Factors Other Than Intelligence Which Affect Success in High School.* Minneapolis: University of Minnesota Press, 1920. Pp. 135.

UPSHALL, C. C., and MASTERS, Harry V. "Differences between Good and Poor Students Chosen on the Basis of College Entrance Test Scores," *Educational Administration and Supervision,* XIX (October, 1933), 507-10.

VAN DENBURG, Joseph K. *Causes of the Elimination of Students in Public Secondary Schools of New York City.* Teachers College Contributions to Education, No. 47. New York: Teachers College, Columbia University, 1911. Pp. iv + 206.

WATSON, Gladys H. *An Exploration of Some Possible Areas of Difference between Students for Whom Predictions for Outstanding Success or Failure Are Made.* New York: Teachers College, Columbia University, 1931. Pp. 99.

WILSON, F. T. *Learning of Bright and Dull Children.* Teachers College Contributions to Education, No. 292. New York: Teachers College Columbia University, 1928. Pp. 56.

2. THE CORRELATION METHOD

a. General References

DUNLAP, Jack W., and CURETON, Edward E. "On the Analysis of Causation," *Journal of Educational Psychology,* XXI (December, 1930), 657-80.

* EZEKIEL, Mordecai. *Methods of Correlation Analysis.* New York: John Wiley and Sons, Inc., 1930. Pp. xiv + 427.

FISHER, R. A. *Statistical Methods for Research Workers.* (Fourth edition, revised and enlarged.) Edinburgh: Oliver and Boyd, 1932. Pp. 307.

* GARRETT, Henry E. *Statistics in Psychology and Education.* New York: Longmans, Green and Co., 1926. Pp. 317.

* HOLZINGER, Karl J. *Statistical Methods for Students in Education.* Boston: Ginn and Co., 1928. Pp. viii + 372.

HULL, Clark L. *Aptitude Testing.* Yonkers-on-Hudson, N. Y.: World Book Co., 1928. Pp. xiv + 535.

KELLEY, Truman L. *Statistical Method.* New York: The Macmillan Co., 1923. Pp. xi + 390.

* ODELL, Charles W. *Statistical Method in Education.* New York: D. Appleton-Century Co., 1935. Pp. xx + 457.

OTIS, Arthur S. *Statistical Method in Educational Measurement.* Yonkers-on-Hudson, N. Y.: World Book Co., 1925. Pp. xi + 337.

RIETZ, Henry Lewis, and Others. *Handbook of Mathematical Statistics.* Boston: Houghton Mifflin Co., 1924. Pp. viii + 221.

——— *Mathematical Statistics.* The Carns Mathematical Monographs, published for the Mathematical Association of America. Chicago, Illinois: Open Court Publishing Co., 1927. Pp. xi + 181.

YULE, G. U. *An Introduction to the Theory of Statistics.* (Tenth edition, revised.) London: Charles Griffin and Co., 1932. Pp. xv + 434.

b. Illustrative Materials

CARROTHERS, G. E. *The Physical Efficiency of Teachers.* Teachers College Contributions to Education, No. 155. New York: Teachers College, Columbia University, 1924. Pp. 72.

CLEM, Orlie. *Detailed Factors in Latin Prognosis.* Teachers College Contributions to Education, No. 144. New York: Teachers College, Columbia University, 1924. Pp. v + 52.

COXE, Warren W., and CORNELL, Ethel L. *The Prognosis of Teaching Ability of Students in New York State Normal Schools.* University of the State of New York Bulletin. Albany: University of the State of New York Press, 1934. Pp. 63.

ENGELHARDT, Fred. *Forecasting School Population.* New York: Teachers College, Columbia University, 1925. Pp. x + 67.

FLANNAGAN, John C. *Factor Analysis in the Study of Personality.* Stanford University, Calif.: Stanford University Press, 1935. Pp. 103.

FLEMMING, E. G. *Predictive Value of Certain Tests of Emotional Stability as Applied to College Freshmen.* Archives of Psychology, No. 96. New York: Columbia University, 1928. Pp. 61.

GATES, A. I. "Correlations of Achievement in School Subjects with Intelligence Tests, and Other Variables," *Journal of Educational Psychology,* XIII (March, April, May, 1922), 129-39, 223-35, 277-85.

JACOBS, C. L. *The Relation of the Teacher's Education to Her Effectiveness.* Teachers College Contributions to Education, No. 277. New York: Teachers College, Columbia University, 1928. Pp. 97.

KNIGHT, F. B. *Qualities Related to Success in Teaching.* Teachers College Contributions to Education, No. 120. New York: Teachers College, Columbia University, 1923. Pp. 67.

KRIEGER, Laura B. M. *Prediction of Success in Professional Courses for Teachers.* Teachers College Contributions to Education, No. 420. New York: Teachers College, Columbia University, 1930. Pp. 77.

KRINER, Harry L. *Pre-Training Factors Predictive of Teacher Success.*

Penn State Studies in Education, No. 1. State College, Pennsylvania: School of Education, Pennsylvania State College, 1931. Pp. 91.

LEAHY, Alice M. "A Study of Certain Selective Factors Influencing Prediction of the Mental Status of Adopted Children," *Journal of Genetic Psychology*, XLI (December, 1932), 294-329.

LINE, W., and GLEN, J. S. "Some Relationships between Intelligence and Achievement in the Public School," *Journal of Educational Research*, XXVIII (April, 1935), 582-8.

MORRIS, Elizabeth H. *Personal Traits and Success in Teaching*. Teachers College Contributions to Education, No. 342. New York: Teachers College, Columbia University, 1929. Pp. 75.

OATES, D. W. "Relation of Temperament and Intelligence to Scholastic Ability," *Forum of Education*, VII (November, 1929), 171-85.

ODELL, Charles W. *Predicting the Scholastic Success of College Freshmen*. University of Illinois Bulletin, Vol. XXV, No. 2. Bureau of Educational Research Bulletin, No. 37. Urbana, Ill.: University of Illinois, 1927. Pp. 54.

ROGERS, Agnes Low. *Experimental Tests of Mathematical Ability and Their Prognostic Value*. Teachers College Contributions to Education, No. 89. New York: Teachers College, Columbia University, 1918. Pp. v + 118.

SEGEL, David. *Differential Diagnosis of Ability in School Children*. Baltimore: Warwick and York, 1934. Pp. vii + 86.

SOMERS, G. T. *Pedagogical Prognosis:* Predicting the Success of Prospective Teachers. Teachers College Contributions to Education, No. 140. New York: Teachers College, Columbia University, 1923. Pp. ix + 129.

ST. JOHN, C. S. *Educational Achievement in Relation to Intelligence*. Cambridge: Harvard University Press, 1930. Pp. xiv + 219.

TERMAN, L. M., and Others. *Nature and Nurture*. Part I, Their Influence upon Intelligence; Part II, Their Influence upon Achievement. Twenty-seventh Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. x + 460, xv + 353.

TIEGS, E. W. *An Evaluation of Some Techniques of Teacher Selection*. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. 108.

TYLER, H. T. *Bearing of Certain Personality Factors Other than Intelligence on Academic Success*. Teachers College Contributions to Education, No. 468. New York: Teachers College, Columbia University, 1931. Pp. 89.

ULLMAN, Roy R. *The Prognostic Value of Certain Factors Related to Teaching Success*. Ashland, Ohio: A. L. Garber Co., 1931. Pp. xiv + 133.

WHITNEY, F. L. "The Analysis of Teaching Functions," *Journal of Educational Research*, VII (April, 1923), 297-308.

——— *The Prediction of Teaching Success*. Journal of Educational Research Monograph, No. 6. Bloomington, Ill.: Public School Publishing Co., 1924. Pp. 85.

3. THE CASE-STUDY METHOD

a. General References

BARR, A. S. "The Case Study in Education," *Journal of Educational Research*, XXII (June, 1930), 59-60.

BOGARDUS, E. S. *The New Social Research*. Los Angeles: Jesse Ray Miller, 1926. Pp. 287. Chapters VI and VII deal with the life history and life-history types respectively.

* BRUECKNER, L. J., and Others. *Educational Diagnosis*. Thirty-fourth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1935. Pp. x + 524.

BUCKINGHAM, B. R. "A Book of Cases," *Journal of Educational Research*, III (January, 1921), 61-3.

BURGESS, Ernest W. "What Social Case Records Should Contain to Be Useful for Sociological Interpretation," *Social Forces*, VI (June, 1928), 524-32.

——— "Statistics and Case Studies as Methods of Sociological Research," *Sociology and Social Research*, XII (November-December, 1927), 99-120.

CAVAN, Ruth S. "Interviewing for Life History Material," *American Journal of Sociology*, XXXV (July, 1929), 100-15.

* CHAPIN, F. S. *Field Work and Social Research*, Chapter IV. New York: The Century Co., 1920.

COLCORD, Joanna C., and Others. "The Social Case Work Interview," *Social Forces*, VII (June, 1929), 519-33.

CRAWFORD, C. C. *The Technique of Research in Education*, Chapter V. Los Angeles: University of Southern California, 1928.

ELIOT, Thomas D. "Objectivity and Subjectivity in the Case Record," *Social Forces*, VI (June, 1928), 539-44.

* ELLWOOD, C. A. *Methods in Sociology—A Critical Study*. Durham, N. C.: Duke University Press, 1933. Pp. xxxiv + 214.

FRASER, C. E., and Others. *The Case Method of Instruction*. New York: McGraw-Hill Book Co., 1933. Pp. x + 166.

* GIDDINGS, Franklin Henry. *The Scientific Study of Human Society*, Chapter VI. Chapel Hill, N. C.: University of North Carolina Press, 1924. Pp. vii + 247.

GUY, J. Freeman. "Diagnosing Individual Cases," *Journal of Educational Research*, X (September, 1924), 101-9.

HAGGERTY, M. E. "The Incidence of Undesirable Behavior in Public-school Children," *Journal of Educational Research*, XII (September, 1925), 102-22.

HARPER, E. B. "The Case Study Method," *Religious Education*, XXII (May, 1927), 505-12.

HEALY, William. "The Contribution of Case Studies to Sociology," *Publications of the American Sociological Society*, XVIII (1923), 147-55.

* ———, and Bronner, Augusta F. *Delinquents and Criminals: Their Making and Unmaking*. New York: The Macmillan Co., 1926. Pp. viii + 327.

JOCHER, Katherine. "The Case Method in Social Research," *Social Forces*, VII (December, 1928), 203-11.

KULP, Daniel H. "The Case Group in Educational Sociology," *Journal of Applied Sociology*, XI (November-December, 1926), 108-13.

LUNDBERG, George A. "Case Work and Statistical Methods," *Social Forces*, V (September, 1926), 61-5.

——— *Social Research:* A Study in Methods of Gathering Data. New York: Longmans, Green and Co., 1929. Pp. xii + 380.

MAXFIELD, Francis N. "The Case Study," *Educational Research Bulletin*, IX (March 5, 1930), 117-22.

NORTON, Margaret A. "The Case Method in Education," *Junior-Senior High School Clearing House*, V (September, 1930), 39-42.

* ODUM, Howard W., and JOCHER, Katherine. *An Introduction to Social Research*, Chapter XV. New York: Henry Holt and Co., 1929. Pp. xiv + 488.

PORTERFIELD, A. L. "Imagination in Social Research," *Sociology and Social Research*, XX (January-February, 1936), 219-28.

* RICE, S. A., and Others. *Methods in Social Science*. Chicago: University of Chicago Press, 1931. Pp. xiv + 822. See the index for numerous page references on the case method.

* RICHMOND, Mary E. *Social Diagnosis*. New York: Russell Sage Foundation, 1917. Pp. 511.

SALSBERRY, Pearl. "Techniques in Case Work," *The Family*, VIII (July, 1927), 153-7.

SHAW, Clifford R. "Case Study Method," *Publications of the American Sociological Society*, XXI (1927-1928), 149-57.

SHEFFIELD, Ada Eliot. *The Social Case History:* Its Constitution and Content. New York: Russell Sage Foundation, 1920. Pp. 227.

STEPHAN, F. F. "Training for Research in Social Welfare," *Journal of Educational Sociology*, IX (January, 1936), 284-90.

SWIFT, Linton B. "Can the Sociologist and Social Worker Agree on the Content of Case Records?" *Social Forces*, VI (June, 1928), 535-8.

TODD, A. J. "Common Ground in Social Case Work," *Social Forces*, VIII (June, 1930), 550-7.

TRABUE, M. R. "Occupational Diagnoses for Educational Programs," *Journal of Educational Research*, XXIX (January, 1936), 327-31.

WHITNEY, R. L. "The Case Study as a Method of Research." Unpublished Doctor's thesis. New York: New York University, 1931.

WILLIAMS, J. Harold, and Others. *Whittier Social Case History Manual*. Bulletin, No. 10. Whittier, Calif.: California Bureau of Juvenile Research, 1921. Pp. 98.

YOUNG, E. F. "The Scientific Study of Social Case Histories," *Sociology and Social Research*, XIV (March-April, 1930), 358-64.

——— "The Scientific Study of Social Case Records," *Journal of Applied Sociology*, IX (March-April, 1925), 283-9.

* YOUNG, Pauline V. *Interviewing in Social Work:* A Sociological Analysis. New York: McGraw-Hill Book Co., 1935. Pp. xvi + 416.

b. Illustrative Materials

BREWER, J. M., and Others. *Case Studies in Educational and Vocational Guidance.* Boston: Ginn and Co., 1926. Pp. xxiv + 243.

——— *Cases in the Administration of Guidance.* New York: McGraw-Hill Book Co., 1929. Pp. 304. A book of 149 cases dealing with the administration of educational and vocational guidance; includes a chapter on the case method.

BUCKNER, Chester A. *Educational Diagnosis of Individual Pupils.* Teachers College Contributions to Education, No. 98. New York: Teachers College, Columbia University, 1919. Pp. ix + 93.

BUSWELL, G. T., and JOHN, Lenore. *Diagnostic Studies in Arithmetic.* Supplementary Educational Monographs, No. 30. Chicago: University of Chicago Press, 1926. Pp. xiii + 212.

COY, Genevieve L. "The Mentality of a Gifted Child," *Journal of Applied Psychology,* II (December, 1918), 299-307.

FURFEY, P. H. *The Growing Boy.* New York: The Macmillan Co., 1930. Pp. viii + 192. A study of the personality of boys between six and sixteen years of age, based on intensive case studies.

GATES, Arthur I. *The Psychology of Reading and Spelling:* With Special Reference to Disability. Teachers College Contributions to Education, No. 129. New York: Teachers College, Columbia University, 1922. Pp. vii + 108.

GRAY, William Scott. *Remedial Cases in Reading:* Their Diagnosis and Treatment. Supplementary Educational Monographs, No. 22. Chicago: University of Chicago Press, 1922. Pp. viii + 208.

HOLLINGWORTH, Leta S. *Special Talents and Defects.* New York: The Macmillan Co., 1923. Pp. xx + 216.

———, and WINFORD, C. Amelia. *The Psychology of Special Disability in Spelling.* Teachers College Contributions to Education, No. 88. New York: Teachers College, Columbia University, 1918. Pp. vi + 105.

Judge Baker Foundation, *Case Studies.* Boston: Judge Baker Foundation, 1922-1923.

MORGAN, J. B. *The Psychology of the Unadjusted School Child.* New York: The Macmillan Co., 1926. Pp. xi + 300.

OWENS, Albert Alexander. The Behavior-Problem Boy: A Socio-Educational Survey. Philadelphia: University of Pennsylvania, 1929. Pp. 188.

PAYNTER, Richard H., and BLANCHARD, Phyllis. *A Study of the Educational Achievement of Problem Children.* New York: Commonwealth Division of Publications, 1929. Pp. x + 72.

REAVIS, William Claude. *Pupil Adjustment in Junior and Senior High Schools.* Boston: D. C. Heath and Co., 1926. Pp. xviii + 348.

RICHMOND, Winifred. *The Adolescent Girl.* New York: The Macmillan Co., 1925. Pp. xvi + 212.

SAYLES, Mary B. *The Problem Child at Home.* New York: Commonwealth Fund, 1928. Pp. x + 342.

——— *The Problem Child in School.* New York: Commonwealth Fund, 1925. Pp. 288.

SHAW, Clifford, and Others. *Delinquency Areas:* A Study of the Geo-

graphic Distribution of School Truant, Juvenile Delinquents, and Adult Offenders in Chicago. Chicago: University of Chicago Press, 1929. Pp. xxi + 214.

SMITHIES, Elsie M. *Case Studies of Normal Adolescent Girls*. New York: D. Appleton and Co., 1933. Pp. x + 284. Chapter I deals with the technique of case work, and other chapters report detailed case studies of individual girls.

SYMONDS, Percival M. *Special Disability in Algebra*. Teachers College Contributions to Education, No. 132. New York: Teachers College, Columbia University, 1923. Pp. vii + 89.

VAN ALSTYNE, Dorothy. "A Study of Ten Gifted Children Whose School Progress Was Unsatisfactory," *Journal of Educational Research*, VIII (September, 1923), 122-35.

WILLIAMS, H. D. *Causes of Social Maladjustment in Children*. Psychological Review Monographs, Vol. XLIII, No. 1. Princeton, N. J.: The Psychological Review Co., 1932. Pp. 276-300.

ZACHRY, Caroline B. *Personality Adjustments of School Children*. New York: Charles Scribner's Sons, 1929. Pp. xiii + 306.

4. THE GENETIC METHOD

a. General References

BUEHLER, Charlotte. *Testing Children's Development from Birth to School Age*. New York: Farrar and Rinehart, 1935. Pp. 191.

GESELL, Arnold. *The Guidance of Mental Growth in Infant and Child*. New York: The Macmillan Co., 1930. Pp. xii + 322.

* ——— *The Mental Growth of the Pre-School Child:* A Psychological Outline of Normal Development from Birth to the Sixth Year, Including a System of Developmental Diagnosis. New York: The Macmillan Co., 1925. Pp. x + 447.

* GOODENOUGH, Florence L. *Developmental Psychology:* An Introduction to the Study of Human Behavior, pp. 3-26. New York: D. Appleton-Century Co., 1934.

———, and ANDERSON, J. E. *Experimental Child Study*. New York: The Century Co., 1931. Pp. 546.

* JERSILD, A. T., and Others. *Training and Growth in the Development of Children*. Child Development Monographs, No. 10. New York: Teachers College, Columbia University, 1932. Pp. 73.

KOFFKA, Kurt. *The Growth of the Mind: An Introduction to Child Psychology*, pp. 1-37. Translated by Robert Morris Ogden. New York: Harcourt, Brace and Co., 1927.

* MURPHY, Gardner, and MURPHY, Lois B. *Experimental Social Psychology*, pp. 1-40. New York: Harper and Bros., 1931.

* STODDARD, G. D., and WELLMAN, Beth L. *Child Psychology*, Chapter II. New York. The Macmillan Co., 1934.

b. Illustrative Materials

BALDWIN, Bird T. *The Physical Growth of Children from Birth to Maturity*. University of Iowa Studies in Child Welfare, Vol. 1, No. 1. Iowa City: University of Iowa, 1921. Pp. 411.

——, and STECKER, Lorle I. *Mental Growth Curve of Normal and Superior Children Studied by Means of Consecutive Intelligence Examinations.* University of Iowa Studies in Child Welfare, Vol. II, No. 1. Iowa City: University of Iowa, 1922. Pp. 61.

BROOKS, F. D. *Changes in Mental Traits With Age.* Teachers College Contributions to Education, No. 116. New York: Teachers College, Columbia University, 1921. Pp. v + 86.

BROWNELL, William A. *The Development of Children's Number Ideas in the Primary Grades.* Supplementary Educational Monographs, No. 35. Chicago: University of Chicago, 1928. Pp. xiii + 241.

DOLL, Edgar A. *The Growth of Intelligence.* Psychological Review Monograph Supplements, Vol. XXIX, No. 2. Princeton, N. J.: Psychological Review Co., 1921. Pp. vi + 130.

GESELL, Arnold. *Infancy and Human Growth.* New York: The Macmillan Co., 1928. Pp. xvii + 418.

——*The Mental Growth of the Pre-School Child:* A Psychological Outline of Normal Development from Birth to the Sixth Year, Including a System of Developmental Diagnosis. New York: The Macmillan Co., 1925. Pp. x + 447.

LINCOLN, E. A. *Sex Differences in the Growth of American School Children.* Baltimore: Warwick and York, 1927. Pp. xii + 189.

STERN, William. *Psychology of Early Childhood:* Up to the Sixth Year of Age. Supplemented by extracts from the unpublished diaries of Clara Stern. Translated by Anna Barwell. (Second Edition, enlarged and revised in accordance with the sixth German edition.) New York: Henry Holt and Co., 1930. Pp. 624.

THOMAS, Dorothy Swaine, LOOMIS, Alice M., and ARRINGTON, Ruth E. *Social Behavior Patterns.* New Haven, Conn.: Institute of Human Relations, Yale University, 1933. Pp. 217.

CHAPTER XI

ANALYSIS AND INTERPRETATION OF DATA

Introduction. The various methods of attacking problems have been presented in the immediately preceding chapters. The present chapter treats the next steps in research, namely, the analysis of the data after they have been collected, and the interpretation of these analyses. Since these steps are largely dependent upon the particular method which has been pursued and upon the data that have been gathered, a complete treatment cannot be given here. Discussions have already been presented in preceding chapters of certain problems of analysis and interpretation peculiar to the methods treated in such chapters. The purpose of this chapter will be to call attention to the relatively general aspects of analysis and interpretation which are common to most quantitative studies.

PROCEDURES IN ANALYSIS

Analysis required from beginning of work. Although this chapter is generally concerned with the analysis of data after they have been collected, analysis is a process which enters into research in one form or another from the very beginning. When one selects a problem to work on, and begins planning his attack upon it, he at once engages upon an analysis of the total problem in order to formulate a hypothesis which will enable him to start work with some plan, and in order to begin gathering data that will fit in with his hypothesis. That is, determining the definition of the concepts which are involved in one's study calls for an analysis of the field conditions and of the factors likely to be reflected in the data if various definitions are adopted. One will further analyze the field and his problem

in determining the factors for study in the general problem, and he will engage in more analysis when methods of measuring these factors are being considered. It may be fair to say that research consists in general of two large steps—the gathering of data, and the analysis of these data; but no amount of analysis can (validly) extract from the data factors which are not present. Consequently, the final analysis must be anticipated in considerable detail when plans are being made for gathering data which will reflect the requisite factors, and this calls for analysis of several kinds at the start of one's work.

The analysis required in these early stages may need to be just as penetrating as that which follows the gathering of the data. Indeed, one might say that it is in reality more important, for the later analysis assumes that the data in hand do actually represent certain things. It is the responsibility of the worker to see that his early analysis of his problem, and of its requirements as it is subsequently developed, is sufficiently valid so that the later interpretation is not built mechanically upon an empty set of facts.

It might be said that this early analysis is concerned with four things. In the first place, one must analyze his problem carefully to see what is necessary to provide a solution of it. The worker must assure himself, and be able to satisfy those to whom he reports his study, that his method of attacking the problem provides a crucial approach.[1] That is, he must be certain that the method will really get at the problem and afford a definite answer in terms of *yes* or *no*, or in terms of definite degrees. In the second place, one must see that the factors which he chooses for study will satisfy the conditions of his problem—a more detailed step than the first one. He should ask himself: "Am I studying enough factors or elements to yield a satisfactory answer to my problem?" "Have I selected elements for study which seem reasonably promising under

[1] McCall discusses this problem in relation to two research methods, the causal-comparative and the experimental. See William A. McCall, *How to Experiment in Education*, Chapter X, "Analyses of Experimental and Causal Investigations," pp. 245-69. New York: The Macmillan Co., 1923. Pp. 281.

critical examination?" "Have I by this selection excluded certain factors that might be of genuine significance in this problem?"

In the third place, one must examine his source of data carefully to see that the factors in which he is interested will have an opportunity to demonstrate themselves. Are the limits which he has set for his source-field (time period, area, or other limiting conditions) sufficiently broad to permit ample operation of the factors to be studied? If not, one may get only the minor *deviations from* the trend of large factors, which will mislead him. On the other hand, are the limits of the source-field too broad? Will many spurious factors enter and perhaps cause sufficiently different conditions within the source-field so that the important factors will "average out," or neutralize each other? In the fourth place, one must examine the means which he expects to employ in gathering data, to see that these means are capable of registering variations of appropriate magnitude, simplicity (purity, or singleness), and at the same time complexity.

As an illustration of the application of these considerations, we may assume that one wishes to study the causes of failure in school work. His early analysis will be concerned with such questions as the following: "What kind of an attack will throw light on the answer to this problem?" "Should I employ the historical method, the normative-survey, the experimental, or some one of the other methods?" The answer will of course depend in part upon the type of study which is to be made; different aspects of a problem may be attacked by a variety of different methods. One cannot hope to make a *complete* study of any problem, so that he exhausts all possibilities of studying further aspects of it. Turning to the factors to be studied, one may think of absence, intelligence, previous success or failure in school work, etc. Again the answer will depend in part upon what kind of study one plans to make—its degree of penetration or superficiality. If one is content to say that absence is a factor in school success or failure, he is mak-

ing a relatively superficial study. If he attempts to measure a variety of factors entering into the lack of adjustment between the school work, as actually carried on in the classroom, and the habits, interests, abilities, outlooks, and personal sensitivities of the pupils who are failing, he is making a more penetrating—and more significant—study. There have been far too many studies of the first sort, correlating failure with amount of absence, when what education needs is an analysis of the factors which lie behind absence and tend to make school work a succession of daily defeats for the pupil.

In the determination of the limits of the field from which one will gather his data, various practical factors will enter, as well as theoretical ones. If the study is to be normative-survey, one will gather data over a wide area; if it is to be historical, one will secure data over a period of years. The procedure is definitely affected by the type of study contemplated. In any case, one will have to consider carefully what is likely to be the result if he includes schools of many different kinds, a wide variety of school grades, pupils of different levels of intelligence, etc. Finally, when consideration is given to the gathering of the data, one must examine his instruments. What is to be considered school failure? Will the evidence used exclude the factor of the social and political standing of the parents in the community? If tests are used, do they measure what the particular school is trying to do? Do they measure what the teacher has covered? Do they measure effects of what the school is doing in an unusual way to develop the pupil in all aspects of his growth, or are they concerned only with academic knowledge demonstrated under formal classroom conditions?[2] One cannot get satisfactory evidence of factors which are not adequately provided for in the instruments which he uses.[3]

[2] See the discussion of measuring many aspects of personal development, given in Chapter VII in connection with survey testing. See footnotes 28 and 45-58, of Chapter VII Further treatment occurs in connection with observation and appraisal, in Chapter VIII.

[3] Douglas E. Scates, "Complexity of Test Items as a Factor in the Validity of Measurement," accepted for publication in the *Journal of Educational Research*, 1936.

Ralph W. Tyler, "Assumptions Involved in Achievement-Test Construction," *Educational Research Bulletin*, XII (February 8, 1933), 29-36. Also in *Constructing Achieve-*

One should not get the impression that all of these decisions can be made in advance. It is necessary, from the standpoint of systematic and effective work, that one formulate a plan which will direct his main efforts; but one must always be on the alert for cues which would indicate that modifications of the plan are desirable, or even that the plan does not promise any returns of worth. The shifting of attention and the following up of leads have been well described for one problem by Brownell.[4] Beginners in research would be greatly aided by more such detailed, frank accounts, portraying the difficulties, the uncertainties, the perplexities of the research worker, as he engages in the analysis of a difficult problem. The general picture is given by Brownell at the outset of his description:[5]

> The report is divided into two parts. . . . The first part is an account of the steps in the investigation. It is . . . concerned with the way in which the problem was almost accidentally discovered and with the manner in which through the application of appropriate research techniques the problem, none too clear at times, was finally made to yield to a solution. This part of the report . . . is to furnish a realistic example of the way in which much research is done: with periods of alternate confusion and enlightenment, with the commission of many errors of judgment and the correction of those errors, and with the following of faulty leads and the attainment of fortunate successes. (Such a description of research method, it will be noted, bears little resemblance to the descriptions to be found in manuals and in many theoretical discussions of research.) The second end served by this part of the report is to supply evidence that not all research is spiritless grubbing and boring drudgery, but that on occasion it affords all the excitement and all the thrills enjoyed by a detective at work on his favorite type of crime.

The discussion which has been presented thus far in the chapter is related to analysis in advance of that which is done after the data are all in hand. This discussion has been presented because analysis during the early steps in research is a necessary foundation for the analysis which is to follow. Many

ment Tests, a collection of planographed reprints by Tyler. Columbus: Bureau of Educational Research, Ohio State University, 1934. Pp. 102.

[4] William A. Brownell, "An Evaluation of an Arithmetic 'Crutch,'" *Journal of Experimental Education*, II (September, 1933), 5-34.

[5] *Ibid.*, p. 5.

a graduate student has found that he had to change his problem after he had his data collected and began analyzing them, because he had not collected data in answer to the principal questions in his original problem. By appropriate thought in advance, one can not only avoid such enforced changes, but he can avoid the forcing of interpretations on his data which they do not legitimately support.

Getting started on the analysis of data. It is a rather common experience for those engaged in research to gather a great many data, to have the data carefully arranged on sheets of paper, and then to find themselves at a complete loss as to what to do next. A few suggestions will be given which may aid one in passing through this stage of his work somewhat more easily. It might be said, however, that such a stage of confusion, while very unpleasant and baffling, is not to be regarded as evidence of the inability of the worker; it is, in fact, somewhat typical of research, and even the most experienced investigator will find many points in his work where he is at a loss to determine what the next step is, if he is undertaking a difficult problem.

One mode of attack which sometimes proves helpful is to think in terms of tables. One may look at his data and ask, "What tables of significance could I make up out of these data?" [6] "In what systematic arrangements of these data can I

[6] Treatises on the preparation of formal tables may be suggestive to the student in starting this type of analysis. See the following:

Bruce D. Mudgett, *Statistical Tables and Graphs*, pp. 3-58. Boston: Houghton Mifflin Co., 1930. Pp. 194.

Helen M. Walker and Walter N. Durost, *Statistical Tables:* Their Structure and Use. New York: Teachers College, Columbia University, 1935. Pp. 96.

Walter S. Monroe and Max D. Engelhart, *The Techniques of Educational Research*, pp. 46-48. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, January 10, 1928. Pp. 84.

Most books on statistical methods have a chapter dealing with tabulation and classification of data. For example, see Charles W. Odell, *Statistical Method in Education*, Chapter II, "Tabulation and Classification," pp. 14-31. New York: D. Appleton-Century Co., 1935. Pp. 457.

See also Chapter XIII of the present text for a discussion of tabular presentation of data, with emphasis on the form of tables.

Two references on the preparation of typewritten tables may be given here:

Bernhard Bargen, *Tabulation Technique*. New York: Gregg Publishing Co., 1934. Pp. 46.

E. H. Brown, *Statistical Typewriting*. Monograph Series, No. 14. New York: The Ronald Press Co., 1924. Pp. 77.

present a picture that is interesting in connection with my general problem?" This type of thinking is approaching the matter from the mechanical aspect, rather than from the standpoint of purposeful planning, but it will often help one to get started, and after the "ice is broken," one may see other comparisons, or points which he feels should be brought into relief.

A careful examination of the statement of the problem, an inspection of the earlier analyses, a study of the original records of data, may afford some suggestion of interesting (significant) aspects that one should immediately work toward in the rearranging and possibly in the statistical analysis of his data. Merely writing up a few case histories of individual cases (in almost any kind of study) may stimulate one's mind to thinking about comparisons and other relationships which should be studied in his data at large; if certain facts are obvious in a particular case, are they so in general? This attack is similar to the process of analyzing more or less complex arithmetic problems by thinking of them in terms of small numbers, where the answers and the relationships are rather obvious.

Still another approach is for one to get away from his data and to think about the problem as well as possible from the point of view of one who has not been working on it. What are the aspects that such a person would want to know about? What questions would such a person raise? And what further questions are there about the answers to these first questions? Usually it is very helpful to discuss the problem in this way with some one who has a stimulating interest in the work, but who is not buried in the details of it.

It may also be helpful to attack one's data by making various simple statistical calculations. Should some data be expressed as per cents of others? Are the data too finely classified—i.e., are they subdivided too many times on the basis of a number of factors at once? Sometimes the elimination of several factors so that one can study the distribution of cases on a single factor is an aid in securing a better picture. Should the data be grouped according to an individual, such as several test scores

for each pupil, or grouped according to some other basis, as grade, subject, school, etc? A number of statistical procedures are presented in the next section. Simply applying these mechanically will often reveal interesting aspects that are worth while.

One will of course realize that these suggestions of mechanical modes of attack are merely for beginning the analysis, and that before one finishes his analysis and presents the results and conclusions, he must have a justifiable reason for what is done. That is, he will probably discard much of his early analysis, keeping only those portions for whose retention there is an important reason. After having made a start, one's analytical procedures will be guided by his findings through preceding analyses, as well as by the principal problem he set out to solve. It may be, also, that his exploration will discover a problem of equal or even greater importance than the one he set out with, and a change in the original statement may be justified.

STATISTICAL METHODS OF ANALYSIS

The field of statistical methods has been developed phenomenally within the last half century in response to a widespread need for analytical procedures appropriate to dealing with large numbers of cases. This section of the present chapter will call attention to the more common modes of statistical analysis and indicate how they fit into the general process of analysis.

Throughout this text, when dealing with highly specialized techniques of procedure, such as test construction, interviewing, the correlation method, etc., the student has been referred for technical details to texts which are devoted entirely to the subject. The same practice is followed here. It is not the thought of the authors that this treatment should provide training in statistics. In fact there are strong reasons for preferring not to go into such a specialized field, in addition to limitations of space and instructional time. Chief among such

reasons is the desire not to distort the emphasis in the total research picture. Students (and often instructors) become so concerned with the details of statistical procedures in the abstract that they lose sight of the larger background of thought and purpose into which these procedures must fit. It is the plan of the present book, being concerned with research in the large, to deal with the development of a general background for research. A concentrated emphasis upon the narrower, technical aspects of certain portions of research, such as statistical methods, is the province of specialized texts. The present treatment is concerned merely with giving the general concepts of statistical tools and with indicating roughly their uses.

Ranks and percentile ranks. A rank is merely the relative position which any particular case occupies in a group. Sometimes groups are ranked from the top (highest value) downward, and sometimes from the bottom (lowest value) upward, the first measure in either direction being called the first rank, the second measure, the second rank, etc. This type of information is often of very real interest; perhaps it is the most common numerical aspect of facts outside of their enumeration and measurement. Often it is of more significance than the measurement itself, for it contains a strong comparative element. For example, we are (or used to be), more concerned with the fact that a certain pupil is at the head of his class, with the fact that a certain college is at the head of the football league, etc., than we are in knowing the particular score or the number of games won.

The significance of a rank is, of course, in part dependent upon the size of the group; a rank of ten is near one end of the distribution in a group of 1000, and it is near the other end of the distribution in a group of 11. To overcome this difficulty, the idea of percentile rank was developed. Percentile rank is essentially the rank that one would have in a group of 100. It is always calculated from the bottom upward, so that a percentile rank of 1 means (approximately) the lowest in the group (of 100), a percentile rank of 40 means that 40 per cent

of the group lie below (the midpoint value of) this case, etc. Percentile rank is merely a device for standardizing the number of cases on which the rank is calculated, so that it will have a stable significance.

Measures of central tendency. There are several forms of averages, the most common being the *mean*. Even in statistical usage, however, the word "average" may be used in a narrow sense to indicate only the mean and not the other kinds of average. The *median* and *mode* are the other common forms of average. The mean is secured by adding up the values in a series and dividing the total by the number of cases; this is commonly understood by most people, since it is usually taught in the elementary school. The median is the point (or value) that divides the cases in half; that is, into two equal groups. As many cases lie above the median as below it. (Statistics has special methods for dealing with cases that fall *at* the median.) The significance of such a point will be apparent at once. The mode is simply the value where the greatest number of cases fall; usually it is not a very stable value, since the movement of a single case might disturb it considerably.

The significance of these three different kinds of average may be clarified by relating them to a frequency distribution. (A frequency distribution is simply a series of values that have been tabulated, or tallied, opposite a scale made up of units, or groups of units, for the purpose.) If such a distribution, made up of tally marks, were cut out of a piece of paper or cardboard, and a pin were put in the edge along the scale at a point where the distribution would just balance, that point would be the mean. If the pin is moved to the point where the median falls, the distribution will not balance (unless it is symmetrical, and the mean and median fall at the same point), but a line erected at that point perpendicular to the scale will divide the area in half. If the pin is placed along the scale where the mode is, neither of the above things will be true (unless the mode coincides with one or both of the other averages).

The mode does not receive much use in educational problems. The median is popular, in part because of its significance, and in part because it is readily calculated. It is not as sensitive to the influence of measures at the extremes as the mean is. The mean is mathematically the most significant average and is used most extensively in advanced statistical analysis. The investigator should, however, be careful to avoid the idea that there is any one best average; each one is best for certain particular purposes, and the worker selects his measure to suit the purpose. Frequently there is not a great deal of difference between them; when the distribution is symmetrical, all three measures fall at the same point.

One must of course remember when using an average to represent a distribution, or series, that, after all, this is only a central measure, and although it may represent the entire group as well as any single value can, the series is nevertheless spread out on either side of this average. People periodically "discover" that averages do not have all the significance of the full distribution, and one will frequently hear people say that averages are misleading. That of course depends on how one thinks of averages; they are misleading if one conceives of the whole series as being fully epitomized in one figure.

Measures of dispersion. Dispersion indicates the spread of the series. This affords the most important corrective for too liberal a concept of the average. If one knows the extent of spread in the series, as well as the mean, he is not so likely to overlook the fact that the mean is merely a middle value and is limited in its powers of representation.

One can collect all sorts of curious and amusing stories illustrating the foolishness of depending too largely or inappropriately upon the average. For example, the hypothetical story is told of the doctor who took the temperature of ten of his patients, averaged the readings, and said that all of them were all right because the average of their temperatures was normal. A measure of dispersion would prevent such a conclusion. Or, one would scarcely put a springboard over a swim-

ming pool that was strong enough only to support a pupil of average weight. A measure of dispersion of the weights of pupils would indicate to him how far above the average he should go before a safe board was obtained. Students who are immersed in the study of statistical methods, learning for the first time in a formal way the advantages of averages and the many things that can be done with them, sometimes require a few moments to comprehend the element of humor when the story is told of the young engineer who was building a bridge over a river and ascertained the average height of the masts and towers of the boats which plied the river, in order that he might know how high above the river to build his bridge.

There are several measures of dispersion common in statistics. These are, the *standard deviation,* the *mean deviation,* the *quartile deviation,* and the *range.* The last is merely the difference between the extremes of the series; it is not extensively used because the extreme values are very unstable. The mean deviation is the average distance out from the average (usually the mean) that the measures lie. The quartile deviation is the average distance out from the median that half of the measures on either side of the median lie. The standard deviation is a more complex function, being calculated from squares of deviations.

Usually students can readily understand averages, because they are accustomed to them. The measures of dispersion—sometimes called measures of variability—are usually new, and students are curious about them. Although measures of dispersion are significant for characterizing series, they find a larger use in the employ of more complex formulas. They have another important use. When one is comparing the averages of two or more distributions, he cannot well tell how significant the difference is unless he knows how much the distributions spread. A difference of ten between averages might be very small, if the two distributions spread over a range of several hundred; or it might be very large if each distribution spread over decimal divisions of a single point.

Measures of relationship. Correlation coefficients are common in theses and in many other studies. Though a considerable amount of calculation may be involved in determining the degree of correlation, the concept is essentially simple. Correlation is the extent to which an individual tends to be in the same relative position in each of two series. That is, if two tests were given to a class of pupils, the correlation between these two sets of test scores would be high if the pupil who was at the top in one set of scores was at or near the top of the other, and so on down through the list, the pupil at the bottom of one group of scores being at or near the bottom of the other series of scores. Perfect correlation, denoted by the figure 1.00, means that there is exact correspondence. No correlation at all, denoted by .00, means that, if you know what a pupil's score on one test is, you have no basis for estimating his score on the other test. Negative coefficients indicate a relationship between the two series, but an inverse one. For example, a correlation value of −1.00 indicates that the correspondence is perfect, but in inverse order, the pupil at the top of one series being at the bottom of the other, and so on through the series.

Of course, correlation is not confined to test scores; these are used merely as an illustration. Correlation can be calculated between any two sets of paired measures—that is, where a measure in one series is connected with a particular measure in the other series, such as the two test scores of a single pupil. These scores are two quantitative representations of the same case; if there is not this connecting link, one cannot calculate correlation. One cannot take *any* two series of measures and find the correlation between them, since correlation cannot exist unless the measures are definitely paired.

It was pointed out in the preceding chapter that correlation indicates that the two series of values have some elements in common. The inference that one variable directly causes fluctuations in the other, however, is not immediate and must be made only after a careful inspection of the logical connection

between the two series. A common use of correlation is for prediction; the higher the degree of correlation, the greater the accuracy with which one can predict a score or other performance in a second series of measures, when the value in the first series is known.

The interpretation of the significance of various degrees of correlation is a matter requiring some background in the field of application and some understanding of the mathematics underlying the formula. There is no immediately simple interpretation that is safe. Correlations between school subjects (i.e., between the standing or ability of pupils in two different school subjects) usually run from about .40 to .60 or perhaps slightly higher. Two different forms of a standard test given to the same group of pupils should, ideally, correlate perfectly (1.00); they are more likely to correlate from .60 to .90. Probably for general purposes the best method of interpreting a given correlation coefficient is to project it against the background of such general knowledge about the usual range of coefficients in a particular field. For further discussion of interpretation the reader is referred back to the treatment in the preceding chapter, and particularly to the references in footnotes 50-58.

Correlation has an extensive use in connection with the critical study of tests and other instruments. The correlation of two series of measures that are supposed to represent the same thing (such as two applications of a standard test, or of comparable forms of it), is known as the *coefficient of reliability*. If it is low, it indicates that the instrument does not succeed in eliciting the same kind of performance from one time to another. Whether this is because the instrument is faulty, or because the performance has actually changed, cannot be told. The correlation of test results with a criterion is known as the *coefficient of validity*. These uses are treated fully in statistics and measurement texts.[7]

[7] Henry E. Garrett, *Statistics in Psychology and Education*, Chapter VI, "Some Applications of Statistical Method and Techniques to Tests and Test Results," pp. 266-301. New York: Longmans, Green and Co., 1926.

Error and probable error. One does not work with figures long before he comes to realize that there are all kinds of approximations used, and that there are all kinds of errors involved. The statistician's idea of error, however, is very different from what the average person thinks of as an error. People in general think of an error as a mistake; the statistician's conception of it is only as a departure from truth, and he usually thinks of it as a relatively chance departure. These chance departures from an idealized concept of truth come about through the operation of many small factors which, when taken together and in large numbers, are regarded as chance. Truth, to the statistician, is usually a sort of an average, the value one would get most often if he kept on measuring or trying something for an indefinitely long time.

A simple illustration may be found in any of the devices that operate by chance. Tossing a coin should, ideally, give an equal number of heads and tails. Practically, one knows that if he tosses a coin four times he is not likely to get two heads and two tails; what he gets, however, other than two heads and two tails, is regarded by the statistician as being just that much in error, since the true values (obtained by tossing an ideal coin many times) are 2 and 2. It will readily be seen from this illustration that the statistician does not mean that one has measured something wrong or made any mistakes; his numbers may be accurate so far as the objective events are concerned, but the statistician knows that events vary, and he is interested in the values they will take in the long run. Anything else is to him an error, even though it may be actual.[8]

To apply the concept to test scores, it is quite possible that

Charles W. Odell, *op. cit.*, Chapters XI, XIX, XX.

G. M. Ruch, *The Objective or New-Type Examination*, Chapters II, III, XV. Chicago: Scott, Foresman and Co., 1929. Pp. 478.

Most books on statistical methods and on tests and measurements discuss problems of validity and reliability.

8 There are of course also errors in the usual or non-statistical sense. See the following:

Walter S. Monroe, "Dependability and Value of Survey Types of Investigations," *School and Society*, XXXVIII (October 21, 1933), 517-22.

———, *The Constant and Variable Errors of Educational Measurements*. Bureau of Educational Research Bulletin, No. 15. Urbana, Ill.: University of Illinois, 1923. Pp. 30.

Charles W. Odell, *op. cit.*, Chapter XX. See also "Error" in the Index of Topics.

an objective test may be scored accurately and yet will not present a very good measure of the pupil who took it. As explained previously in Chapter VII, many factors enter into the performance of a pupil at any particular time; these various factors cause the pupil to do certain things at one time that he will not do at another, with the result that his score at any time may not be his normal or typical score, and hence it is in error as representing his true ability. This is a very useful and highly important concept for teachers to grasp; it helps prevent the iron-clad and foolishly mechanical interpretations that many teachers are inclined to put upon test scores, especially when the test is a well-known "standardized" test and has been constructed by persons with well-known reputations. Such tests may be excellent, but they do not eliminate variability in pupil performance. Teachers should invariably look at a test score with the idea that there is likely to be, say five or ten points, between that particular score and what the pupil typically would do. Such a concept may disrupt the thought habits of many teachers, in feeling that they can mark a pupil with scientific accuracy after having given him a test, but it may serve to bring such teachers to a more nearly correct way of thinking about educational measurement.

All of these comments apply with equal or greater force to the research worker. One must be very careful not to conclude that one pupil is better than another because the first learner made a score of 78 on a test and the second made a score of 73. It is not unlikely, with the usual test, that another testing would show the second pupil as good as the first—or perhaps much worse. The statistician has a way of estimating how likely these changes are. If he can ascribe the changes to chance or assume that the changes will follow the same laws as chance, then he can use mathematical tables of chance to determine how likely a change of any particular amount will be.

The unit of measurement which the statistician uses in thinking about chance changes from one measurement to another is the *probable error*. The concept will not be defined

here in statistical terms, other than to say that it represents a function of the standard deviation, which was described earlier. What it means is, that a second measurement is as likely to differ from the first measurement by more than one probable error, as it is to differ by less than one probable error. In other words, it is the average expected change, or error, caused by the operation of the many elements which are responsible for a variation in value. Of course, when the variation from one time to another is systematic with respect to any observable factor, then it is no longer regarded as a chance variation, and its relation to the important factor becomes a subject for study. It is only the small, relatively unobservable factors that are gratuitously (but conveniently) regarded as "chance."

Perhaps the foregoing remarks will suggest to the reader that it becomes important at times to determine whether a change, or a difference between any two values, is really caused by some significant factor or whether it is a caprice of chance. One cannot answer such a question with certainty, unless he repeats his experiment or keeps up his measurements for an indefinitely long time. But he can answer the question in terms of probability, without doing more measuring. This is accomplished by applying the statistician's measuring rod of probable error. If the change (or difference) is equal to only one probable error, then there is nothing much to be said about it; it could easily have been caused by the operation of the chance factors that make results vary. If chance factors will account for all of a difference, then one cannot say that the difference shows the influence of any particular factor, such as an experimental factor which he may be studying. All he can conclude under such circumstances is that the factor he thought was important does not, under study, seem to be effective in causing a difference between one group or set of observations, and another.

One may ask the question, "What if the difference is equal to two probable errors?" Then, the statistician would answer,

it is less likely that it is due to the fluctuations of chance causes, but it is still quite possible, and in fact it is so likely that one had better not draw any important conclusions. In fact, it is not until a difference is equal to about four times the value of a probable error, that one can begin to say with some feeling of (scientific) certainty that a result is *typically* different from another; here the probability is only one in about three hundred that the observed difference is the result of what are called chance factors and not the result of some significant factor. Any difference, therefore, that is equal to or greater than four times its probable error is commonly called a *significant difference.*[9]

The reader can probably follow the above reasoning without understanding how the value of the probable error is calculated. For such calculations he is referred to statistics texts.

The foregoing discussion has treated only general statistical devices. There are special procedures adapted to various particular problems. For example, McCall[10] gives an extended treatment of statistical analysis of results obtained from experimentation, and Monroe and Engelhart[11] present a similar treatment. Bixler[12] devotes a chapter to general aspects of statistical analysis.

Brief description of elementary statistical calculations. To give students an introductory idea of the processes of

[9] One will appreciate that statistical significance differs from practical significance.
E. A. Lincoln, "Insignificance of Significant Differences," *Journal of Experimental Education*, II (March, 1934), 288-90.
———, "Reliability Coefficients Are Still Unreliable," *Journal of Educational Psychology*, XXIV (March, 1933), 235-6.
Charles W. Odell, *The Interpretation of the Probable Error and the Coefficient of Correlation*. Bureau of Educational Research Bulletin, No. 32. Urbana, Ill.: University of Illinois, 1926. Pp. 49.
R. W. Tyler, "What Is Statistical Significance?" *Educational Research Bulletin*, X (March 4, 1931), 115-8, 142. Also found in R. W. Tyler, *Constructing Achievement Tests*, pp. 66-70. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1934. Pp. 102.

[10] William A. McCall, *How to Experiment in Education*, Chapters VI-VIII. New York: The Macmillan Co., 1923. Pp. 281.

[11] Walter S. Monroe and Max D. Engelhart, *Experimental Research in Education*, Chapter III, "The Interpretation of Differences in Gains," pp. 59-76. Bureau of Educational Research Bulletin, No. 48. Urbana, Ill.: University of Illinois, 1930. Pp. 105.

[12] H. H. Bixler, *Check Lists for Educational Research*, Chapter V, "Statistical Methods Used in Research," pp. 52-62. New York: Teachers College, Columbia University, 1928. Pp. 118.

statistical calculations, a number of the commoner ones are described herewith. In presenting these verbal directions, the authors have no thought that students will "learn statistics" from reading them; it is rather the purpose that these may furnish a reference list if the instructor wishes to discuss these processes. Also, the descriptions may enable one to look more expeditiously for what he is seeking in statistics texts, which he should consult for fuller treatments. It is not expected that the student will understand the following directions without explanation and illustration.

These procedures are put in words to avoid a long description of symbols. The symbol N, which is universal in statistics, indicates the number of cases in a series (i.e., in one's study). *Ungrouped data* means data that are in the form in which one gathers them; *grouped data* means data which have been tabulated into a frequency distribution.

1. *Mean.* Ungrouped data: Add the values and divide by N.

Grouped data: Add to the midpoint of any selected interval a "correction" which is obtained by multiplying the frequency in each interval by the number of intervals it is *away from* the selected interval (using negative numbers for intervals below the selected one), getting the net sum of these products, and dividing by N. Multiply this sum by the width of the interval and add or subtract the "correction" according to its sign.

2. *Median.* Ungrouped data. If N is odd, take the value of the $(N + 1)/2$ measure; if N is even, average the $N/2$ and $(N + 2)/2$ measures.

Grouped data. Interpolate between the limits of the interval in which the $N/2$ measure lies, assuming that the frequencies are evenly distributed over the interval.

3. *Mode* (approximations). Ungrouped data. Take the most frequently occurring value.

Grouped data. Use midpoint of the interval containing the greatest frequency.

4. *Percentile rank.* Ungrouped data. Subtract ½ from the

rank of a case (when ranked with "one" at the low end), and multiply by 100/N.

Grouped data. Not normally desired.

5. *Percentile points.* Ungrouped data. Multiply N by given per cent, round product to nearest whole number, and count upward from bottom of series (arranged in order of magnitude) till the value having this rank is reached.

Grouped data. Multiply N by the given per cent; count upward in the frequency distribution till the measure having this ordinal value is reached. This normally requires interpolating within an interval, assuming that the frequencies are evenly distributed over the interval.

6. *Mean deviation.* Ungrouped data. Calculate the mean, subtract it from each value in the series; average the resulting differences, disregarding their sign. (The median may be used instead of the mean.)

Grouped data. The method is involved. See a statistics text.

7. *Quartile deviation.* Calculate the 25th and the 75th percentile points; subtract the former from the latter and divide the difference by 2.

8. *Standard deviation.* Ungrouped data (first method). Square each measure, and sum; divide the total by N; subtract from this quotient the square of the mean, and take the square root of the difference.

(Second method). Subtract the mean from each value, and square the remainder. Sum these squares and divide by N. Take the square root.

Grouped data. Proceed as in calculating the mean for grouped data; next, multiply *each* of the products *again* by the number of intervals it is away from the selected interval, (which will make all signs positive); sum these values and divide by N. Subtract from this quotient the *square* of the "correction" obtained for calculating the mean (without multiplying by width of interval), take the square root of the remainder, and multiply it by the width of an interval.

9. *Correlation (product-moment).* Ungrouped data. Arrange

the two series of measures to be correlated in two columns, keeping opposite each other the measures which belong together. Subtract the mean of each series from each of the values in its series and work entirely with these differences. One decimal place is usually sufficient. Multiply together the difference in one column by the corresponding difference in the other column and sum these products. Call this total *a*. Next, square each difference, (probably rounding to one decimal place), and sum each of the two series of squares; call these sums *b* and *c*. Multiply *b* and *c* together, take the square root of the product, and divide it into *a*. The result is the coefficient of correlation.

There are other methods, but they are too involved to put into words.

Grouped data. Use a printed correlation form and a textbook or manual which supplements it.

10. *Correlation of ranked series.* With the two series of ranks arranged in columns, subtract each rank in one series from the rank in the other series opposite it; square these differences, sum the squares, and multiply the sum by 6. Divide by $N^3 - N$ and subtract the quotient from 1.

11. *Probable error of the mean.* Divide the standard deviation of the series by the square root of N; take 2/3 of this quotient.

12. *Probable error of the median.* Calculate the probable error of the mean and increase it by one-fourth.

13. *Probable error of the correlation coefficient.* Square r and subtract from 1. Divide the difference by the square root of N, and take 2/3 of the quotient.

14. *Probable error of the difference between two means.* Square the probable error of each mean, sum these two squares, and take the square root of this sum. (If the two means are correlated a more complex formula is required.)

Tabulating machines. It should be mentioned here that large-scale statistical analysis can be accomplished expeditiously by the use of statistical tabulating machines, particu-

larly the Hollerith machines. Such machines employ cards on which the data are punched. A sorter arranges the cards according to the information punched in them and will at the same time count the cards having each particular value. (All sorting operations are performed on only one digit at a time.) Cards are sorted (and counted) at the rate of over 400 per minute. Another machine, the tabulator, performs the operation of adding. Cards can be added, on as many as forty columns (digits) at once, the totals being accumulated as desired in five different banks. Cards go through this process at the rate of about 100 per minute. The machine can be set to take totals on various columns (fields) at selected places and will print results. The capabilities of the machine are large, even extending to correlation without the necessity of hand tabulation.

Such machines are rented by the month and used by many large establishments for accounting purposes. Life insurance companies use them extensively in actuarial work, and large school systems and universities have such machines for research and accounting purposes. One who wishes to analyze his data on such machines and who does not have direct access to them, may have all of the punching and analysis performed for him according to directions, by service bureaus maintained by various branches of the International Business Machines Co. Various agencies not connected with the tabulating-machine company also do this service; their advertisements appear in the *Journal of the American Statistical Association.*

A helpful literature on the use of such machines is now developing. Umstattd[13] has prepared a simple treatise and one who is unfamiliar with the machines should begin by reading such a reference. A visit to an office of the International Business Machines Company for a demonstration will give concreteness to any verbal description of the work. An article by Sollins[14] discusses an application of the machines to a socio-

[13] J. G. Umstattd, *The Tabulating Machine in Educational Research.* Minneapolis, Minn.: Educational Test Bureau, Inc., 1933. Pp. 21.

[14] I. V. Sollins, "Hollerith Statistical Technique," *Journal of Educational Sociology,* VI (September, 1932), 43-51.

logical study. Warren and Mendenhall[15] published the first description for general use of the method of calculating correlations on the machines, and of securing powers. A second publication, by Warren,[16] deals with the fitting of trend lines by the least squares method. Wallace and Snedecor[17] have prepared an amplified treatment of the use of the machines for correlation, including multiple correlation and partial correlation. They also include a chapter on coding. The most extended treatment of the applications of these machines is a recent book edited by Baehne[18] and written by men who have had considerable experience with practical uses of the machines. It includes problems of coding as well as other practical topics.

It was pointed out in the discussion of questionnaires, in Chapter VII, that one should consider the possibility of using such machines early in his study and plan his instruments and early recordings in the light of such use. For example, many questionnaires are now pre-coded; that is, various responses are given a code directly on the blank when it is printed, so that the operator can punch cards from the blank without an intermediate step of coding. It might be said that the United States Bureau of the Census has for many years employed these machines for the tabulating of census returns. Before these machines were invented, census returns were not available until years after the data were gathered.

A method of coding has been devised which greatly increases the capacity of the cards and makes them practically limitless.[19]

15 Richard Warren and Robert M. Mendenhall, *The Mendenhall-Warren-Hollerith Correlation Method*. Columbia University Statistical Bureau, Document No. 1. New York: Columbia University, 1929. Pp. 43.

16 Richard Warren, *Hollerith Machine Computation of Least Squares Trend Lines*. Columbia University Statistical Bureau, Document No. 2. New York: Columbia University, 1933. Pp. 35.

17 H. A. Wallace and George W. Snedecor, *Correlation and Machine Calculation*. Iowa State College of Agriculture and Mechanic Arts, Official Publication, Vol. XXX, No. 4, June, 1931. Ames, Iowa: Iowa State College. Pp. 71. Includes a bibliography, pp. 70-71.

18 G. W. Baehne, ed., *Practical Applications of the Punched Card Method in Colleges and Universities*. New York: Columbia University Press, 1935. Pp. 442.

19 Halbert L. Dunn, "Adaptation of New Geometric Code to Multiple Punching in Mechanical Tabulation," *Journal of the American Statistical Association*, XXVII (September, 1932), 279-86.

Elmer B. Royer and Herbert Toops, "The Statistics of Geometrically Coded Scores," *Journal of the American Statistical Association*, XXVIII (June, 1933), 192-8.

For current literature, see the topic, "Tabulating Machines," in the *Education Index*.

INTERPRETATION

The past few paragraphs of the section on "Error and Probable Error" dealt with a certain aspect of interpretation, namely, the legitimacy of ascribing an observed difference to a factor which varies (changes in magnitude or kind) from one observation or set of observations to another. The recognition of variations ascribable to chance places a very important limitation upon conclusions which one is likely to deduce at first glance. The trained research worker knows that differences which are observed must first be compared with the conclusions that one could draw simply by tossing coins or dice and noting the variations that laws of chance produce. If a difference observed in one's study is greater than these chance differences are likely to be, one can say that the difference is significant; otherwise, it may not be a typical difference, just as the difference between two successive throws of dice is not *typically* 5, though one may actually *observe* such a difference at one time or another.

The process of interpretation is essentially one of stating what the results (findings) show. What do they mean? What is their significance? What is the answer to the original problem? This process calls for a critical examination of the results of one's analysis in the light of his previous analyses concerning the gathering of data. That is, all of the limitations of his data-gathering must enter into and become a part of his conclusions, which grow out of his interpretations of the results. This step is as important as any other in the research study. It is almost purely subjective, and many errors are made at this point. If, however, one is careful, and critical of his own thinking, he should be able to make satisfactory interpretations.

It may be remarked here that the interpretative phases of research constitute one of the important reasons why it is

necessary for a research worker to know his field of work and not depend solely upon his knowledge of investigational techniques. There are many phases of research which cannot be well done unless one is familiar with the field in which he is working, in addition to having an understanding of the processes of research. One should not, therefore, undertake any large or important study in a field until he has had an opportunity to obtain background and insight in that field—otherwise he cannot help making a rather mechanical and probably misleading study. It is wholly erroneous to assume that an adequate knowledge of research processes will safeguard one's findings and conclusions. Familiarity with the field of work is equally, if not more, important than technical knowledge. Both, however, are highly desirable.

Misinterpretation due to unstudied factors. It may be worth while to illustrate a few of the difficulties that arise in interpretation. Many of the fallacious conclusions drawn in research grow out of the limitations of the studies which are made. A given result is composed of many factors; it is not produced simply by a single factor. It is true that one may *know* of only one important factor, but this does not justify the drawing of immediate conclusions, unless one has taken pains to explore other areas and see that other factors which might be important have not operated to produce the result. For example, a worker may conclude that a certain method of teaching spelling is better than others he has studied. In reality (if he has not studied or controlled other factors), the superiority of results which he finds for one group of pupils taught by a certain method may be due to a higher average intelligence, an older age, a better teacher, a better previous teacher, a better set of readers, a better previous (or present) reading teacher or method, better home conditions with more emphasis upon spelling, a greater incentive to learn, more time to study, more sleep at night, etc. The factors which condition any result are innumerable; usually we assume that those we have not studied will average out and will be the same for one

group as for the other. This is an assumption which is convenient, but not always safe.

Not long ago a study reported a correlation of .50 between scholarship and teachers' estimates of their pupils' intelligence, and a correlation of .75 between scholarship and character ratings. One may conclude that character factors are more important in producing scholarship than is intelligence. But there are other possible interpretations. Scholarship was rated by the teachers, and the higher correlation with character ratings may mean merely that scholarship and character are not entirely separated in the minds of the teachers, so that those pupils who "behaved" tended to get better marks, and those pupils who were regarded as generally undesirable received lower marks, etc. Before one can draw conclusions with reference to the relative strength of the relation between intelligence and scholarship and character, he must study carefully the effect of the factor introduced by having the same person judge all three characteristics.

In some instances the interpretation is difficult or inconsistent with other results because one has conceived of his problem in too narrow terms. McGeoch [20] calls attention to this difficulty in a review of the studies on the whole-part problem in learning. The fallacy in the assumption that the study can be concerned with proving that one method is better than another is well stated in her own words:

> Such questions imply that there is a method of learning which is *really* or *inherently* superior, and that certain experimental conditions permit this superiority to show itself, while other conditions mask or hide this intrinsic superiority. McGeoch [21] has called attention to the fact that such a point of view is contrary to the logic of science. No phenomenon known to science is unconditioned: an absolutely best method of learning has no empirical existence. The scientific goal, and likewise the goal of the educator, is to discover by experimentation all the possible factors of which the efficiency of any given learning

[20] Grace O. McGeoch, "A Revaluation of the Whole-Part Problem in Learning," *Journal of Educational Research*, XXVI (September, 1932), 4.

[21] J. A. McGeoch, "The Acquisition of Skill," *Psychological Bulletin*, XXVIII (June, 1931), 413-66.

method is a function. The question is not: "Is the whole method superior to the part method?" The question is: "Under what conditions is the whole method superior to the part method?"

One suspects that many of the contradictory findings which abound in educational research are attributable to an inadequate conception of the problem to be studied, with a consequent lack of attention to variables which are really significant. These, and other illustrations which might be added, will aid in making clear the importance of the early choice of factors for study. One's conclusions are always limited *to the factors studied,* and the cautious person will not draw generalizations which involve factors and conditions which he has only assumed. Several articles have been written calling definite attention to assumptions that are made in different fields of work.[22] As an example of very cautious conclusions, the reader is referred to a study by Easley;[23] even though he may not be able to follow the statistical part of the report, he may note the quality of thought which is involved.

Ignoring selective factors. Although selective factors are in reality a special case of the foregoing topic, they are of sufficient importance to warrant specific treatment. They are frequently ignored and lead to unwarranted conclusions. As an illustration, one may study the per cent of pupils who fail in the different years of high school. He will likely find that the per cent is high in the first year and low in the last year. He might, therefore, conclude that the first year of high school is hard and the fourth easy. We know, however, that the observed result is due to selection—the pupils who fail in the first year do not go on in any large numbers into the fourth year. A research worker who did not know this would be as likely to

22 Gordon Hendrickson, "Some Assumptions Involved in Personality Measurement," *Journal of Experimental Education*, II (March, 1934), 243-9.

Douglas E. Scates, "Types of Assumptions in Educational Research," *Journal of Educational Psychology*, XXVI (May, 1935), 350-66.

Ralph W. Tyler, "Assumptions Involved in Achievement-Test Construction," *Educational Research Bulletin*, XII (February 8, 1933), 29-36. Also reprinted in his *Constructing Achievement Tests*, pp. 58-66. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1934. Pp. 102.

23 Howard Easley, "An Attempt to Isolate the Factor of 'Attention,'" *American Journal of Psychology*, XLIII (April, 1931), 202-15.

draw the wrong conclusion as the right one; there is nothing in the figures themselves to tell him.

One may say that nobody would overlook such a selective factor; but that depends entirely upon one's familiarity with the field of work. To take an illustration not so familiar to educators, it has been observed that cancer is less prevalent among prisoners than among the population at large. One can calculate the diet of the nation on the basis of food produced and find that the rations in prisons contain less meat than the average. If one has not developed research (or educational) cautions, he is likely to be swayed by the implication. Even students of the problem have been. But some one who has a greater understanding of the cancer problem is suspicious of such conclusions and looks up the average age of prisoners. He finds it is below thirty-five, and cancer is known to be rare below this age. The conclusion that diet is responsible for the low incidence of cancer among prisoners therefore becomes less convincing. To establish a causal relationship between meat and cancer would require observing the effects of the given diet upon normal age distribution. If such further study showed a relationship, it would need careful testing by various kinds of attack before the conclusion could be regarded as valid.

Not many years ago it was generally believed that delinquent children were of lower than average intelligence. Facts proved it. One had only to measure the intelligence of those children who were in various penal institutions to find plenty of evidence to this effect. Then it began to be realized that not all delinquent children were in institutions, and that the more intelligent ones, on the whole, escaped apprehension. A very definite selective factor (intelligence) operated to make the children in institutions appear to have less than average intelligence, but one does not have any right to generalize such findings to include *all* children who are delinquent in the sense of doing wrong. Selective factors are indeed subtle and pernicious.

The statement seems warranted that all studies concerned with the inheritance of intelligence and of personality char-

acteristics, as well as special talents, that were made previous to the important nature-nurture study,[24] ignored very definite selective factors, and from the standpoint of scientific proof their conclusions concerning the strength of inherited characteristics suffer in the same way that the conclusions in the preceding illustrations do. Although such studies—frequently reported in books on educational psychology and principles of education—show that such successions of characteristics do occur in families, they are of little significance scientifically, notwithstanding their widespread acclaim. The very strong factors of home environment, and of living in a general socio-economic class, are utterly ignored.[25]

Difficulties of interpretative evaluation. The two preceding sections have been primarily concerned with interpretations connected with causal relationships. The chief difficulty of interpretation connected with studies of the simple descriptive type, such as normative-survey studies, is in relation to evaluation. One is called upon, either to leave the significance of his findings in doubt, or to place some practical interpretation upon them which involves evaluation. For example, there is the problem of evaluating opinion. If a questionnaire study shows that three-fourths of the high-school teachers of a city consider the curriculum, as they are teaching it, very closely related to the needs of people in general community living, the question is still open as to whether this articulation with non-academic life is a fact, or whether the teachers are in reality naïve and know so much of school and so little of everyday life that they lack sound judgment on such a question. What the result does show is that the teachers think that way; any further interpretation is done with considerable hazard. Attention was earlier directed to the difference between objective facts and facts of opinion. Even a 100 per cent vote on some-

24 L. M. Terman and Others, *Nature and Nurture:* Their Influence upon Intelligence and Achievement, Parts I and II. Twenty-seventh Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1928. Pp. v + 460, xv + 353.

25 See for example, Barkev S. Sanders, *Environment and Growth.* Baltimore, Md.: Warwick and York, 1934. Pp. 375.

thing does not necessarily mean that it is an objective fact; it only means all of a certain group think that way.

Another difficulty grows out of interpreting frequency in some of the normative-survey studies, particularly those dealing with an analysis of the frequency with which certain topics or names occur in adult reading, and the like. There may be little significance in such frequencies that is undebatable. Does the frequent mention of a name in the newspaper mean that the given name is more important or more worthy of attention, than less frequently mentioned names? Any one familiar with newspapers knows that there are in any city many citizens whose acquaintance and counsel are worth seeking as much as those whose names are much oftener mentioned, and the same thing is true of national life. Does one not need to know many things as means of understanding current events, when it is reasonably certain that these antecedents will not have an appropriate frequency of mention in current reading material? Can cruciality be inferred from frequency, or can the importance of an event for a single individual be inferred from the prevalence of the event in the total group?

Another kind of interpretation grows out of the evaluation which one makes of the findings. This is not always done, but it is likely to come in as an element which colors many conclusions. For example, if one looks at a table showing average salaries of teachers throughout the nation and finds that kindergarten teachers receive on the average about the same as elementary teachers, is this a fact that is fortunate or unfortunate? Should it be, or does it represent something that is wrong in some respect? Suppose, further, one should find the average salaries for elementary and high-school teachers constantly approaching one another over a period of years, is this cause for alarm? Or does it indicate a gradual trend toward a wholesome situation? One will at once recognize, in the answers he tends to give to such questions, the influence of his ideas on the subject.

Although most workers will refrain from making interpre-

tations which are patently personal, probably most of us cannot always draw the line between our personal philosophies and a simple statement of facts. Our thinking is so colored by our intrenched attitudes that it is very difficult to separate the two. Further, it is not here argued that all research should be mechanically colorless; one should make an attempt to separate conclusions which represent a considerable amount of personal belief, from the relatively incontrovertible logic of his facts, but he does not always have to omit his somewhat personal interpretations. He should merely state them in such a way that they do not mislead the unwary into thinking that "statistics prove" certain things that the writer thinks.

There is yet another type of interpretation which is often worth while, and that is the explanation of the findings in terms of their practical implications. What do they mean for society? What can be done about them? What possibilities do they open up? How do they change the picture in general? It will be recognized that these fall mostly under the heading of the personal interpretations mentioned in the last paragraph. They may be very worth-while conclusions; in fact they may be the most important part of the research, so far as getting anything done is concerned. Such interpretations are perfectly legitimate, but they should, as previously stated, be put in such a way that the uncautious reader will not confuse them with the factual interpretations. Such recommendations constitute a part of the general interpretation which the research worker should undertake, if he is interested in making his research practically helpful.

Other discussions of interpretation in this text. Inasmuch as interpretation varies considerably with the type of research which is in process, it has seemed appropriate to inject discussions of interpretation at various points of the text where the methods were being presented. For example, in Chapter VI, problems of interpretation were discussed in connection with historical material. It is necessary for one to subject his material to careful scrutiny and to examine it for internal con-

sistency, external consistency, and likelihood of representing misleading factors, before he presents it as representative of a certain period and place. There are also large problems of historical interpretation which represent a historical philosophy, relating to the relative importance of basic factors in causing changes.

In Chapter VII, interpretation was discussed in connection with survey testing, and the importance of recognizing many factors that might account for the results was stressed. In drawing conclusions from questionnaire studies, and from documentary frequency analyses, it was stressed that inferences relating to cruciality and social importance were generally required; also, that a basic philosophy, or pattern of thought into which the facts might fit, was necessary before such studies attained their maximum usefulness.

Chapter VIII, dealing with the interview, observation, and appraisal procedures, called attention to conditions that must be satisfied before the facts obtained could be regarded as facts and consequent interpretations drawn. It was pointed out that judgments are not objective facts, but they may nevertheless be important facts, when properly used and interpreted. Index numbers, and the results of all other relatively objective procedures for appraisal purposes, must be interpreted in the light of subjective judgments that have entered into their construction or use at some earlier stage, and which condition the conclusions that are finally drawn.

In the chapter on experimental work (Chapter IX), the difficulties of interpretation when control groups are not used were pointed out, and the proper conditions for inferring causal connections were described.

In the preceding chapter, dealing with four methods of research—the causal-comparative, correlation, case-study, and genetic—considerable attention was given to interpretation. It was stressed, especially in connection with the section on the correlation method, that the inferring of cause is difficult and cannot be done mechanically from the objective evidence.

It was pointed out that two correlated series may not cause one another, but that both of them may be results of some common causal factors. The necessity for comparable data as a basis for statistical generalizations from case studies, and the need for studying individuals rather than groups in the genetic method, were emphasized.

Further illustrations of difficulties in interpretation and of erroneous conclusions will be given in the following chapter.

Importance of comparison in interpretation. Underlying all research is the element of comparison. In fact, whenever we speak of variables, and variation, we recognize implicitly the comparison of one value with another, at some other place, time, or under other conditions. It seems appropriate therefore to end the discussion of interpretation with a reference to this element of comparison, which is fundamental to all research.

In some cases, research undertakes to set up a criterion with which results can be compared. For example, this is one of the outstandingly important elements in experimental research, and the control-group type of experimentation is recognized as the most crucial type for the study of a single variable, the control group of course providing the criterion. In other cases, research is concerned chiefly with the production of results, which, for practical purposes, must be compared before they attain significance.

Because of the variety of techniques involved in school surveys, it seems fitting to quote from Caswell a review of the methods of comparison which have been found useful in such undertakings:[26]

1. *Comparison of units in the system.* The above heading includes comparisons of schools, grades, groups of schools, etc., within the school system being studied.

2. *Comparison with comparable cities.* When data on the school system being studied were evaluated by comparison with other cities, selected because of their similarity in other characteristics, this was classified under the above heading.

[26] Hollis L. Caswell, "Survey Techniques," *Educational Administration and Supervision*, XIX (September, 1933), 431-41.

3. *Comparison with neighboring cities.* Upon occasion data were evaluated by comparison with cities in the same general territory regardless of their comparability otherwise.

4. *Comparison with average practice.* This includes all cases in which the basis of evaluation was comparison with the average of a general group or classification.

5. *Comparison with outstanding practice.* In some cases data were evaluated by comparison with situations selected because of their outstanding merit. The above heading includes cases of this type.

6. *Equated groups.* The experimental procedure . . . depends for evaluation upon a comparison with respect to a variable factor of groups equated with respect to other factors. When such comparison was the basis of evaluation, it was included under the above heading.

7. *Comparison with generally accepted standards.* This classification includes standards of accrediting agencies, teacher training, etc. Only cases in which the standards were objective were included. Cases involving individual judgments were included under headings eleven or twelve.

8. *Test standards.* Since data secured from the application of standardized tests depend for interpretation on the standards of the tests, these standards were considered the basis of evaluating test data.

9. *Score-card and rating-scale standards.* As in the case of test standards, data secured from score cards and rating scales depend for evaluation upon the standards of these scales.

10. *Research results.* Whenever evaluation was made by referring to a specific research, this was classified under the above heading.

11. *Judgment of the survey staff.* Whenever the data were declared to represent a desirable or undesirable condition and no basis of evaluation was given other than the judgment of the survey staff, this was classified under the above heading.

12. *Opinion of educational experts.* Whenever the opinions of educators not on the survey staff were brought to the support of an evaluation, this was classified under the above heading.

Concluding statement. This chapter has been concerned with the general aspects of analysis in research. It was pointed out that the analysis of data after they have been collected is dependent upon various kinds of analyses made at the beginning of the study. Analysis, in fact, must be pursued throughout a research undertaking. General procedures for beginning analysis were suggested, such as mechanical manipulations of data, and taking a longer perspective on one's work.

One section was devoted to certain statistical procedures in

analysis. It has not been the purpose of this chapter to go into the technical details of statistical work, but rather to describe a few of the more important statistical concepts, and to indicate their general use in carrying on analysis in quantitative research.

The third part of the chapter was devoted to interpretation of the findings, after the data had been analyzed. Considerable difficulty in interpretation is related to the assignment of causes. Conclusions should be limited to the factors actually studied, since other causes than those to which one has given attention may prove to be more important. Selective factors, as causes, are subtle and likely to be overlooked. Another type of difficulty in interpretation is related to evaluation. If one's findings are to be of the greatest practical value, he needs often to evaluate them; yet he should endeavor to keep such evaluations distinct from the actual findings. Interpretation is one of the most important steps in research and should be undertaken with extreme care.

Problems and Exercises

1. Apply the discussion of early analysis to some research study (such as those given in any of the preceding five chapters), and illustrate by specific reference to the facts of the study what would be included in each of the four things to be analyzed, as pointed out early in this chapter. Suggest what considerations might enter into one's reasoning in coming to decisions on these points.

2. Select an example of each of the major types of research discussed in this book, and indicate the statistical procedures employed in the analysis and interpretation of the data. Suggest additional methods of analysis which might have been used with profit in given studies.

Selected References

For the general aspects of analysis and interpretation, the reader is referred to the following:

Crawford, Claude C. *The Technique of Research in Education.* Los Angeles, Calif.: University of Southern California, 1928. Pp. 320. Chapter XVI, "Analysis and Interpretation of Data," pp. 273-85. Includes 17 references in the bibliography.

GOOD, Carter V. *How to Do Research in Education*. Baltimore: Warwick and York, 1928. Pp. 298. Chapter VII, "Problems Involved in the Analysis, Organization, and Summarization of Data," pp. 160-7, and Chapter VIII, "Interpretation of Data and Formulation of Conclusions," pp. 168-75. Has 37 references in footnotes.

MONROE, Walter S., and ENGELHART, Max D. *The Techniques of Educational Research*. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928. Chapter IV, "Analyzing, Organizing, and Summarizing Data," pp. 42-8, and Chapter V, "Determining Conclusions," pp. 49-56.

ODUM, Howard W., and JOCHER, Katherine. *An Introduction to Social Research*. New York: Henry Holt and Co., 1929. Pp. 488. Chapter XXIII, "Types of Procedure: Analyzing, Interpreting, and Presenting Results," pp. 386-401.

SCHLUTER, W. C. *How to Do Research Work*. New York: Prentice-Hall, Inc., 1927. Pp. 137. Chapter XII, "Step XI—Systematizing and Arranging the Data Preparatory to Their Analysis," pp. 89-97, and Chapter XIII, "Step XII—Analyzing and Interpreting the Data," pp. 99-108.

The following five references are designed to be of the utmost simplicity in the presentation of simple statistical procedures:

FORAN, T. G. *Elementary Statistical Methods*. Washington: Catholic Education Press, 1924. Pp. 26.

GOOD, Warren R. *The Elements of Statistics*. Ann Arbor, Mich.: Ann Arbor Press, 1933. Pp. 28.

PRESSEY, Luella Cole, and PRESSEY, Sidney Leavitt. *Methods of Handling Test Scores*. Yonkers-on-Hudson, N. Y.: World Book Co., 1926. Pp. 60.

RUGG, Harold. *A Primer of Graphics and Statistics*. Boston: Houghton Mifflin Co., 1925. Pp. 142.

WHITNEY, Frederick Lamson. *Statistics for Beginners in Education*. New York: D. Appleton and Co., 1929. Pp. 123.

The following references are of the work-book or exercise type and present the essential steps of statistical procedure in connection with practice exercises:

CARROLL, Robert P. *A Drill Book in Methods of Computation in Educational Measurements*. Syracuse, N. Y.: University Bookstore, 1926. Pp. 128.

GREENE, Harry A. *Work-Book in Educational Measurements*. New York: Longmans, Green and Co., 1928. Pp. 156. (Forms A and B.)

HARTER, Richard S., and SMELTZER, C. H. *Self-Instructional Manual in Handling Test Scores*. New York: Henry Holt and Co., 1933. Pp. 58.

HOLZINGER, Karl John, and MITCHELL, Blythe Clayton. *Exercise Manual in Statistics*. Boston: Ginn and Co., 1929. Pp. 160.

LINDQUIST, Everett F., and STODDARD, George D. *Study Manual in Elementary Statistics*. New York: Longmans, Green and Co., 1929. Pp. 109.

MACDONALD, Marion E. *Practical Statistics for Teachers.* New York: The Macmillan Co., 1930. Pp. 176.

MORTON, Robert Lee. *Laboratory Exercises in Educational Statistics.* New York: Silver, Burdett and Co., 1928. Pp. 145 + lii pages of tables.

REUSSER, Walter C. *Workbook in Tests and Measurements.* Ann Arbor, Mich.: Edwards Brothers, Inc., 1935. Pp. 159. (Planographed.)

The following three references may be regarded as complete textbooks written with the intent of presenting statistical methods simply, but more thoroughly than the first group of books on statistics:

KRAMER, Edna E. *A First Course in Educational Statistics.* New York: John Wiley and Sons, Inc., 1935. Pp. 212.

TIEGS, Ernest W., and CRAWFORD, Claude C. *Statistics for Teachers.* Boston: Houghton Mifflin Co., 1930. Pp. 212.

THURSTONE, L. L. *The Fundamentals of Statistics.* New York: The Macmillan Co., 1925. Pp. 237.

Among the texts in statistics which afford a comprehensive treatment of the subject four may be mentioned:

GARRETT, Henry E. *Statistics in Psychology and Education.* New York: Longmans, Green and Co., 1926. Pp. 317.

HOLZINGER, Karl J. *Statistical Methods for Students in Education.* Boston: Ginn and Co., 1928. Pp. 372.

KELLEY, Truman L. *Statistical Method.* New York: The Macmillan Co., 1923. Pp. 390.

ODELL, Charles W. *Statistical Method in Education.* New York: D. Appleton-Century Co., 1935. Pp. 457.

The following work represents the most complete treatment of correlation to be found in any one book:

EZEKIEL, Mordecai. *Methods of Correlation Analysis.* New York: John Wiley and Sons, Inc., 1930. Pp. 427.

A book of the manual type, which incorporates formulas with brief notes of explanation, and which is useful for reference purposes, is:

ARKIN, Herbert, and COLTON, Raymond R. *Statistical Methods.* New York: Barnes and Noble, Inc., 1934. Pp. 177 + 47 pages of tables.

For a systematic list of formulas, see either of the following:

HOLZINGER, Karl J. *Statistical Methods for Students in Education.* Boston: Ginn and Co., 1928. Pp. 372. Appendix B, "List of Important Formulas for Reference," pp. 347-59.

DUNLAP, Jack W., and KURTZ, Albert K. *Handbook of Statistical Nomographs, Tables, and Formulas.* Yonkers-on-Hudson, N. Y.: World Book Co., 1932. Pp. 163. Part III, "Formulas," pp. 99-140. This is the most elaborate list of statistical formulas extant.

CHAPTER XII

THE FORMULATION OF CONCLUSIONS AND GENERALIZATIONS

The object of research. To secure a better perspective of the nature and function of generalizations in educational research, the reader should review again the purposes and processes of research. The chief purposes for which research is conducted are: (1) to determine the status of phenomena, past and present; (2) to ascertain the nature, composition, and processes that characterize phenomena; (3) to trace growth, change, and developmental history; and (4) to study cause-and-effect relationships. The methods of research devised for the pursuit of these purposes have been discussed in preceding chapters of this book.

In the search for truth the investigator starts with some felt need or difficulty, and employing such knowledge of the situation as he may already possess or secure from a direct preliminary examination of the object or from previously reported experiences, he formulates some tentative conclusions, hypotheses, or suppositions as to the probable nature of the phenomenon under investigation. These hypotheses may be employed in the further examination of the data that are already available in the form of recollections, documents, and critical surveys by previous students of the same problem. Using these data, each hypothesis is carefully tested in both thought and fact and accepted, modified, or rejected as the available evidence indicates. If the evidence already available is sufficient to establish the hypothesis or hypotheses under scrutiny, the investigation may be concluded at this point, but if insufficient, a new appeal to experience must be made. The most effective procedures of these new approaches to experience

have been discussed in the preceding chapters of this book dealing with methods of research.

Generalizations should be carefully formulated. In an earlier chapter (IV), the characteristics of a good hypothesis were enumerated as follows: (1) a good hypothesis is conceivable and in agreement with the observed facts; (2) a good hypothesis does not conflict with any law of nature which is known to be true; (3) a good hypothesis is stated in the simplest possible terms; and (4) a good hypothesis admits of the application of deductive reasoning. These same characteristics are applicable to the conclusions drawn from educational investigations and should be so employed in evaluating the generalizations reached.

Educational generalizations should be conceivable and in agreement with fact. As the research worker comes to the conclusion of his investigation, he should review carefully the evidence for and against each hypothesis. In the first place, each generalization must agree with the facts revealed by the investigation. The absence of agreement between the conclusions and the facts is so complete in some studies that the collection of data in such instances appears to have been nothing more than a formality, influencing to a minimum the investigator's already preconceived conception of the phenomenon. After the investigation is completed in the conventional sense, all the steps in the process should be checked with great care. And the investigator should ask himself repeatedly: "Are the data complete?" "Are the data accurate?" "Are the conclusions in agreement with the data?" and "Are the conclusions conceivable and in agreement with common sense?"

This final question suggests that new appeals to experience will ordinarily produce only a limited number of new data, collected from some particular point of view. Since this is true, the investigator will desire to check each generalization carefully, not only against the facts of his own study but against the facts and experiences of other investigators. This is a particularly important step in all research. We have already seen

how all investigations start with facts, go from facts to hypotheses, and from hypotheses again to fact. As one turns to facts for the verification of hypotheses, one must return not only to the facts of one's own investigation but again to the facts of previous studies. One reason why the conclusions of some research workers never appear to be conceivable, even though in apparent agreement with the facts brought forward in their own investigations, is that they neglect to check their generalizations against the wider field of facts made available by previous studies.

In this connection, the reader's attention is called to four fairly common instances in which the conclusions of investigations do not accord with the known facts. There is, first, the case in which the conclusions of the investigator are directly contrary to the facts. This situation arises occasionally where there are strongly preconceived ideas of the results. This type of conclusion probably needs no further explanation. Then, there is the case in which the investigator assumes that the names given to data-gathering devices accurately indicate what they measure. If one assumes, merely because a given data-gathering instrument possesses a certain name, that it, without further evidence, really measures what it purports to measure, one is almost certain to be led sooner or later into erroneous conclusions. Many of the generalizations relative to the relationship between intelligence and scholastic success, for example, are subject to this error, inasmuch as most of the so-called intelligence tests do not really measure intelligence. There are many other similar instances in the literature of education. A third type of situation, in which generalizations may not be in accord with the data, is that in which the facts and relationships found to exist under certain conditions are held to be true under all conditions. Many illustrations of this fallacy may be found in the field of learning, where certain facts are discovered about the learning of certain materials (nonsense syllables, for example), by pupils of certain ages, interests, and levels of intelligence under certain conditions,

and these facts are held to be true for all materials, learned by all pupils under all conditions. Finally, the generalizations made in evaluative investigations are not always in accord with the facts, because of the partial measurement of outcomes. If one were investigating, for example, the relative merits of direct and activity learning, and measured only certain outcomes, it would be erroneous to say that the facts show either the direct or indirect method of learning superior to the other, since only part of the outcomes were studied, with only a limited number of pupils studying certain materials under given conditions. Experienced research workers limit their conclusions to bring them into close agreement with the known facts.

Generalizations should not conflict with the known laws of nature or previously established generalizations. A second test of the dependability of the conclusions drawn from any particular investigation is their agreement with previously established generalizations. This test is important because, if a conclusion is in conflict with a generalization already held to be true, the disagreement must be resolved, either by showing that the conflict is not real or that the conflicting statement is false. According to the principle of "excluded middle," a statement or its denial must be true. Either a thing is true or it is not true. If, of two generalizations, one appears to deny the other, one or the other of the two statements cannot be true. Thus, before an investigation can be considered complete, a conflicting conclusion must be shown not true or not in disagreement with the generalization reached in seeking to interpret the data.

Educational generalizations should be stated in the simplest possible terms. Attention has already been directed (in Chapter IV) to the fact that the number of hypotheses should not be needlessly multiplied. Every generalization should be reduced to the simplest possible terms consistent with clarity of expression. The dangers arising from too implicit confidence in the accuracy of educational terminology were emphasized in

a preceding section of this chapter. The terminology must be simple and direct but of such a character as to summarize as precisely as possible the actual facts of the case. Each generalization should be studied with extreme care, in terms of accuracy, clarity, and simplicity of expression. (Certain problems of terminology are discussed in Chapter XIII.)

Educational generalizations should be amenable to deductive reasoning. Remembering that the generalizations of one study may become the point of departure in a subsequent investigation, they should be formulated in terms which render them subject to further verification. Attention has already been directed (in Chapter IV) to the futility of employing mystical and ethereal forces to explain educational phenomena. If the projected cause of a phenomenon cannot be verified in fact, however true it may appear, it must be discarded in all scientific explanations for something that can be substantiated. That every generalization be verifiable is a fundamental principle of scientific method, which the investigator should consider carefully before casting a conclusion in final form. He may well ask himself this question with reference to each generalization: "Is this conclusion stated in a form that it may be further verified by subsequent research?"

Some common fallacies of reasoning leading to erroneous generalizations. In an earlier chapter (I) of this discussion eleven fallacies of reasoning were enumerated. These fallacies were given as follows: (1) argument from a single or limited number of instances; (2) argument from positive instances, to the neglect of negative cases; (3) the omission of evidence contrary to one's opinion; (4) failure to observe important circumstances attending different phenomena; (5) erroneous conclusions due to prepossessions, preconceived ideas, and prejudices; (6) attributing to a single variable, effects resulting from two or more variables; (7) inaccurate instruments of measurement: dependence upon subjective judgment, estimates, and guesses; (8) argument from analogy; (9) failure to discriminate between material and immaterial circum-

stances; (10) mistaken inferences of various sorts; and (11) generalization from insufficient data.[1]

Fowler lists the following fallacies incident to induction:[2] (1) fallacy of non-observation, consisting of neglect either of some of the instances or of some of the circumstances attendant on a given instance; (2) fallacy of mal-observation; (3) errors incidental to classification, nomenclature, and terminology; (4) errors originating in the employment of the *inductio per simplicem enumerationem;* (5) errors commonly arising out of the use of the inductive methods: (*a*) mistaking *a* for the cause of *b* when the real cause is *c,* (*b*) mistaking *a* for the sole cause when *a* and *c* are the joint causes, (*c*) mistaking joint effects for cause and effect, (*d*) mistaking the remote cause for the proximate cause, or the reverse, (*e*) neglecting to take into account the mutual action of cause and effect, (*f*) inversion of cause and effect; and (6) false analogy including argument from antiquity and final causes. As the research worker comes to the end of his investigation, it is highly desirable that he take careful inventory of the data, processes, and conclusions of the study as a whole by literally checking it for each of the foregoing fallacies.

No attempt will be made to elaborate upon each of the foregoing fallacies separately, but several deserve special mention because of their common violation in educational research. Much has already been said in the literature of education about the dangers involved in generalizations arising from the study of too few cases. It is probably unnecessary to say more here. The argument from positive cases and the neglect of negative cases is a fallacy more frequently found in reasoning from incidental observation than from systematic observation. Although too much emphasis probably cannot be placed upon the dangers lurking in the shadow of preconceived ideas, personal prejudice, and mental inflexibility, we shall not stress this point further. The importance of having accurate data

1 Thomas Fowler, *The Elements of Inductive Logic.* (Third Edition, corrected and revised.) Oxford: Clarendon Press, 1876. Pp. xxvii + 360.

2 *Ibid.,* pp. 250-351.

with which to reason has also been emphasized in numerous places in this volume. Special attention was called to the dangers of non-observation in the application of principles of agreement in Chapter X. Attention has also been directed in a preceding section of this chapter to the fallacy of accepting the names of objects or instruments as accurately descriptive or as guarantees of successful performance, for example, intelligence tests as measures of native intelligence. An equally misleading problem arises in the classification of data. The assignment of data to categories should be studied carefully, since it is likely to be a highly subjective problem and both the investigator and the reader may be misled by the nomenclature employed. Although the preceding aspects will not be further emphasized in this discussion, it seems worth while to analyze and illustrate in greater detail some of the more common fallacies arising out of the use of inductive methods.

Some common fallacies of induction. Fowler's previously cited list of six common fallacies of induction includes those of mistaking *a* for the cause of *b* when the real cause is *c*, of mistaking *a* for the sole cause when *a* and *c* are joint causes, and of mistaking joint effects for cause and effect. The illustrations which follow in the next paragraph illustrate rather clearly the error of mistaking *a* for the cause of *b* when the real cause is *c*, although it is possible in some of the examples to see applications of the other two fallacies.

In reaching conclusions, a common mistake for inexperienced investigators, in the case of two or more attendant circumstances or results, is to interpret one factor as causal, overlooking some common or third factor with a causal relationship to one or more of the several results involved. For example, it was found that the greater the amount of Latin taken in high school the better the college marks of the students in question. This fact was used as a basis for a recommendation that one should take Latin in high school in order to succeed at the college level, overlooking the causal factor of intelligence which operated both in the election of Latin in the

secondary school and in college performance. An investigation of the composition of high-school boards revealed that urban secondary schools ranked high with accrediting organizations and had boards made up, in most instances, of professional men, while rural schools ranked lower in terms of accrediting ratings and had boards composed of farmers. The conclusion reached was that improvement of standards in rural schools could be brought about by placing professional men on the boards, overlooking the economic and social status of the community as a causal factor in determining both school standards and the composition of the population and board. A study of one hundred eminent Negroes revealed that most of them had attended segregated Negro elementary schools and ended with the conclusion that such training was a factor in producing eminence, not recognizing the fact that most of these mature individuals had attended elementary schools in the South, with only a few cases who had attended school in other parts of the country; of course, during the latter part of the nineteenth century when these persons were in elementary school, segregated schools were the rule. One investigator found that where a dean of girls was present in the high school, there was a fairly extensive program of social and extra-class activities for girls. The conclusion reached was that the dean of girls was responsible for initiation and stimulation of such pupil activities, overlooking the type of community as a causal factor in creating a demand for this type of training and school officer, as well as overlooking the part played by principal or superintendent in promoting pupil activities and possibly in seeing the need for a dean of girls.[3]

The second type of mistaken inference, namely, that of mistaking *a* for the sole cause of *b* when *a* and *c* are the joint causes, may be due to either the fact that both contribute to the total effect or that both are essential to the production of the result. These situations have already been referred to in

3 Carter V. Good, "Cautions to the Beginner in Educational Research," *Journal of Educational Research*, XXVI (December, 1932), 302-4.

the discussion of principles of agreement (Chapter X), and in the preceding examples of school boards and the dean of girls. A familiar instance of the error appears in many prediction studies where intelligence (or whatever is measured by the so-called intelligence test) is employed to predict scholastic success when, as a matter of fact, scholastic success is not caused by intelligence alone but by many factors, such as interest, effort, methods of work, health, and the ability to get along with other people. When a number of factors operate to produce a given effect, it is plain that working together they may modify, counteract, or even frustrate each other's influence in such a manner that it is exceedingly dangerous to generalize about any one factor. A splendid illustration of a situation where two or more factors are essential to produce a result may be found in the experimental studies of verbal learning. Under certain conditions, verbal learning may be an ineffective method, but when pursued by pupils with certain training, experience, and intelligence, it may become an exceedingly effective one. Again, it is dangerous to generalize about one cause when the effects of other causes are not known.

The third type of fallacious inference arises out of mistaking joint effects for cause and effect. A good illustration of this type of error is found in some discussions of reading, where certain eye-movements are considered the cause of poor reading. Without saying that defective eye-movement habits may not cause poor reading, there are, however, many instances in which the eye-movements observed are merely the symptoms of some more fundamental difficulty. Interestingly enough, in spite of the many discussions of eye-movements in reading, many persons have not grasped the true import of these investigations. Studies of the eye in reading may be important, but their primary purpose is not to study the eyes as such, but to use the knowledge of eye-movements as an index to important mental processes that characterize reading.

The fourth type of erroneous inference arises out of mistak-

ing the remote cause for the proximate cause and the reverse. Splendid illustrations of this fallacy are found in the conventional methods of discipline. When a pupil appears not to behave as he should, one corrective device is to move the pupil to a front seat, or to move other pupils from his vicinity, or to remove the pupil from activities where his behavior has been particularly unsatisfactory. Obviously all such adjustments are temporary in character, and a change in any one of them will produce merely a temporary effect, the real cause of the disturbance or misbehavior being more fundamental in character.

A fifth type of mistaken inference is that which arises out of the failure to take into consideration the mutual action of cause and effect. Illustrations of this type of fallacy are found in the operation of the law of effect. As each subject observes the effect of each factor in learning, knowledge of this effect (and his attitude toward it) will produce its own effect, and henceforth, the operation of the factor, the subject's knowledge of the effect, and his attitude, all operate to produce a new effect. The new effect may be either positive or negative. The law of diminishing returns, in the application of many educational devices, also appears to operate in somewhat the same fashion.

The last type of mistaken induction to which Fowler calls attention is the inversion of cause and effect. This type of error is most common in historical research where cause and effect are frequently confused. It is always a question as to whether the man produces the times or whether the times make the man. Undoubtedly, in many instances the influences are of a reciprocal character. One observes at the present time certain tendencies toward organization among professional workers. Are these organization tendencies the cause or the effect of higher standards in training, better salaries, more secure tenure? It is sometimes difficult, particularly in uncontrolled observation, to ascertain which is the cause and which is the effect.

Aside from the above list of fallacies, the investigator should not lose sight of the fact that what one sees in the study of educational problems depends upon what he knows, and that one's conclusions are accurate and fruitful exactly in proportion to the thoroughness and correctness of one's previous knowledge. When previous knowledge is vague and indeterminate, the observation will lack definiteness and depth, and will ordinarily lead to unfruitful results. The fact that one sees only what he knows how to seek out, taken together with the blinding effect of bias, preconceived ideas, and prejudices, makes it almost certain that one rarely arrives at true pictures of the objects of educational research. Generalizations cannot be made with too great care.

Certain rules of scientific thinking which are an amplification and restatement of points made earlier in this chapter, with respect to formulation of conclusions and generalizations, have been well stated by Trow:[4]

1. Give first place to facts.
2. Don't multiply theories unnecessarily.
3. Avoid reification of abstractions.
4. Regard analogy as a source of suggestions, not as proof.
5. Apply the test of agreement.
6. Scrutinize all statements purporting to be true.
7. Avoid basing conclusions on too few cases.
8. Be consistent and coherent.
9. Use precise terms.

Two levels of generalization. There are two well-recognized levels of generalization attained in educational research: (1) empirical generalizations, and (2) complete scientific explanation. When one observes some uniformity of nature which he holds to be true and for which he has no adequate explanation, his knowledge is said to be empirical. If one knew, for example, nothing of the theory of gravitation and planetary motion, but had observed the sun to rise in the east each morning, his knowledge of the movement of the sun would be

[4] W. C. Trow, *Scientific Method in Education*, pp. 72-93. Boston: Houghton Mifflin Co., 1925.

empirical. This is only one of many illustrations of this sort of knowledge which might be cited. There are, of course, numerous instances of this type of generalization in specific fields such as science and education, thus, empirical education, empirical agriculture, empirical medicine, etc. Most of the practices in the field of education to-day rest not upon complete scientific explanation but upon observed uniformities arising from either ordinary observation or scientific investigation, for which there are as yet no satisfactory explanations. The distinguishing feature of empirical knowledge, however, is not whether it has its origin in ordinary observation or in scientific investigation, but whether it is explained and understood. It arises not only in agriculture, medicine, or education, but in the physical and biological sciences and wherever there are observed but unexplained uniformities.

The aim of every science is to extend knowledge beyond the facts of observation to other facts that have not been observed, by binding them together into one comprehensive system of knowledge. To refer again to the illustration introduced above, one desires to know not merely that the sun rises regularly in the east, but why it rises in the east and why it is likely to do so for some time to come. Even though the majority of recorded facts must be empirical and thus are awaiting explanation, such knowledge is of minor value in comparison with explained knowledge, because it does not permit safe and extensive inference. What one desires to know is not merely that certain phenomena behave in certain observed uniform ways, but why they behave as they do. To make such explanations, one must refer the observed uniformities to some already established principle of science. One understands a thing only when he grasps its underlying principles. There is in the field of education to-day, for example, a rather large amount of superficial investigation of the relative merits of different instructional procedures, owing to the absence of any fundamental theory of teaching and learning to serve the purpose of directing the research and explaining observed uni-

formities. Such studies can result only in observed uniformities and empirical knowledge. The ultimate goal of educational research, however, is knowledge which is understood and explained.

Ways in which conclusions may be stated. Excellent examples of different ways in which conclusions may be stated, classified according to the following outline, are available; that is, the illustrations consist of references to investigations which may be examined to note the way in which the generalizations have been formulated:[5]

A. Statement of conclusions
   1. Concise statements
      a. Answers specifically connected with questions asked in statement of problem
      b. Conclusions specifically connected to declarative statements of problems
   2. General statements

B. Statement of limitations in conclusions
   1. Recognition of limitation due to faulty or incomplete data
   2. Recognition of danger of generalization

C. Application of conclusions
   1. Suggestions for application to practice
   2. Suggestion of problems for further investigation

Concluding statement. The purpose of research is to derive verified generalization. Because of the many pitfalls accompanying the processes of investigation, generalizations should be made with great care. Four tests should be painstakingly applied to all conclusions before accepting them as valid: (1) agreement with fact; (2) agreement with the laws of nature already held true; (3) simplicity of formulation; and (4) verifiability. In addition to these tests, each investigation should be checked for numerous fallacies in reasoning. Although the great mass of recorded facts, collected through the process of research, is empirical and is awaiting explana-

[5] W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*, pp. 50-4. University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928.

tion, the ultimate goal of the scientific method is complete explanation of the processes of nature.

Problems and Exercises

1. Cite a number of erroneous generalizations in education, other than the examples mentioned in this chapter, and indicate the nature of the fallacies involved.
2. Select a recent educational investigation, and analyze the conclusions reached according to the principles discussed in this chapter.

Selected References

A. General References

Abelson, Harold H. *The Art of Educational Research:* Its Problems and Procedures. Yonkers-on-Hudson, N. Y.: World Book Co., 1933. Pp. xi + 332.

* Almack, John C. *Research and Thesis Writing.* Boston: Houghton Mifflin Co., 1930. Pp. xiii + 308.

Bain, Alexander. *Logic:* Deductive and Inductive. (New and revised edition.) New York: D. Appleton and Co., 1880. Pp. viii + 731.

Barr, A. S., and Rudisill, Mabel. *An Annotated Bibliography on The Methodology of Scientific Research as Applied to Education.* Bulletin of the Bureau of Educational Research, No. 13. Madison: University of Wisconsin, June, 1931. Pp. 129.

* Burtt, Edwin Arthur. *Principles and Problems of Right Thinking:* A Textbook for Logic, Reflective Thinking and Orientation Courses. New York: Harper and Bros., 1928. Pp. xii + 590.

* Creighton, James Edwin. *An Introductory Logic.* (Fourth revised edition.) New York: The Macmillan Company, 1920. Pp. xvi + 502. Fifth edition, 1932 (with H. R. Smart).

* Fowler, Thomas A. *The Elements of Inductive Logic.* Oxford: Clarendon Press, 1876. (Third edition.) Pp. xxvii + 360.

* Jevons, W. Stanley. *The Principles of Science:* A Treatise on Logic and Scientific Method. (Second edition.) London: Macmillan and Co. Ltd., 1924. Pp. xliv + 786.

* McClure, Matthew Thompson. *An Introduction to the Logic of Reflection.* New York: Henry Holt and Co., 1925. Pp. xviii + 479.

Mill, John Stuart. *A System of Logic, Ratiocinative and Inductive:* Being a Connected View of the Principles of Evidence and Methods of Scientific Investigation. London: Longmans, Green and Co., 1884. Pp. xvi + 622.

Minto, William. *Logic, Inductive and Deductive.* New York: Charles Scribner's Sons, 1915. Pp. xii + 373.

* Monroe, Walter S., and Engelhart, Max D. *The Techniques of Educational Research.* University of Illinois Bulletin, Vol. XXV, No. 19.

Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928. Pp. 84.

* ROBINSON, Daniel Sommer. *The Principles of Reasoning:* An Introduction to Logic and the Scientific Method. New York: D. Appleton and Co., 1930. (Second edition.) Pp. xviii + 393.

SEGEL, David. *Differential Diagnosis of Ability in School Children.* Baltimore: Warwick and York, 1934. Pp. vii + 86.

* TROW, William Clark. *Scientific Method in Education.* Boston: Houghton Mifflin Co., 1925. Pp. xi + 159.

VENN, John. *The Principles of Empirical or Inductive Logic.* London: Macmillan and Co., Ltd., 1889. Pp. xx + 594.

WELTON, J. *The Logical Basis of Education.* London: Macmillan and Co., Ltd., 1919. Pp. xvi + 288.

——— *A Manual of Logic.* Two volumes. (Second edition.) London: W. B. Clive, 1912. Pp. xxii + 411 + 23, viii + 292 + 23.

* WESTAWAY, F. W. *Scientific Method:* Its Philosophical Basis and Its Modes of Application. London: Blackie and Son, Ltd., 1931. (Fourth edition.) Pp. xviii + 522.

WHEWELL, William. *History of the Inductive Sciences.* Three Volumes. (Third edition with additions.) London: John W. Parker and Son, 1857. Pp. xxxii + 394, xii + 488, xiv + 565.

* WOLF, A. *The Essentials of the Scientific Method.* New York: The Macmillan Co., 1925. Pp. 160.

WHITNEY, F. L. *Methods in Educational Research.* New York: D. Appleton and Co., 1931. Pp. 335.

B. Illustrative Materials

BARR, A. S. "A Study of the Amount of Agreement Found in the Results of Four Experimenters Employing the Same Experimental Technique in a Study of the Effects of Visual and Auditory Stimulation on Learning," *Journal of Educational Research,* XXVI (September, 1932), 35-45.

BILLS, Arthur G. "Some Causal Factors in Mental Blocking," *Journal of Experimental Psychology,* XVIII (April, 1935), 172-85.

BUHLER, Charlotte. "The Child and Its Activity with Practical Material," *British Journal of Educational Psychology,* III (February, 1933), 27-41.

BURKS, Barbara S., and TOLMAN, Ruth Sherman. "Is Mental Resemblance Related to Physical Resemblance in Sibling Pairs?" *Journal of Genetic Psychology,* XL (March, 1932), 3-14.

BURTON, William H., and IBANEZ, Dalmyra M. "Introductory Courses in Education," *Journal of Educational Research,* XXIX (November, 1935), 171-86.

FREEMAN, Frank N., et al. *Visual Education:* A Comparative Study of Motion Pictures and Other Methods of Instruction. Chicago: University of Chicago Press, 1924. Pp. viii + 391.

———, and HOEFER, Carolyn. "An Experimental Study of the Influence of Motion Picture Films on Behavior," *Journal of Educational Psychology,* XXII (September, 1931), 411-25.

FRYER, Douglas. "A Genetic Study of Motivation Under Changing Auditory Situations," *British Journal of Psychology,* XXIV (April, 1934), 408-33.

GATES, Arthur I., and SCOTT, Adelin White. "Characteristics and Relations of Motor Speed and Dexterity Among Young Children," *Journal of Genetic Psychology,* XXXIX (December, 1931), 423-54.

GRAY, William Henry. "An Experimental Comparison of the Movements in Manuscript Writing and Cursive Writing," *Journal of Educational Psychology,* XXI (April, 1930), 259-72.

HARAP, Henry. "A Survey of Courses of Study Published in the Last Two Years," *Journal of Educational Research,* XXVIII (May, 1935), 641-56.

HARTMANN, George W., and BARRICK, Floyd M. "Situations in General Cultural Information among Undergraduates," *Journal of Educational Research,* XXVIII (December, 1934), 255-64.

HOLLINGWORTH, Leta S. "Do Intellectually Gifted Children Grow Toward Mediocrity in Stature?" *Journal of Genetic Psychology,* XXXVII (September, 1930), 345-58.

HULL, Clark L. *Quantitative Aspects of the Evolution of Concepts.* Psychological Review Monograph Supplements, XXVIII, No. 1. Princeton, N. J.: Psychological Review Company, 1920. Pp. 86.

HUNT, Joseph McVicker. "A Functional Study of Observation," *American Journal of Psychology,* XLVII (January, 1935), 1-39.

HURLOCK, Elizabeth B. "Suggestibility of Children," *Journal of Genetic Psychology,* XXXVII (March, 1930), 59-74.

HURLOCK, Elizabeth B., and NEWMARK, Ella D. "The Memory Span of Pre-School Children," *Journal of Genetic Psychology,* XXXIX (June, 1931), 157-71.

JERSILD, Arthur T., and HOLMES, Frances B. "A Study of Children's Fears," *Journal of Experimental Education,* II (December, 1933), 109-18.

JONES, Harold E. "The Retention of Conditioned Emotional Reactions in Infancy," *Journal of Genetic Psychology,* XXXVII (December, 1930), 485-98.

———, and DUNN, Dorothy. "The Configural Factor in Children's Learning," *Journal of Genetic Psychology,* XLI (September, 1932), 3-15.

LINE, W., and KAPLAN, E. "The Existence, Measurement and Significance of a Speed Factor in the Abilities of Public School Children," *Journal of Experimental Education,* I (September, 1932), 1-8.

MCGEOCH, Grace O. "A Revaluation of the Whole-Part Problem in Learning," *Journal of Educational Research,* XXVI (September, 1932), 1-5.

MCNEMAR, Quinn. "Twin Resemblances in Motor Skills, and the Effect of Practice Thereon," *Journal of Genetic Psychology,* XLII (March, 1933), 70-97.

MACE, C. A. "The Influence of Indirect Incentives Upon the Accuracy of Skilled Movements," *British Journal of Psychology,* XXII (October, 1931), 101-14.

MALLER, Julius B., and LUNDEEN, Gerhard E. "Sources of Superstitious Beliefs," *Journal of Educational Research*, XXVI (January, 1933), 321-43.

SHEN, Nai-Chang. "Simultaneous Lifting of Equally Heavy Weights by Both Right and Left Hands," *Journal of Experimental Psychology*, XVIII (October, 1935), 544-61.

SIMS, Verner Martin. "The Relative Influence of Two Types of Motivation on Improvement," *Journal of Educational Psychology*, XIX (October, 1928), 480-4.

SPENCE, Ralph B. "Lecture and Class Discussion in Teaching Educational Psychology," *Journal of Educational Psychology*, XIX (October, 1928), 454-62.

STEPHENS, J. M. "The Influence of Punishment on Learning," *Journal of Experimental Psychology*, XVII (August, 1934), 536-55.

TINKER, Miles A. "Photographic Measures of Reading Ability," *Journal of Educational Psychology*, XX (March, 1929), 184-91.

———, and GOODENOUGH, Florence L. "Mirror Reading as a Method of Analyzing Factors Involved in Word Perception," *Journal of Educational Psychology*, XXII (October, 1931), 493-502.

VALENTINE, C. W. "An Enquiry As to Reasons for the Choice of the Teaching Profession by University Students," *British Journal of Educational Psychology*, IV (November, 1934), 237-59.

VERNON, M. D. "Characteristics of Proof Reading," *British Journal of Psychology*, XXI (April, 1931), 368-81.

WASHBURNE, John N. "The Use of Questions in Social Science Material," *Journal of Educational Psychology*, XX (May, 1929), 321-59.

WELLMAN, Beth L. "The Effect of Pre-School Attendance Upon the I.Q.," *Journal of Experimental Education*, I (December, 1932), 48-69.

CHAPTER XIII

THE PREPARATION OF THE RESEARCH REPORT

Introduction. This chapter emphasizes the importance of effective reporting of educational research and outlines the major elements to be considered in such writing. The most important items here discussed are: major divisions of the report; development, evaluation, and organization of ideas; English usage; educational terminology; tables and graphs; bibliographical and footnote form; and publication of manuscripts.

Importance of effective writing. Extended comment is unnecessary to indicate the need for clear, forceful expression in reporting the results of an educational investigation. In many instances, worth-while results secured from an experiment or study have been rendered comparatively ineffective through a careless and inadequate style of writing and organization. At least a part of the energy once devoted to promotion of classroom experiments and to convincing field workers of the desirability of replacing subjective opinion with objective data must be diverted to improvement in educational writing. Undoubtedly there is a close relation between clear thinking and a well-organized, effective style of writing. The foregoing statements are made with a definite recognition of the fact that the most fundamental element in determining the value of a research report is the scientific character of the material presented. However, since it is difficult for those who read a report to give undivided attention to content if the form is poor, certain requirements commonly accepted by careful writers should be observed. Subsequent pages of this chapter set forth briefly selected elementary principles of effective writing and organization of material.

The significance of reporting as a phase of educational research and the communicatory function of the report are well stated by Monroe and Engelhart: [1]

The report of an investigation not only serves to record and communicate the procedure and the results but it also fulfills an important function in the process of research. In the act of writing, if it is well done, the research worker refines his thinking, and the detailed record facilitates the critical testing of the work done. Thus an investigator should not consider that he has completed his task until a complete report has been prepared. If he is interested in communicating his work to others, the report must be well written in order to fulfill that purpose effectively.

Usually, in preparing a report of a study, a research worker should not confine his purposes to "telling" the reader the answer that he has obtained to the problem studied. Instead, he should try to guide the reader to think about the problem in such a way that at the conclusion of his reading a dependable answer will have been attained. Thus a complete report of an investigation should guide the reader (1) to define the problem clearly so that he will understand just what questions are to be answered and in some cases their relation to other questions, (2) to understand the data introduced, especially to be aware of their limitations, and (3) to test critically the hypothesis which is to be accepted as the answer and as a result to qualify or limit it if the data indicate that this should be done. In case other hypotheses are likely to occur to the reader, the discussion should guide him to an understanding of the reasons for their rejection.

The same authors have prepared an excellent list of criteria to be used in evaluating educational writing, which is of service as a check-list in analyzing or criticizing either the work of other writers or of one's self.[2] The organization of the present chapter is determined to a considerable extent by the sequence of topics listed in the outline which follows. In the discussion subsequent to the outline the present writers are also indebted to Monroe and Engelhart. Some of the nineteen items in the following list are grouped in the discussion presented in this chapter.

1 W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*, p. 57. University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928.

2 *Ibid.*, pp. 58-61.

SUMMARY OF CRITERIA FOR REPORTING RESEARCH

A. General structure of a report
   1. Major divisions
      (*a*) Are the following divisions reasonably explicit: definition of problem, collection of data, treatment of data, discussion of each question to be answered, and the conclusion?
   2. Introduction
      (*a*) Is the problem introduced in such a way that a competent reader will understand and appreciate the purpose of the report?
      (*b*) Has superfluous material been eliminated from the introduction?
   3. Definition of problem
      (*a*) Is the reader given a precise statement of the questions to be answered?
      (*b*) In case the problem is related to other problems, are the relations made clear to the reader?
   4. Conclusion
      (*a*) Is the reader given in convenient form an explicit answer to each question included in the "definition of the problem"?

B. Development, evaluation, and organization of ideas
   5. Trend of thought
      (*a*) As the reader "traces" the writer's thinking, will he be led from a clearly defined problem to a critical and scholarly answer by a route that is satisfying to him?
      (*b*) Is an encyclopedic enumeration of ideas or facts avoided?
   6. Development of ideas
      (*a*) Has the writer avoided leaving "gaps" in his "trend of thought" for the reader to fill in?
      (*b*) Have the important ideas been "developed" so that the average reader will fully comprehend them?
      (*c*) Has the writer developed his ideas so completely that no points have been overlooked which might leave the reader with unanswered questions?
   7. Evaluation of ideas
      (*a*) Have all irrelevant ideas been eliminated?
      (*b*) Have the ideas been grouped properly with reference to their relative importance?
   8. Accuracy of interpretation
      (*a*) Have the data been accurately interpreted?
      (*b*) Do the statements agree with generally accepted opinion

and "common sense"? If not, is attention called to such disagreements?

9. Precision of statement
   (*a*) Are the statements made so that they will convey to the reader exactly the meaning intended?
   (*b*) Are all statements worded so that ambiguity or indefiniteness is avoided?

C. Details of structure and form

10. Diction
   (*a*) Have appropriate words and phrases been used at all times?
   (*b*) Have particular words and phrases been used with a consistent meaning?
   (*c*) Have words and phrases to which common practice has assigned technical meanings been used correctly?
   (*d*) Has attention been called explicitly to each word or phrase used with an unusual or restricted meaning?
   (*e*) Has the "overworking" of certain words been avoided?
11. Clearness
   (*a*) Is the vocabulary suitable for the intended audience?
   (*b*) Are the ideas expressed in simple yet definite language?
12. Rhetoric, grammar, spelling, and punctuation
   (*a*) Have the rhetorical rules relative to unity, coherence, and emphasis in sentence and paragraph construction been properly observed?
   (*b*) Have rules of grammar been observed?
   (*c*) Are all words correctly spelled?
   (*d*) Has consistency in the plan of punctuation been observed?
13. Form of tables and graphs
   (*a*) Are the captions of tables at the top and those of graphs at the bottom?
   (*b*) Are the captions, box headings, and other labels sufficiently complete so that a competent reader will be able to understand the table or graph without referring to the accompanying text?
14. Explanation and interpretation of tables and graphs
   (*a*) Has the enumeration of the facts summarized in a table or diagram been minimized in the accompanying text?
   (*b*) Is the accompanying text sufficiently complete so that it is unnecessary for the reader to refer to the table or diagram in order to follow the trend of thought?
   (*c*) Are references to tables and graphs sufficiently explicit

so that the reader will have no difficulty in locating the correct table or graph?

(*d*) In interpreting a table or graph, is the introduction of irrelevant facts or comments avoided, so that the trend of thought is not broken?

15. References to sources of information
    (*a*) Are bibliographical references given for statements or facts taken from the works of other persons?
16. Bibliographical form
    (*a*) Are all references both in footnotes and in bibliographies given in an approved bibliographical form?
17. Chapter titles, table of contents, preface, title page, order of paging, spacing, kind of paper, and so forth
    (*a*) Have conventional rules with reference to chapter titles, table of contents, and so forth been observed?
18. Footnotes
    (*a*) Have footnotes been used to give needed explanations or other comments which will make more certain a correct and complete understanding by the reader?
    (*b*) Has material which would tend to break the trend of thought but which is desirable to include been placed in a footnote or in an appendix?
19. Miscellaneous
    (*a*) Have conventional rules with reference to abbreviations, division of words, spelling out numbers, and so forth been complied with?

Major divisions of the report. The first step in the preparation of a report should be the formulation of an outline of its major divisions. A brief, expressing in abbreviated form the principal statements to be made under each heading and subheading, is helpful, representing a more advanced stage of thinking than in the case of the outline.

A report of some length (fifty pages or more) may be appropriately divided into chapters or sections which deal with the fundamental problems involved, such as statement of the problem, related studies, techniques of collecting data and sources of data, results, and conclusions. Short reports usually indicate such subdivisions by paragraph or center headings rather than by a chapter type of organization.

Paragraph headings are now considered highly desirable in

educational reports and publications: textbooks, monographs, bulletins, theses, and articles. If the number of topics is large and the writer is unable to organize an effective sequence by use of a sheet of paper, cards may be employed. In the case of a graduate student who was preparing a long chapter of his thesis, some sixty-five subdivisions were listed on as many cards, which were shuffled until the desired sequence or organization resulted. Paragraph headings may be based on the outline or brief and should be prepared before rather than after the report is written. Of course it is not necessary that each paragraph have a heading; only when a new unit is begun should there be a heading to show the transition in thought. One overzealous student not only began each paragraph with a heading, but for some unknown reason mistakenly assumed that each heading should contain an author's name. In the typewritten manuscript the common practice is to underscore paragraph headings, which changes to italics or bold-face type in print, depending on preference. Effectively organized reports also use summary and transitional statements and paragraphs to aid the reader in following the author's basal outline. One writer who said some years ago that it was a reflection on the intelligence of the reader to make use of paragraph and sectional headings wrote an important educational book without such mechanical aids. Interestingly enough, the 1931 revision of this book has an excellent organization in terms of appropriate headings, probably the result of a demand by first-edition readers for assistance in following a rather technical type of educational thinking. The amount of significant literature available to-day is so large that it requires every legitimate mechanical aid which publisher and author can devise to promote rapid reading and economy of time.

In the introductory part of the report the problem should be stated clearly in order that subsequent discussion may be understood. In fact, it is a fairly safe plan in the graduate thesis to state the problem in the opening paragraph. It is a source of irritation and confusion to the reader to cover sev-

eral pages of material dealing with the reasons for undertaking the study and its significance before ascertaining the nature of the problem itself. The length of the introductory section depends in part on whether the writer includes under this heading a statement of the sources of the data used, techniques employed, limitations, historical background, related studies, etc. In some instances separate sections or chapters may be devoted to such items as those enumerated in the preceding sentence, especially where the available material is extensive.

Detailed suggestions concerning the definition of the problem have been given in Chapter II.

Formulation of conclusions is discussed in Chapter XII. Briefly and clearly stated conclusions, placed at the end of each major division of the report and in the final chapter of a lengthy manuscript, are of great assistance to the reader, as well as the writer, in ascertaining the generalizations to be deduced from the study in question. Use of an outline form or a numerical sequence facilitates rapid examination of, and reference to, such summaries.

Development, evaluation, and organization of ideas. The tendency of many young writers is to leave gaps or breaks in their reports, taking for granted familiarity with the concepts and procedures employed. In his own thinking and experience the immature writer has used certain ideas so frequently that he forgets the reader has not had a similar opportunity. The carefully prepared outline and brief mentioned earlier in this chapter should aid materially in promoting a continuous and unified trend of thought. The skilful writer leads his reader step by step through a well-organized analysis of the problem, method, data, and conclusions. Poor writing may be due to inadequate command of the English language, to hazy thinking on the problem in question, or to both.

Analysis, interpretation, generalization, and evaluation as applied to data and ideas are discussed at some length in Chapters XI, XII, and XIV.

The need for accuracy in the preparation of all phases of the report has been well expressed as follows:[3]

> The price of accuracy is quite evidently eternal vigilance. The degree to which it is feasible or desirable having been determined in the light of purposes and the nature of the data with which we deal, one must persistently strive for it by defining terms and simplifying procedure while gathering the information, by applying the known theorems concerning accuracy, by adopting an accuracy routine during the compiling, tabulating, and interpreting of the data, and finally by painstaking care during the period when the final report is passing through the hands of the printer.
>
> With particular reference to educational workers, we believe the ideals for insuring accuracy are not as high as they should be. Very likely this is likewise true of workers in other fields. Not only—as we have had repeated occasion to know in our editorial work—do figures in different tables of the same report often fail to "check up," but little effort appears to have been made to rid the data of such error as even an editor may detect. Some of the most competent workers are so much interested in devising tests and increasing the volume of material on which their conclusions rest that they have failed to devote the attention to accuracy which, in our judgment, it demands.

English usage. The writer should have reference to a good handbook which deals with the accepted principles of rhetoric and grammar. Too frequently faulty sentence structure, illogical paragraphing, poor punctuation, incorrect spelling, and other violations of English usage render an otherwise promising manuscript virtually worthless. It is unfortunate that too often the reader's attention is distracted from significant data and conclusions because of such lapses. It may be suggested, parenthetically, that simplified spelling systems have not yet been generally adopted in scientific writing. Certain of the available style manuals for authors are especially valuable.[4] Other manuals are listed in the chapter bibliography,

[3] "Accuracy," *Journal of Educational Research*, VIII (June, 1923), 63-7.

[4] George Carver, *Points of Style*. New York: Thomas Nelson and Sons, 1928. Pp. 86.
W. R. Good, *How to Prepare a Term Report*. Ann Arbor, Mich.: Alumni Press, 1931. Pp. iv + 28.
Garland Greever and Easley S. Jones, *The Century Handbook of Writing*. (Third edition.) New York: The Century Co., 1933. Pp. xvi + 272.
J. H. Hanford and Others, *The Nelson Handbook of English*. New York: Thomas Nelson and Sons, 1932. Pp. 344.

and in addition, certain portions of volumes on research procedure, found at the end of this chapter, may be examined, for example, Abelson, Almack, Bixler, Campbell, Crawford, Good, Odum and Jocher, Reeder, Schluter, Spahr and Swenson, and Whitney.

Educational vocabulary and terminology. An analysis of the style employed in educational periodicals ends with the recommendation that educational writing be done in a straightforward, business-like manner suited to technical publications.[5] Many educational journals need improvement in this respect.

Obviously, school workers and writers in education should seek to employ a vocabulary as exact and uniform as that used by practitioners in medicine or law. However, there is evidence of a diversified character to show that such is not the case. It seems appropriate to cite certain of the evidence concerning inexact and confusing usage of terminology in secondary and higher education, as well as to indicate the vocabulary problems which confront the reader of textbooks and professional treatises in high school and college. Some of the attempts toward standardization of our educational nomenclature will be enumerated as sources of additional information. Elsewhere, one of the writers has discussed these problems at greater length than is possible at this time.[6]

An excellent statement of the inconsistencies and lack of

A Manual of Style. (Ninth edition.) Chicago: University of Chicago Press, 1927. Pp. 391.

Manual on Research and Reports. Baltimore: Williams and Wilkins Co., 1931. Pp. 108.

C. O. S. Mawson, *Style Book for Writers and Editors.* New York: Thomas Y. Crowell Co., 1930. Pp. 213.

R. Morel Schmitz, *Preparing the Research Paper.* New York: Richard R. Smith, Inc., 1931. Pp. 94.

W. K. Smart, *Handbook of Effective Writing.* New York: Harper and Brothers, 1931. Pp. xx + 292.

Style Manual of the Government Printing Office. Washington: Government Printing Office, 1933.

S. F. Trelease and E. S. Yule, *Preparation of Scientific and Technical Papers.* (Revised edition.) Baltimore: Williams and Wilkins Co., 1930.

E. C. Woolley, *College Handbook of Composition.* Boston: D. C. Heath and Co., 1928. Pp. xix + 396.

5 Arthur Minton, "Style in Education Periodicals," *English Journal, College Edition,* XXIV (November, 1935), 724-7.

6 Carter V. Good, *How to Do Research in Education,* Chapter III. Baltimore: Warwick and York, 1929.

exactness found in the terminology of periodical literature is as follows:[7]

One who reads carefully the articles that appear in the successive issues of the *School Review* cannot fail to be struck by the loose use of terms which constantly occurs in the educational writings of the present day. For example, one author in the March number uses the term *grades* in the title of his article, while another employs the terms *mark* and *grade* interchangeably. *Grade* is the term in general use to distinguish the successive groups of pupils in their progress through the school and should be used exclusively for this purpose. The term *mark* is accurately descriptive and has but one use which is clearly understood. There is a similar, but less confusing, use of the terms *pupil* and *student* in articles in the secondary field. The more careful writers use *pupil* when speaking of the high school and *student* when referring to the college. There is also the confused use of *schedule* and *program of recitations*. The former is distinctive; the latter is properly used only in the expression *program of studies* which is applied to all of the curriculum offerings of a school. School men in other countries avoid the confusion into which we have fallen by using the terms *schedule* and *time-table*. *Extracurricular* is another descriptive word which is now inaccurate. When the activities thus designated first appeared, they were quite outside the formal studies comprising the curriculum. With the broader aims now accepted, the curriculum has expanded to include all educative experiences, among which the great variety of social activities now organized and directed by the modern school are recognized as having an important place. The term *extra-classroom* should be used as more accurately descriptive in designating these.

. . . The claim that teaching is a profession would be strengthened by a more exact use of language in our professional journals.

A number of specific factual studies of the range of terminology employed in education are available. Even in the much discussed field of objectives in secondary education an analysis of forty manuals and programs of studies reveals 106 ways of stating the aims of high schools.[8] If secondary-school workers themselves do not express with some uniformity the goals toward which they are working, pupils and parents may well be hazy concerning such objectives.

[7] Franklin W. Johnson, "Educational Terminology," *School Review*, XXXII (June, 1924), 407-8.

[8] Carter V. Good, "The Objectives of Secondary Schools in 1926-27," *Education*, XLVII (June, 1927), 585-92.

A study of the titles of parallel curricula listed in sixty-nine city programs of studies and state manuals showed 130 in use,[9] while a later investigation of the senior high schools of sixty-five school systems revealed 184 curriculum titles.[10] The courses of study in the social-science departments of twenty-nine high schools contained forty-eight different course titles.[11] Without attempting at this point to suggest the range of curricula or courses desirable in secondary schools or to select the titles appropriate, it seems clear that any increased uniformity of terminology should facilitate pupil transfer from one high school to another and college entrance, as well as clarify the thinking and writing of workers in this field.

Problems of terminology in higher education are of concern to the public-school worker. Most administrators, supervisors, and classroom teachers come from the higher institution to begin their work in the field, and many return during summer sessions for further training. The high school in turn must provide guidance for its graduates who enter the college and university in large numbers each year. The problem of articulation will prove much less difficult when a common basis of understanding has been effected through the employment of uniform titles for courses of similar content, use of the same terms in evaluation of credit, elimination of duplication in course content, etc. The partial neglect of these issues is well illustrated by the diversity of the terminology in use, the lack of standardization, and the frequent neglect of the vocabulary problems of the young student.

Illustrations may be drawn from several fields. First, data are given relative to the size of the technical vocabulary to which the young college student is introduced. An investigation including ninety-eight students who were asked to prepare a statement of what they considered the characteristics of good

9 Carter V. Good and Raymond E. Good, "Titles of Curriculum Offered or Suggested in Secondary Schools," *School Review*, XXXV (September, 1927), 503-9.

10 Carter V. Good and Edward D. Roberts, "Curriculum Titles and Curriculum Constants in Senior High Schools," *School Review*, XXXVI (November, 1928), 679-84.

11 Carter V. Good, "The Variables of the Senior High School Curriculum and the College-Entrance Problem," *School Review*, XXXV (November, 1927), 686-91.

and poor textbooks shows that "too much technical vocabulary" heads the list of specific sources of difficulty in the textbooks mentioned.[12] Analysis of ten textbooks in educational psychology revealed 559 selected technical terms considered important by four psychology instructors. The catalogues of 155 teacher-training institutions contained a total of 897 courses in psychology under 182 different course titles.[13]

A college text in zoölogy commonly used in beginning courses was found to contain 4,226 technical terms not included in the ten thousand words of the Thorndike list of most commonly used words.[14] Since teachers of foreign languages consider the acquisition of one thousand new words a fair achievement for the first year's work in their field, the technical vocabulary in the zoölogy text appears to be about four times as great as that which students are expected to master in a foreign language. Such facts indicate that the problem of technical vocabulary is one worthy of consideration in the textbooks of fields other than education.

At present several available attempts toward standardization of portions of the vocabulary in education and psychology may be mentioned: high-school [15] and college [16] terminology, financial reports of higher institutions and terms and procedures used in school statistical reports,[17] measurement and research,[18]

12 S. L. Pressey, L. C. Pressey, and Others, *Research Adventures in University Teaching*, pp. 61-3, 127-33. Bloomington, Ill.: Public School Publishing Co., 1927.

13 Marion E. MacDonald, "A Catalog Study of Courses in Psychology in State Normal Schools and Teachers Colleges," *Educational Administration and Supervision*, XIII (April, 1927), 272-82.

14 S. L. Pressey, L. C. Pressey, and Others, *op. cit.*, pp. 127-53.

15 Charles Hughes Johnston, Jesse H. Newlon, and Frank G. Pickell, *Junior-Senior High School Administration*, pp. 65-88. New York: Charles Scribner's Sons, 1922.

16 David A. Robertson, *Standard Terminology in Education*. Educational Record Supplement (January, 1927). Washington, D. C.: American Council on Education. Pp. 32.

17 National Committee on Standard Reports for Institutions of Higher Education, *Suggested Forms for Financial Reports of Colleges and Universities*. Emory University, Georgia: The Committee, G. H. New, Secretary.

H. A. Dawson and E. M. Foster, *A Preliminary Study of Terms and Procedures Used in School Statistical Reports*. Office of Education Circular, No. 137, February, 1935. Washington: Office of Education, 1935. Pp. 16.

18 Walter S. Monroe, *Definitions of the Terminology of Educational Measurements*. University of Illinois Bulletin, Vol. XX, No. 6. Bureau of Educational Research Circular, No. 13. Urbana, Ill.: University of Illinois, 1922. Pp. 18.

Charles W. Odell *A Glossary of Three Hundred Terms Used in Educational Measurement and Research*. University of Illinois Bulletin, Vol. XXV, No. 28. Bureau of Educational Research Bulletin, No. 40. Urbana, Ill.: University of Illinois, 1928. Pp. 68.

psychological terms,[19] and ambiguous terms in educational psychology.[20] Haggerty is responsible for the compilation of a list of 2,584 topics in psychology.[21] Voegelein has prepared a valuable alphabetical classification of activities and functions which covers the entire field of education and aims to assist educators and librarians in the preparation of references to educational literature and in filing materials.[22]

Rugg attempted to find what educational terminology a beginning teacher should know by analyzing five general introductory textbooks in education and by sampling eleven periodicals. The study resulted in 2109 different concepts, including derivatives.[23] Gilchrist sought to determine the educational terms which secondary-school teachers must know in order to understand present-day educational literature, by analyzing the articles dealing with secondary education in the *School Review* during the years 1913, 1920, 1926, and 1927.[24] Although such studies possess obvious limitations in terms of completeness, they offer valuable suggestions to writers, students, teachers of education, and workers in the field.

Of course, space is not available to present a glossary of educational terms, which seems unnecessary in view of the several dictionaries devoted to this purpose.

At this writing certain terminology projects are under way or under consideration. A committee of the American Council on Education has developed plans for a comprehensive dictionary of educational terms. A. K. Kurtz and H. A. Edgerton have worked out tentatively a dictionary of some 2,000 sta-

19 Horace B. English, *A Student's Dictionary of Psychological Terms*. Yellow Springs, Ohio: Antioch Press, 1929. Pp. 82.
H. C. Warren, *Dictionary of Psychology*. Boston: Houghton Mifflin Co., 1934.

20 S. M. Corey, "Certain Ambiguous Terms in Educational Psychology," *Journal of Educational Psychology*, XXII (February, 1931), 131-8.

21 M. E. Haggerty, *Topics in Psychology*. Minneapolis, Minn.: University of Minnesota Press, 1929.

22 L. Belle Voegelein, *List of Educational Subject Headings*. Columbus, Ohio: Ohio State University, 1928. Pp. xiv + 338.

23 E. U. Rugg, "What Educational Terminology Should a Beginning Teacher Know?" *Educational Administration and Supervision*, XVI (March, 1930), 187-95.

24 Robert S. Gilchrist, "Leading Terms in Educational Literature," *School Review*, XXXVIII (October, 1930), 622-6.

tistical terms. H. L. Nearpass is preparing a dictionary and handbook of educational measurements in which more than 2,000 terms are defined and discussed. A committee of the American Library Association is now formulating definitions of library terms. There is in progress a classified list of educational subject headings, with an alphabetical index, which will include definitions of many terms.

Tables and graphs. The problems of analysis, classification, and interpretation of data are treated at length in Chapter XI. Therefore, tabular and graphic presentation will be discussed briefly at this time only in terms of form.

In the interest of brevity, a series of statements may be made with respect to construction of tables.

1. Each series of items which involves frequencies should be presented in the form of a table with an appropriate title and number. When a table lacks either title or number, both author and reader may have difficulty in referring to or locating readily the desired data.

2. The table heading should not be divided into separate clauses or sentences, but should express adequately in a continuous title the nature of the data included. To begin the title with such words as "showing," "table showing," and "distribution of" (usually) is superfluous.

3. The word TABLE (written in double caps as in this sentence), together with the number of the table in Roman numerals, should be centered above the table, followed on the next line by the title in double caps.

4. A double ruling should appear below the title of the table.

5. A single ruling should appear at the end of the table.

6. Vertical rulings should be inserted as needed, and care should be taken that the heading above each particular section applies only to that section. Rulings are not necessary on the right and left margins of the table.

7. Uncommon abbreviations should be explained in footnotes below the table. In general, abbreviations are to be avoided, if possible.

8. Footnotes in connection with the table should be referred to by stars, asterisks, or letters rather than by figures. Otherwise, confusion with the data of the table might result.

9. If possible, confine the table to a single page. Unwieldy tables in many instances may be broken up into separate tables in order to prevent use of a large sheet which has to be folded. Folded tables and graphs involve difficulties in binding the report, are easily lost or torn,

and wear through where creased. When a table must be continued on a second page, the box headings should be repeated at the top of each column of data, so as to facilitate ready use of the material; the table number, but not the table title, should be repeated, thus, TABLE I (Continued). It is sometimes necessary to turn unusually wide tables sidewise on the page.

10. Titles of tables in the list of tables (in the front of the report) should be written in single caps. Lists of tables and figures are useful in locating desired data.

11. The title of each table in the list of tables should correspond exactly with the title on the page where the table appears.

12. Tables should be placed in the manuscript as near the point of first reference as possible and should be centered in the page for the balanced appearance which results.

13. Too many groups or columns of data should not be shown in one table. It is better to select for each table the data needed to establish clearly a limited number of points, in some instances only one or two, than to invite confusion as the result of too complicated a table.

For illustrations of tabular form the reader may examine the various tables of this book, as well as the lists of tables found among the preliminary pages of many volumes, which will aid in locating the tables, although the reader must remember that the typewriter lacks the flexibility of printing type and cannot reproduce exactly tables found in printed volumes.

A committee has provided valuable suggestions for the preparation of graphs, diagrams, figures, charts and maps.[25]

1. The general arrangement of a diagram should proceed from left to right.

2. Where possible, represent quantities by linear magnitude, as areas or volumes are more likely to be misinterpreted.

3. For a curve, the vertical scale, whenever practicable, should be so selected that the zero line will appear in the diagram.

4. If the zero line of the vertical scale will not normally appear in the curve diagram, the zero line should be shown by the use of a horizontal break in the diagram.

5. The zero lines of the scales for a curve should be sharply distinguished from the other coördinate lines.

6. For curves having a scale representing percentages, it is usually desirable to emphasize in some distinctive way the 100 per cent line used as a basis of comparison.

25 *Report of the Joint Committee on Standards for Graphic Presentation.* New York: American Society of Mechanical Engineers, 1918. Pp. 50.

7. When the scale of the diagram refers to dates, and the period represented is not a complete unit, it is better not to emphasize the first and last ordinates, since such a diagram does not represent the beginning and end of time.

8. When curves are drawn on logarithmic coördinates, the limiting lines of the diagram should each be of some power of 10 on the logarithmic scale.

9. It is advisable not to show any more coördinate lines than necessary to guide the eye in reading the diagram.

10. The curve lines of a diagram should be sharply distinguished from the ruling.

11. In curves representing a series of observations, it is advisable whenever possible, to indicate clearly on the diagram all the points representing the separate observations.

12. The horizontal scale for curves should usually read from left to right and the vertical scale from bottom to top.

13. Figures for the scale of a diagram should be placed at the left and at the bottom or along the respective axes.

14. It is often desirable to include in the diagram the numerical data or formulae represented.

15. If numerical data are not included in the diagram, it is desirable to give the data in tabular form accompanying the diagram.

16. All lettering and all figures in a diagram should be placed so as to be easily read from the base as the bottom, or from the right-hand edge of the diagram as the bottom.

17. The title of a diagram should be made as clear and complete as possible. Subtitles or descriptions should be added if necessary to insure clearness.

Rugg has provided excellent illustrations of these seventeen principles of graphic presentation enumerated above, as well as a helpful treatment of tabular, graphic, and statistical analysis in general.[26]

Additional suggestions concerning the form of graphs are as follows:

1. Figures should be numbered in Arabic numerals, followed by a period and a dash, with the legend placed beneath the figure (not in double caps).

2. Sufficient explanation of symbols should be given below the figure. This applies to different cross rulings in a bar diagram, different kinds of lines or colors in a line diagram, etc.

[26] Harold Rugg, *A Primer of Graphics and Statistics for Teachers*, pp. 123-32. Boston: Houghton Mifflin Co., 1925.

3. Titles of figures in the list of figures (in the front of the report) should be written in single caps.

4. The title of each figure in the list of figures should correspond exactly with the title on the page where the figure appears.

For additional information concerning tabular and graphic presentation of data, reference may be made to almost any one of the textbooks of the past few years dealing with statistical method. Preparation of tables and graphs has received detailed attention in a number of useful books.[27] In view of the availability of such aids and the variety of graphic procedures, it does not seem feasible to reproduce illustrations in this book.

Bibliographical form. A consistent and complete bibliographical form should be adopted and used conscientiously. If a given form is prescribed by the graduate school, publishing house, or journal for which the individual is working, of course that plan should be followed. Once a given style has been adopted, no liberties should be taken with it, even though the student thinks he knows of better forms. One of the best systems of bibliographical and footnote form is that used by the University of Chicago Press in issuing its educational publications—the *School Review, Elementary School Journal,* and *Supplementary Educational Monographs* (University of Chicago). The *Journal of Educational Research* uses essentially the same style. The illustrations given in this chapter follow the Chicago system.

The form for books should include information concerning author, title (underscored on the typewriter and in italics in print), place of publication, publisher, date of publication, and number of pages, for example,

HOLZINGER, Karl J. *Statistical Methods for Students in Education.* Boston: Ginn and Co., 1928. Pp. viii + 372.

27 Fay Campbell, *Charts.* Chicago: Wheeler Publishing Co., 1928. Pp. 96.
K. G. Karsten, *Charts and Graphs.* New York: Prentice-Hall, 1923. Pp. 724.
Bruce D. Mudgett, *Statistical Tables and Graphs.* Boston: Houghton Mifflin Co., 1930. Pp. viii + 194.
Helen M. Walker and Walter Durost, *Statistical Tables: Their Structure and Use.* New York: Teachers College, Columbia University, 1935. Pp. 96.
J. H. Williams, *Graphic Methods in Education.* Boston: Houghton Mifflin Co., 1924. Pp. xviii + 320.
See also footnote 6 in Chapter XI.

Monographs, bulletins, and year-books should be listed in the same way as books, with the addition of the name of the series and the volume (where used) and number of the series, for example,

LYMAN, R. L. *Summary of Investigations Relating to Grammar, Language, and Composition.* Supplementary Educational Monographs, No. 36. Chicago: University of Chicago, 1929. Pp. viii + 302.

MONROE, W. S., and ENGELHART, M. D. *The Techniques of Educational Research.* University of Illinois Bulletin, Vol. XXV, No. 19. Bureau of Educational Research Bulletin, No. 38. Urbana, Ill.: University of Illinois, 1928. Pp. 84.

McHALE, Kathryn, and Others. *Changes and Experiments in Liberal-Arts Education.* Thirty-first Yearbook of the National Society for the Study of Education, Part II. Bloomington, Ill.: Public School Publishing Co., 1932. Pp. x + 310.

Periodical references should include author, title (in quotation marks), exact name of periodical (underscored on the typewriter and in italics in print), volume number in Roman numerals, month and year, and number of pages inclusive, thus,

STOUTEMYER, J. H. "The Psychology of the Table of Contents," *Journal of Educational Research,* XXIV (October, 1931), 227-30.

Periodical literature in education includes all published materials appearing at regularly stated intervals, ranging from weeklies such as *School and Society* to quarterlies like the *North Central Association Quarterly.* As a rule the makeup, cover, size, range of topics covered, etc., distinguish educational periodicals or journals rather sharply from year-books, annual reports, volumes of proceedings, monographs, and occasional bulletins belonging to a series. Some students become confused when attempting to distinguish between an educational journal or periodical such as the *Educational Research Bulletin* (Ohio State University) which appears monthly during the school year, and occasional monographs or so-called bulletins, which may belong to a series, but usually deal with a single major problem and in form approximate the makeup for books.

Unpublished material, such as a graduate thesis or term paper, may be listed as follows:

GRINNELL, John Erle. "The Rise of the North Central Association of Colleges and Secondary Schools." Unpublished Doctor's thesis. Stanford, Calif.: Stanford University, 1934. Pp. 400.

Legal material is listed as follows:

Atlantic Reporter, 1885-1927.
Legislative Acts of Ohio, 1850-1900.
Reports of the Supreme Court of Ohio, 1920-27.
Session Laws of Wisconsin, 1920-26.

The bibliography should be arranged alphabetically by surnames of authors. Underscoring in a typewritten manuscript is italicized in print. The bibliography ordinarily is placed at the end of the report rather than at the ends of the various sections or chapters, except in the case of textbooks. If it is rather long, there is some advantage in grouping the references under appropriate subject or topical headings (but not in terms of the form in which printed), maintaining the alphabetical arrangement under each separate heading. Annotations render the bibliography more valuable to the reader. A group of references on creating social intelligence, with unusually full annotations, has been published as a "descriptive bibliography." [28]

Certain suggestions or cautions concerning bibliographical form may be summarized briefly:

1. Be consistent in the use of the form adopted.
2. Arrange the bibliography alphabetically by surnames of authors.
3. Avoid abbreviations of journals, organizations, institutions, etc.
4. Academic and professional titles such as Doctor and Professor are unnecessary in scientific writing.
5. Use the home office of the publishing house represented.

Two helpful sources present numerous examples of biblio-

[28] "Creating Social Intelligence: A Descriptive Bibliography," *Research Bulletin of the National Education Association*, XIII (May, 1935), 71-159

graphical form, the first including a rather detailed card for accumulating references.[29]

The extent to which bibliographies have been used is shown in an analysis of 144 periodicals in psychology and related fields over the period 1900-1927; 2,134 bibliographies were discovered.[30] Writers have stressed the importance of a canvass of related literature by speaking of the bibliographical survey as the "pilot" of research.[31]

Footnote form. The form of a footnote reference is the same as for a bibliographical reference except that the author's name is written in the normal order, as John S. Smith, followed by a comma instead of a period. When references to the same publication occur on the same page, *Ibid.*, followed by the page reference may be used, for example, *Ibid.*, p. 28. When a reference has been given in full in a footnote less than four or five pages back, the author's name followed by *op. cit.* and page reference may be used, for example, John S. Smith, *op. cit.*, p. 72. Other possible forms are listed in the style manuals, cited in this chapter, but the two given here will take care of the reader's needs. When there is a large number of citations in a report, it is recommended that the author or investigation to which reference is made be followed by numerals in parentheses, indicating the proper item in the bibliography, instead of giving the reference in a footnote. Thus, Smith's study (21:105) means that bibliographical item No. 21 contains on p. 105 the data cited. Footnotes should be separated by a line from the rest of the page in a typed manuscript, and numbered in Arabics consecutively throughout a given chapter.

Interesting illustrations of erroneous citations are given in

29 Carter Alexander, *How to Locate Educational Information and Data*, pp. 52-64. New York: Bureau of Publications, Teachers College, Columbia University, 1935.
Eleanor M. Witmer and Ethel M. Feagley, *A Beginner's Guide to Bibliography with Examples Drawn from the Field of Education.* (Revised edition.) New York: Teachers College Library, Columbia University, 1935. Pp. 32.

30 C. M. Louttit, "The Use of Bibliographies in Psychology," *Psychological Review*, XXXVI (July, 1929), 341-7.

31 W. A. Hamor and L. W. Bass, "Bibliochresis: The Pilot of Research," *Science*, LXXI (April 11, 1930), 375-8.

an article dealing with scientific publications.[32] The many obvious mistakes made in footnote and bibliographical references indicate the need for especial care in copying citations to the sources used.

Whenever material has been quoted directly or indirectly, reference by means of the raised Arabic numeral in the body of the page should be made to the appropriate footnote, or the plan of cross-reference to the bibliography, described above, should be used. The practice of giving such recognition for material, ideas, and points of view secured from others is only intellectual honesty. The individual who violates this principle is guilty of plagiarism or intellectual theft. Available discussions refer to striking illustrations of flagrant "literary piracy."[33]

There is at least one instance in which a student was awarded a Doctor's degree from one of the best known universities on the basis of a dissertation, the most important chapter of which was largely borrowed from a new book in the same field, with no word of recognition. Apparently the candidate was provincially ignorant or intellectually dishonest, and his reading committee lax in evaluating the work in terms of up-to-date publications on the same subject. Not until after the degree was awarded did the officers of this university discover the theft through information presented by workers from another institution.

Failure to give full credit in the field of research has been referred to as Pythagoreanism. Pythagoras was a Greek scientist of the sixth century, B.C., credited with contributions to mathematics, astronomy, and physical science.[34] He is said to

32 G. A. Shull, "Erroneous Citations and Titles of Scientific Papers," *Science*, LXXIII (April 3, 1931), 363-4.

33 W. D. Matthew, "Credit or Responsibility in Scientific Publication," *Science*, LXXI (June 27, 1930), 662-3.
C. W. Stiles, "Absent-Mindedness as a Factor in Professional Ethics," *Science*, LXXI (January 24, 1930), 100-1.
H. B. Van Hoesen, "Literary Piracy," *School and Society*, XXXII (November 15, 1930), 672-3.
J. E. W. Wallin, "Literary Piracy," *School and Society*, XXXII (October 18, 1930), 527-9.

34 T. A. Boyd, *Research*, pp. 277-82. New York: D. Appleton-Century Co., 1935.

have founded a secret society, the members of which were pledged to reveal all their ideas and discoveries to him alone. Unfortunately some workers to-day take credit for discoveries which they did not make, just as in the case of Pythagoras. Nothing could be more detrimental to the morale of an institution, school system, research department, or laboratory than to have some ranking officer take full credit for the work done by his subordinates. This means that ordinarily research should be reported or published under the name of the person who conducted the investigation.

Short quotations of a line or two may be placed in quotation marks within the paragraph, while longer quotations should be single spaced, without quotation marks, in a separate paragraph. If copyrighted material is to be quoted in a published report, permission to do so should be secured from the publisher or author (as a rule, the former); usually such permission is graciously given. It is not necessary to secure permission to quote material in an unpublished manuscript. The various chapters of this book provide numerous examples of footnote usage.

Examples of footnote form in the case of legal materials are as follows:

[1] *Barry* v. *McCollom*, 81 Conn. 293, 129 Am. St. Rep. 215, 70 Atl. 1035.
[2] *Laws of Nebraska*, 1919, Chap. 44, sec. 843.
[3] *Burn's Annotated Statutes of Indiana*, 1925, Vol. II, sec. 6448.
[4] *School Laws of Pennsylvania*, 1925, sec. 1432.
[5] *Compiled Statutes of Nebraska*, 1922, sec. 6509.
[6] *Revised Statutes of Kansas*, annotated, 1923, act. 48, sec. 28.
[7] *Smith* v. *Johnson*, 105 Neb. 61, 178 N.W. 835, 12 A.L.R. 231.

Preliminary pages and miscellaneous items. Title page, preface, table of contents, list of figures, list of tables, and index hardly require comment as mechanical aids valuable to the reader for orientation purposes and for the ready location of material in the manuscript or printed report. Ordinarily the typewritten report does not have an index, and in such

cases it may be desirable to make the table of contents more elaborate than for an indexed printed report. The type of material included in the various preliminary pages of the report and the appropriate form are illustrated in the corresponding pages of this book.

White bond paper of approximately sixteen-pound weight is preferable, and a black ribbon and black carbons should be used in the preparation of the typewritten manuscript. Margins should be reasonably wide, approximately 1 to 1¼ inches on all four edges of the page. The same margins should be left on pages containing charts, graphs, statistical tables, maps, etc. The typewritten manuscript should be written on one side only and double spaced, except in the case of quotations, which are single spaced. In the preparation of the first draft, it is desirable and economical to place tables of some length on separate pages, as well as to begin major subdivisions on a new page. In this way insertions are possible, and a considerable amount of retyping is avoided. Scissors and paste frequently are valuable aids in assembling the first draft and in making revisions. Valuable time should not be wasted in unnecessary copying or typing, when cutting and pasting will aid in preparing a readable draft.

Unnecessary division of a word at the end of a line should be avoided. If it is necessary to divide a word, the conventional rules should be followed, according to the natural divisions in correct pronunciation. "Simplified" spelling is undesirable in academic and scientific writing.

Numbers below one hundred and round numbers such as five hundred, ten thousand, and one million should be spelled out, as well as any number at the beginning of a sentence. Spell out "per cent" rather than use the symbol %. Decimals used in expressing money and per cent, and enumerations going as high as five or six separate items should be expressed in figures.

Scientific writing should be done impersonally. The editorial "we" is especially objectionable.

Publication of the manuscript. Valuable studies, reports, and theses may be published either in full or in summary form in order that the generalizations formulated may be applied in the improvement of educational procedure. Of course the writer must consider carefully the characteristics of his prospective audience and the medium of publication contemplated. If submitted to the wrong publisher or editorial staff, the best of manuscripts will be returned. The annual year-book of the Educational Press Association of America contains a list of the available educational periodicals. The information in Chapter III of the present book should aid in selecting a prospective avenue of publication. The appendix contains lists of journals in subject-matter fields.

Usually publication of an article in an educational journal is considered a professional service and an academic recognition, without tangible return other than reprints or copies of the periodical, furnished without cost in most cases. If the suggestions made in this chapter are followed, much editorial labor and revision by both author and editor will be avoided. The uninitiated field worker and student hardly suspect the way in which editors make readable reports out of almost hopeless first drafts of manuscripts in which was hidden a gleam of truth. This same statement may be made with respect to the work done by many university professors in editing graduate theses. It should be emphasized that this type of revision belongs properly on the shoulders of the individual who prepares the initial draft of the report. Such training should have been secured before the graduate-school period.

Most journals furnish the author galley proof of his material, while in the case of books he receives both galley and page proof. It should be emphasized that changes in proof are expensive, especially in page proof. The writer is, therefore, obliged to have his copy in as nearly perfect form as possible before sending it to press.

Eells reports an analysis of the editorial policies of forty-nine leading journals which should be valuable to those sub-

mitting manuscripts for publication.[35] He asked questions as follows:

1. Do you accept unsolicited contributions for publication from graduate students in education?
2. Is there any restriction to the field you attempt to cover other than that indicated by the title of your journal? *e.g.*, elementary, secondary, collegiate, research, special topics, etc.?
3. What is the desirable or maximum length of articles that you ordinarily consider favorably for publication?
4. Do you prefer charts?
5. Do you prefer tables?
6. Do you pay for contributions accepted?
7. If so, at what rate?
8. Do you furnish the author, without cost, extra copies of an issue containing his article?
9. Are reprints furnished, without cost, to the author? If so, how many?
10. If reprints are not furnished without cost, what is the approximate charge per page for four pages, one hundred copies? Three hundred copies?
11. Do you send the author proof of articles accepted, before publication?
12. If you have any printed instructions or suggestions for contributors, please send a copy.
13. Please state some criteria which you employ to determine whether a research article is worthy of publication in your journal.

The answers given are too detailed and varied to summarize here. The reader may refer to Eells' analysis for the policy of any one of the forty-nine journals.

For the benefit of the writer, whether a beginner or one of experience, proofreader's marks in common use are reproduced on the next page.[36]

Concluding statement. The foregoing discussion of the preparation of the research report has been directed mainly to the field investigator and graduate student, in many instances one and the same person. It is hoped that such supervisors of educational investigation as directors of research

[35] Walter C. Eells, "Publication of Educational Research," *Journal of Educational Research*, XXXIII (January, 1931), 31-42.
[36] Compiled by the University of Chicago Press.

PROOFREADER'S MARKS

Delete and close up	En dash
Reverse	Insert semicolon
Close up	Insert colon and en quad
Insert space	Insert period and en quad
Paragraph	Insert interrogation point
Indent one em	Query to author
Move to left	Use ligature
Move to right	Spell out
Lower	Transpose
Elevate	Wrong font
Insert marginal addition	Set in **bold face** type
Even space	Set in roman type
Broken letter	Set in *italic* type
Push down space	Set in CAPITALS
Straighten line	Set in SMALL CAPITALS
Align type	Set in lower case
Insert comma	Lower-case letter
Insert apostrophe	Let it stand
Insert quotes	Run in same paragraph
Hyphen	Insert lead between lines
Em dash	Hair space between letters

bureaus, progressive school supervisors, and graduate professors are thoroughly acquainted with these elementary principles of good writing. However, it must be confessed that this hope is far from realized, as witnessed by the number of poorly prepared manuscripts received by all who serve in any editorial

capacity. Due appreciation of the work of those who edit educational reports, whether books, magazine articles, theses, surveys, classroom experiments, courses of study, or other field projects should be expressed.[37]

A silent aid if not a "ghost writer" stands behind the finished work of many a successful author. He (or she) is the editor who labors for long hours over the manuscript, the galleys, and the page proof. In the finished production his name rarely appears; yet to him must go the credit for many a succinct phrase, for many an appropriate word, for a large part of the mechanical correctness, appropriateness, and beauty, and for the general form and style of the completed work. With him work the other less well-known technicians who have to do with the making of books and magazines. To the editor and his helpers the author owes, but seldom gives, their due of praise and thanks.

The making of a book or magazine is no simple task. Eternal vigilance is the price of perfection. In the securing of fine precision in diction, beauty of style, and mechanical beauty no person has quite so much influence as the careful editor. He catches the careless author at every turn. He has a fine ear attuned to dissonant words and phrases, a fine eye for the detection of misplaced marks of punctuation, a positive genius for the insertion of the elusive comma, the sturdy semicolon, and the stalwart colon. To him the loose sentence is a simple thing, the split infinitive a matter of slight difficulty, and the misplaced phrase a problem of simple transposition. The printer's legend "one line short" is a trivial question of mere language ingenuity. With consummate care he puts in a shim here, tightens a bolt there, and adds the ever-needed lockwasher to keep the whole thing snug and workmanlike. Yet in all of this skilled and exacting work, the editor carries on in a modest manner; he is courteous and kindly. He constantly says to the struggling author, "Would you prefer this, or shall we let the original stand?" Truly in the making of books and magazines he has a grand and noble part.

In the making of educational books, the editor has a very large share. Such work is exacting and technical. Facts are facts, principles are principles, and must be accurately stated. And it may be said, without casting reflections upon any one, that writing is an art which many educational workers do not possess. The fine appearance, the mechanical correctness, and the smooth and effective style of many of our educational books and magazines, therefore, owe a great deal to the ever present, but generally silent, editor. Praise to him, and to her—for in an astonishingly large number of cases it is "her." Women seem to have a special aptitude for the making of magazines and books.

[37] "Praise to the Editor," *University of Pittsburgh School of Education Journal*, III (January-February, 1928), 58-9.

Problems and Exercises

1. Examine one of the bibliographies prepared in connection with earlier problem assignments and note whether all of the various possible types and forms of references are represented, and follow some complete and uniform bibliographical style. Make any needed corrections.

2. Select some completed study, and analyze it in terms of desirable standards for reporting research, as developed in this chapter. If desired, use the check-list of 19 major items found near the beginning of this chapter.

Selected References

* Abelson, H. H. *The Art of Educational Research: Its Problems and Procedures*, Chapter XIX. Yonkers-on-Hudson, N. Y.: World Book Co., 1933.

* Almack, J. C. *Research and Thesis Writing*, Chapters IX, X. Boston: Houghton Mifflin Co., 1930.

Arthur, J. C. "Proposed Amendments to the International Rules of Nomenclature," *Science*, LXX (October 4, 1929), 330. Deals with nomenclature in botany.

Barr, A. S. "Educational Terminology," *Journal of Educational Research*, XXIII (May, 1931), 417-8.

* Bentley, Madison, and Others. "Instructions in Regard to Preparation of Manuscript," *Psychological Bulletin*, XXVI (February, 1929), 57-63.

Berglund-Gray, Gunborg. "Methods Used in Preparing Manuscripts for Publication in Psychology and Education," *Journal of Educational Research*, XXIX (November, 1935), 212-5. Based on statements made by forty-four authors in the fields represented.

* Bixler, H. H. *Check-Lists for Educational Research*, Chapter VI. New York: Teachers College, Columbia University, 1928.

Brace, D. K., and Others. "Report of the Committee on Terminology in the Measurement of Physical Education," *American Physical Education Review*, XXXIV (September, 1929), 393-405.

———, and Others. "Report of the Committee on Terminology," *Research Quarterly of the American Physical Education Association*, II (March, 1931), 175-8.

Campbell, L. R. "Editing the Curriculum," *School and Society*, XXXVII (February 25, 1933), 251-6.

* Campbell, W. G. *A Form Book for Thesis-Writing*. Los Angeles, Calif.: University of Southern California Press, 1933. Pp. 146.

* Cole, A. H., and Bigelow, K. W. *A Manual of Thesis-Writing*. New York: John Wiley and Sons, 1934. Pp. 48.

Crabb, A. L. *A Study in the Nomenclature and Mechanics Employed in Catalogue Presentations of Courses in Education*. George Peabody

College for Teachers Contributions to Education, No. 21. Nashville, Tenn.: George Peabody College for Teachers, 1926. Pp. 98.

CRANE, E. J. "The Standardization of Chemical Nomenclature," *Journal of Chemical Education*, VIII (July, 1931), 1335-40.

* CRAWFORD, C. C. *The Technique of Research in Education*, Chapter XVII. Los Angeles, Calif.: University of Southern California, 1928.

DAVIS, Watson. "Publication of Industrial Research," *Science*, LXXIII (May 1, 1931), 477-8.

DAVIS, W. M. "Preparation of Scientific Articles," *Science*, LXXII (August 8, 1930), 131-4.

EGINTON, D. P. "Obsolete Terms of Traditional Educators," *High School Teacher*, X (January, 1934), 5-8, 23.

EMIG, E. J. "A Survey of University Presses," *School and Society*, XXXIII (April 25, 1931), 572-4.

FAIG, J. T. "Report on Technical Nomenclature," *Journal of Engineering Education*, XIX (October, 1928), 220-2. Includes a list of scientific and engineering symbols and abbreviations.

FISHER, M. L. "Vocabulary Difficulties of Students in Educational Psychology." Unpublished Master's thesis, University of Nebraska, 1928.

FOSTER, F. M. "Uniformity in Administrative Nomenclature," *Junior College Journal*, III (April, 1933), 362-4.

FRANK, J. O., and WHITE, H. K. *High School Science Terminology: Chemistry and Physics*. Oshkosh, Wis.: J. O. Frank and Sons, 1930. Pp. 204.

GLEASON, H. A. "A Plea for Sanity in Nomenclature," *Science*, LXXI (May 2, 1930), 458-9. Discussion of terminology in botany.

GOOD, Carter V. "Careless Practices in Educational Writings," *School and Society*, XXIII (May 29, 1926), 684-6.

——— "Educational Writings, Editing and Errors," *School and Society*, XXVII (February 4, 1928), 146-50.

* ——— *How to Do Research in Education*, Chapter IX. Baltimore: Warwick and York, 1929.

* GOODENOUGH, Florence L., and ANDERSON, J. E. *Experimental Child Study*, Chapter VIII. New York: The Century Co., 1931. Deals especially with the reporting of an experiment.

HANCE, R. T. "Publication," *School and Society*, XXXIV (November 7, 1931), 625-6. Discusses the desirability of writing for publication.

HENDERSON, Junius. "Biological Nomenclature," *Science*, LXXI (March 14, 1930), 286-7.

JACOT, A. J. "Nomenclature and Me," *Science*, LXXII (September 12, 1930), 272-3. Discusses nomenclature in botany and zoölogy in the naming of plants and animals.

JOHNSON, G. L. "A Problem in the Study of a Technical Vocabulary in Educational Psychology." Unpublished Master's thesis, Ohio State University, 1933.

KITZMILLER, A. B. "A Study of Certain Vocabulary Problems in High-School Science." Unpublished Doctor's thesis, Ohio State University, 1928.

LANE, B. H. "A Uniform Scheme for Citations," *Science*, LXXIII (April 10, 1930), 390-2.

LEAL, Mary A. "Difficulties Encountered in Writing a Thesis," *Education*, LII (December, 1931), 214-9.

MCDONOUGH, T. E. "An Investigation of Terminology in the Field of Physical Education." Unpublished Master's thesis, George Peabody College for Teachers, 1928.

MANUEL, H. T. "The Use and Misuse of Figures of Speech in Educational Writings," *Journal of Educational Research*, XIX (March, 1929), 232.

MEES, C. E. K. "The Publication of Papers from Research Institutions," *Science*, LXX (November 22, 1929), 502. Discusses the merits of publication in the journals of scientific societies as compared with the bulletins of local institutions.

MONROE, W. S. "Standardization of Statistical Symbolism," *Journal of Experimental Education*, I (March, 1933), 223-8.

MORROW, P. R., and MISHOFF, W. O. *A Guide to Thesis Writing*. Athens, Ga.: University of Georgia, 1932. Pp. 20.

MUSSER, Belle M. "Terminology in Educational Psychology." Unpublished Master's thesis, University of Colorado, 1933.

* ODUM, H. W., and JOCHER, Katherine. *An Introduction to Social Research*, Chapter XXIII. New York: Henry Holt and Co., 1929.

* REEDER, W. G. *How to Write a Thesis*. Bloomington, Ill.: Public School Publishing Co., 1930. Pp. x + 216.

REINMUTH, O. W. "Greek Contributions to the Terminology of Psychology," *Psychological Review*, XLI (September, 1934), 412-23.

REMMERS, H. H., and GRANT, A. "The Vocabulary Load of Certain Secondary School Mathematics Textbooks," *Journal of Educational Research*, XVIII (October, 1928), 203-10. Includes a sampling of words, a thousand from each book, taken from twelve texts in secondary-school mathematics.

RICH, S. G. "Exact Terminology in Education," *Phi Delta Kappan*, XVI (August, 1933), 62, 66.

ROLLER, Duane. "Physical Terminology," *Scientific Monthly*, XXXI (December, 1930), 543-7.

——— *The Terminology of Physical Science*. Norman, Okla.: University of Oklahoma Press, 1929. Pp. 116.

SHAW, C. L. "Proposed Amendments to the International Rules for Botanical Nomenclature," *Science*, LXIX (June 7, 1929), 601.

SMITH, F. A. "Variations in Educational Research Terminology." Unpublished Master's thesis, University of Colorado, 1934. Classifies the most frequently used terms found in six textbooks, and shows the need for standardization of research terminology.

SMITH, V. C. "A Consumer's Code for Research," *School and Society*, XXXIX (March 24, 1934), 371-2. Suggests a coördinated plan for publication of educational and psychological research.

ST. JOHN, J. L. "A Unified System of Presenting Bibliographies," *Science*, LXX (August 30, 1929), 217.

* SCHLUTER, W. C. *How to Do Research Work*, Chapters XIV-XVI. New York: Prentice-Hall, 1926.

* SE BOYAR, G. E. *Manual for Report and Thesis Writing*. New York: F. S. Crofts and Co., 1929. Pp. 58.

SEIDELL, Atherton. "Limitations upon the Unification of Chemical Nomenclature," *Journal of Chemical Education,* VI (April, 1929), 720-9.

SEYFRIED, J. E. *Principles and Mechanics of Research,* pp. 127 ff. Albuquerque, N. M.: University of New Mexico, 1935.

* SPAHR, W. E., and SWENSON, R. J. *Methods and Status of Scientific Research,* Chapters XII-XIV. New York: Harper and Bros., 1930.

STILES, C. W. "Is an International Zoölogical Nomenclature Practicable?" *Science,* LXXIII (April 3, 1931), 349-54.

STOUTEMYER, J. H. "The Psychology of the Table of Contents," *Journal of Educational Research,* XXIV (October, 1931), 227-30.

WEST, P. V. "Need for Standardization of Symbols and Formulae in Educational Statistics," *Journal of Experimental Education,* I (March, 1933), 216-22.

WHIPPLE, G. M. "Does a Copyright Mean Anything?" *Nation's Schools,* XII (August, 1933), 21-4. Cites flagrant cases of piracy in use of copyrighted materials.

* WHITNEY, F. L. *Methods in Educational Research,* Chapters V, VIII. New York: D. Appleton and Co., 1931.

WITTLER, Milton. "Errors in Education Literature," *Phi Delta Kappan,* XVI (December, 1933), 136-8.

WOODWARD, H. P. "Priority in Stratigraphic Nomenclature," *Science,* LXX (July 26, 1929), 96-7.

Amos Tuck School of Administration and Finance, Dartmouth College, *Manual on Research and Reports.* Baltimore: Williams and Wilkins Co., 1931. Pp. 108.

"The Art of Head Writing," *High School Teacher,* V (March, 1929), 99.

* *Author's Book on the Preparation of Manuscripts, on the Reading of Proofs, and on Dealing with Publishers.* New York: The Macmillan Co., 1925. Pp. 74.

Report of the Committee on Terminology, Federated Council on Art Education. Baltimore: L. L. Winslow, Director of Art Education, Public Schools. Pp. 70.

"The National Joint Commission on Terminology, Functions, and Relations in Supervision," *Educational Method,* IX (April, 1930), 437. States the purposes of the Commission.

CHAPTER XIV

STANDARDS FOR EVALUATION OF WRITING, RESEARCH, AND PROCEDURE IN EDUCATION

The public-school worker and student of education should have standards for use: (1) in the evaluation of the large volume of literature and research which appears annually, (2) for guidance in the preparation of their own reports, and (3) for analysis of practice and new movements in education. All of the chapters of this book are of some assistance in providing criteria for evaluation of the various phases of educational thinking, research, and practice. Therefore, the reader is referred to the appropriate chapter and bibliography devoted to his given problem. For example, Chapter II on the selection of a problem for investigation discusses the extent to which various fields and problems have been investigated, accomplishments of research in given areas, analyses of trends, critiques of investigational effort, educational prophecies, research under way, needed studies, and criteria for selecting a problem. Chapter III, on the survey of related literature, includes detailed information concerning the availability of guides to the various types of educational writing, evaluations of published materials, and analytical summaries of research in a variety of fields. The nineteen points outlined and discussed in Chapter XIII, as significant in the preparation of the written report, are of almost equal importance as criteria or standards for use in determining the effectiveness of educational literature. Criteria for evaluating the various investigational methods are found in other appropriate chapters of this book.

In the present chapter no attempt is made to deal directly with the rather elusive question of whether education is sci-

ence, philosophy, or art, or some appropriate combination of each of these. Other chapters (I, IV, XI, and XII) concerned with the characteristics of scientific method, use of hypotheses, interpretation of data, and formulation of conclusions and generalizations provide assistance in discerning the relationship between philosophy, theory, logic, art, and science, as does the bibliography of the present chapter. Also, detailed information concerning the evaluation of given educational procedures, plans, practices, or theories must be secured from this chapter bibliography, as well as from the references in the chapters (II and III) on the selection of a problem and the survey of related literature. Therefore, the subsequent discussion covers the standards or criteria which may be applied in evaluating written reports of educational research or even non-investigational published materials, including professional books and monographs, periodical literature, theses, school textbooks, and courses of study.

EVALUATION OF EDUCATIONAL LITERATURE AND CURRENT RESEARCH

Evaluation and the consumer of research. An extended but excellent statement of the need for evaluation of research before attempting to apply its results to educational practice follows:[1]

> For three decades, at an ever increasing tempo, the results of educational research have been accumulating. The sheer bulk of research literature is now in 1935 little short of astounding. The curriculum worker naturally turns to this vast storehouse of material for guidance in the solution of his problems,—naturally, because he has been led to expect help from this quarter. Has not a considerable part of his training been specifically devoted to building in him confidence in research and in what research will do for education?
>
> The curriculum worker comes, then, trustingly to educational research, and what happens? (*a*) He may be disappointed to discover not a single investigation on the point of his interest. (*b*) Or, he may find

1 W. A. Brownell, "The Field Worker as a Consumer and Producer of Research," *Journal of Educational Research*, XXIX (October, 1935), 144-8.

one, or perhaps two studies, which he accepts happily and the conclusions of which he uncritically incorporates into his revised curriculum. (*c*) Still again, he may, if he reads widely enough, discover a number of studies which report inconsistent and even antagonistic findings. What now? Whose research is he to follow? Would that he had not been so ambitious! It would have been so much more satisfying to have stopped with the first study he found.[2]

In any event the curriculum worker has not solved his problem by locating relevant research. His obligation is not the one which is usually stressed, namely, that of translating research into school practice. He has a more fundamental obligation, that of first determining *what* research, or *which* research, if any, to accept. Laudable as it is in motive, his eagerness to advance the cause of science in education by honoring its products is apt to be harmful in its consequences. He may be guilty of fostering error, of perpetuating mistakes. All research is not equally good. It is not even all good. Some of it is misleading; and some of it is bad. The printed word, especially when supported, or better, accompanied, by tables, statistical constants, and graphs still carries undeserved prestige. Uncritical acceptance of pseudo-research creates a demand for, and a supply of, more unscientific effort of the same kind.

The nature of pseudo-scientific research in education has been too frequently delineated to justify more than a passing word here. So far as the field worker is concerned, perhaps the most important caution relates to the interpretation of experimental results. Attention has been repeatedly called to the fact that the majority of educational studies are fragmentary; they deal with isolated problems. Even when such studies are technically accurate and when the findings are derived from data by approved statistical procedures, there remains the vital question, *What does the study mean?* The significance pointed out by the investigator himself is not always to be implicitly trusted. On the contrary, the investigator may be too close to his study to see it in proper perspective. After all, back of most serious research inquiries lies a question and a doubt, and associated with that doubt is some hypothesis. It is by no means uncommon for that hypothesis to pass over into bias which, even when wholly unconscious, may wreck the scientific worth of the study.

Yes, the field worker must be a cautious consumer of research. He will be the first to welcome valid research findings, but he will satisfy himself that the findings *are* valid. He will read *all* the research literature on his problem. He will recognize that each inquiry represents one attack upon the question and that many other attacks may be possible.

[2] One suspects sometimes that textbook writers in education have hit upon this happy expedient. This or that educational procedure is recommended on the basis of a single citation, others, perhaps better, being omitted—or unknown.

He will critically scrutinize the data reported, not hesitating to leave the data themselves to weigh their theoretical and practical implications.[3] He will temper his enthusiasm for research and his faith in its ultimate contributions with a sympathetic appreciation of its limitations.

Because of the scattered sources in which the consumer of research must look for materials, a rather novel proposal has been made for improvement of publications in education and psyschology: [4]

1. Classify research in these fields as to scientific relationships and utility.
2. Assign to magazines of national circulation as much material in a given field as they would normally select from the whole field, combining those left over, or starting new ones if needed. Restrict each magazine to its own type of material.
3. Require all research material to be submitted to a board of readers whose duty it would be to classify, edit, abstract, and distribute such material.
4. Sign agreements with graduate schools to submit abstracts of theses written in article form, or to file copies of theses with a central organization to which the board of readers would have access.
5. Provide translators adequately trained in psychology to make available important foreign research without delay.
6. Offer to specialized and general magazines abstracts of articles related to their fields or articles overlapping.
7. Draw up a set of standards to increase the value of articles by adequate presentation.
8. Collect articles which belong in the field of education or psychology, but which have wandered for publication into other fields, and abstract them completely.
9. Eventually summarize valid research material of the past in all fields.

At this writing a subcommittee of the American Council on Education is considering a proposal for a comprehensive evaluation, synthesis, and interpretation of the contributions of educational research, to be published in one volume.

[3] An excellent example of the need for just such a careful consideration of research, a consideration which carries the inquirer beyond the data of the studies reported, is found in Buckingham's recent critique of the experimental studies on the value of instruction in primary arithmetic. See: B. R. Buckingham, "When to Begin the Teaching of Arithmetic," *Childhood Education*, XI (May, 1935), 339-43.

[4] V. C. Smith, "A Consumer's Code for Research," *School and Society*, XXXIX (March 24, 1934), 371-2.

Professional books, monographs, and bulletins. Each year in *School and Society* there is published a relatively complete list of American educational books, monographs, and bulletins issued during the preceding year. The number for 1935 is 823 and for 1934, 765, as compared with 813 titles reported in 1933. The list is subdivided into twenty-eight fields.[5] Since field workers, college professors, students of education, and librarians have neither the time nor opportunity to examine such a large number of titles for purposes of evaluation with a view to professional reading, classroom use, or purchase, assistance has been provided in the form of a group of sixty selected books of the year,[6] which are starred in the complete *School and Society* list. This work is done by the Enoch Pratt Free Library of Baltimore for the American Library Association and the *Journal of the National Education Association.* Selection of the sixty books of the year is based on an examination of the publications themselves, analysis of several hundred book reviews, and the scoring and comments of educational specialists in the various fields represented. It is recognized that such an attempt to select so small a percentage of the total titles available means the omission of many worthwhile volumes, particularly in a subdivision of education where unusual productivity has taken place. It is not improbable that in some instances the specialists in the field pass judgment on the merits of new books without having examined them carefully, possibly not at all. In spite of such limitations, this well-balanced group of sixty books of the year proves annually of increasing value in the guidance of teachers, students, and librarians.

Other book lists, such as those published by the Research Division of the N. E. A., the American Library Association,[7]

5 "Educational Books of 1935," *School and Society*, XLIII (March 28, 1936), 409-26. "Educational Books of 1934," *School and Society*, XLI (March 30, 1935), 432-48.

6 "Sixty Educational Books of 1935," *Journal of the National Education Association*, XXV (April, 1936), 121-4.
"Sixty Educational Books of 1934," *Journal of the National Education Association*, XXIV (April, 1935), 127-30.

7 American Library Association, *Books and Pamphlets on Library Work*. Chicago: American Library Association. Annually.

and in authoritative professional books, are very helpful in determining the merits of educational publications. Of course it is not to be assumed that all of the books appearing in such lists are of uniformly high quality. The *Education Index* (under the general heading of "book lists" with appropriate subheadings), the *Readers' Guide* (for general lists, under the heading of "books and reading" with subheadings), the *United States Catalogue* (under the heading of "books and reading"), the *International Index* (under the heading of "books and reading"), and a number of indexes covering special fields are helpful in locating useful book lists. Alexander has prepared a partial roster of the book lists cited by the *Education Index* up to December, 1934, as a part of a valuable discussion of the location and use of book lists in education.[8]

Book reviews. For assistance in keeping in touch with current literature and in its evaluation, educational workers, to a large extent, must rely on reviews published in periodicals.[9] The professional journals in the field of education may be classified roughly into three groups with respect to the type of book review published. A limited number of these journals provide analytical, critical estimates of new books, prepared by specialists in the fields represented. Certain other periodicals conduct rather uncritical, informal, occasionally "gushing," and almost always complimentary "book chats" concerning current literature in the field. A third group of journals publishes little more than brief book notices which in many instances have been culled from the preface of the new book or from the publisher's advertisement. Undoubtedly the critical point of view, thoroughness, and professional tone embodied in the book reviews of the first class of journals mentioned above appeal to the serious educational worker. Among the more general educational journals which give especial attention to their book-reviews departments are: *Educational*

8 Carter Alexander, *How to Locate Educational Information and Data*, pp. 171-2, 183-6. New York: Bureau of Publications, Teachers College, Columbia University, 1935.

9 Subsequent paragraphs on book reviews are adapted from Carter V. Good, "The Art of Book Reviewing," *School and Society*, XXIV (July 31, 1926), 142-3.

Administration and Supervision, Elementary School Journal, Journal of Educational Psychology, Journal of Educational Research, Journal of Higher Education, Junior College Journal, and *School Review.*

The *Book Review Digest* provides indexes of important books and abstracts of reviews published in leading English and American periodicals, although this digest is by no means complete for the field of education. It appears monthly, cumulating semi-annually, annually, and at intervals of several years. The *Education Index,* under the heading of "book reviews," is helpful in locating such evaluations. Reviews of encyclopedias and sets of books are available in the *Subscription Books Bulletin,* which appears quarterly with an annual index.[10] The most likely place in which to locate reviews of elementary- and secondary-school textbooks is the journal devoted to the level or school subject in question, six months to a year after publication of the book in question. An extended list of periodicals featuring book reviews of interest to educational workers has been classified according to fields or school subjects.[11] The same source contains a rather extended discussion of the characteristics of book reviews and the methods of locating such evaluations.[12] Editorial and news columns of educational journals sometimes comment on new books and periodical articles.

A carefully written book review should include three fairly distinct parts. An introductory statement or paragraph may give the setting of the "stage" upon which the new book appears or a brief comment on the need for the new publication. Frequently it is the skill with which this introductory paragraph is written that attracts the initial attention of the reader and lends tone to the remainder of the review.

In the second place, it is the duty of the reviewer to give a brief summary of the contents of the book under considera-

10 *Subscription Books Bulletin.* Chicago: American Library Association
11 Carter Alexander, *op. cit.,* pp. 177-80.
12 *Ibid.,* pp. 171-7.

tion, together with such critical comment as he deems necessary. Too frequently reviewers lack the skill necessary to condense a large amount of material into a small space and either extend the summary to unusual length or neglect to give a statement of the contents of the volume. In the latter instance the reader secures from the review little more than the personal impressions and generalizations of the reviewer. However, it must be recognized that in some cases the general evaluation of a recognized authority is worth a great deal, even though he has neglected to present concrete evidence from the volume in question as a basis for his expressed opinion. Undoubtedly this type of review would take on added meaning if adequately documented with factual evidence taken from the book under review.

In the third place, a review should present a critical evaluation and summary statement of the place the book seems destined to fill in its given field. This third part may not be definitely separated in every instance from the second phase, although such a brief statement at the close of the review serves to summarize concisely the conclusion reached.

Discriminating readers of reviews will find that even well-written analyses of books vary considerably in style. In some instances the reviewer prepares an essay presenting his own point of view concerning the field of the book under consideration. When written by a master, this discussion may be even more stimulating than the book itself, although little insight into the content of the new volume is provided. Another type of review is little more than a summary of major conclusions reached, together with a list of major problems treated or of chapter headings. The strictly summary review does give a table-of-contents overview, but lacks critical analysis and evaluation and injection of the personality of the reviewer. A third type of review emphasizes critical and analytical treatment which is the approach of most interest to the careful student of education. However, there are possibilities for combination of all three types of treatment into a well-balanced

review. In fact, few reviews follow exclusively a single type of approach.

It should be stated that the critical review is not advocated universally by students of educational literature. Two contrasting points of view are presented in the quotations which follow. Averill and Mueller analyzed book reviews which appeared during 1926 in seven educational journals in terms of the length of the review, practice with regard to signing reviews, and the reviewer's attitude (favorable, unfavorable, doubtful, or impersonal). Their recommendation relative to printed evaluations of books in education follows: [13]

> It would seem to the present writers that the only proper function of reviewers should be to present the aims and general scope of the books which they review in a wholly impersonal and unbiased way. It should reasonably be left to the intelligence of the reader to form his own judgment concerning a book's merits or demerits, and the likelihood of its being a desirable volume for him to add to his list. As it is, too often a reviewer is inclined either, on the one hand, to cater to the good will of publishing houses or, on the other, to express freely the favor or disfavor with which he personally—and often narrowly—reacts to a new volume according as it is or is not in line with his own individual philosophy or viewpoint.

Monroe and Hull analyzed 548 reviews of one hundred educational books published between 1922 and 1925. Their conclusions substantiate the point of view of the present chapter, urging a more critical and analytical type of book review.[14]

> Book reviews in general may be criticized upon at least two grounds: they are inadequate and they are non-critical. Their inadequacy lies in their failure to give sufficient information about the book. Too many reviews consist of only a few general statements describing the nature of the content and make no reference to many specific details that should be mentioned. In addition to a general description of the content, reviews commonly mention such items as purpose of the book, intended audience, and the number of pages. Except for the latter item, mechanical features, such as binding, size of type, quality of paper, and

[13] Lawrence A. Averill and Alfred D. Mueller, "Analysis of Book Reviews," *School and Society*, XXVI (December 31, 1927), 848-9.

[14] W. S. Monroe and Mabel R. Hull, "A Critical Review of Book Reviews," *School and Society*, XXIX (April 20, 1929), 521-6.

illustrative material, are rarely mentioned. Very few reviews compare the book reviewed, or its author, with others. Only a small per cent quote a table of contents, and no more than half include any other quoted material. Special features, such as bibliographical material, problems or questions for study, summaries, etc., are seldom mentioned.

A more serious fault with the present-day book review is the lack of critical evaluation. The vast majority of reviewers point out the good qualities of books, or, very frequently, make general statements in praise of them, to the utter neglect of any deficiencies. The usual method of evaluation appears to consist merely of stating that the book makes a contribution to its field. It appears justifiable to say that reviews are failing to render a needed service to their readers. Teachers could select their textbooks more intelligently if reviewers would distinguish between valuable books and those of doubtful merit. And perhaps some amateur writers would be discouraged from rushing into print, if reviewers had the courage, or took the pains, to criticize in a meaningful rather than a stereotyped manner.

It should be recognized that editors have difficulties in securing the kind of evaluation suggested by Monroe and Hull. Cattell discusses such problems in terms of cost of space devoted to review departments, objective and impartial selection of a limited number of books meriting review (some books may be of interest to only three persons—author, publisher, and reviewer), difficulty in securing critical signed reviews, promptness on the part of reviewers, and editing of reviews submitted.[15]

At its annual meeting in February, 1930, the Educational Press Association of America approved a report of its committee on policies with respect to book notices and reviews. The nine recommendations are as follows:[16]

1. The reviewing policy of an educational magazine should be consistent with the purposes and policies of the magazine as a whole.

2. Only books and other publications pertaining to the field the magazine seeks to cover should be accepted for notice or review.

3. Reviewing should be recognized as requiring both appropriate professional equipment and special skill in exposition and criticism.

15 J. McKeen Cattell, "Book Reviews in Science," *Science*, LXIX (February 22, 1929), 220-2.

16 "Policies as to Reviews in Educational Journals," *Educational Method*, IX (April, 1930), 437-8.

The practice of inviting reviews from educators in general is, therefore, not to be commended.

4. Only books deserving positive praise or dispraise should be reviewed. Others should be merely noticed.

5. The practice of making laudatory comments on all books received is especially to be condemned.

6. Reviews should be regarded as essentially editorial in character and should support the educational position and point of view of the magazine in which they appear.

7. Reviews and notices of books should be regarded as equal in importance with other departments of the magazine. In accordance with this principle, they should be printed in the regular body type of the journal, not reduced.

8. It is the duty of each educational journal to inform publishers as to what books and other publications will be reviewed or noticed.

9. It is proposed that the Educational Press Association take steps to prepare a standard scale of excellence in reviews to serve as a guide to editors and reviewers.

Books by Gard and Jones assist in the preparation of reviews or evaluations of books.[17] Gard's discussion of the reviewer's aims and methods, editors' opinions on reviews, and types of reviews is applicable to the field of education, although his major concern is the literary review.

Periodical literature. No systematic attempt in published form has been made to evaluate articles which appear in professional journals, although a number of digests, indexes, and abstracts (listed in Chapter III) serve as guides to the periodical literature. However, in most instances the aim of such library aids has been completeness rather than evaluation or critical analysis, for example, *Psychological Abstracts* and *Social Science Abstracts* (discontinued in 1932). *The Teachers Journal and Abstract* (discontinued in 1932), *Educational Abstracts*, the *Education Digest*, and the *Loyola Digest*, as well as the bibliographical departments of a number of current periodicals, do and have attempted to exercise discrimination in selecting the articles to be reviewed, although the resulting

17 Wayne Gard, *Book Reviewing*. New York: Alfred A. Knopf, 1927. Pp. xii + 160
Llewellyn Jones, *How to Criticize Books*. New York: W. W. Norton and Co., 1928. Pp. 190.
Also see W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research*. Chapter III. New York: Harper and Bros., 1930.

abstracts are of the summary type with no attempt at critical analysis or evaluation. Among the more serious attempts on the part of journals to provide a selected annotated bibliography of current research articles is the Department of Research Abstracts and Bibliographies of the *Journal of Educational Research*. In its summaries of investigational literature, the *Review of Educational Research* analyzes articles as well as books, monographs, and bulletins, although it is in no sense a month-by-month review of research of the preceding month or two. In fact, the editors of each issue select the investigations involved from approximately the preceding three-year period. Many of the "Selected References" in the *School Review* and *Elementary School Journal* are from periodicals.

As in the case of book reviews, objection has been made to the non-critical character of many of the articles in educational periodicals. One writer especially emphasizes the non-critical type of writing on higher education found in current professional journals, and suggests that the reader's inclination is to turn from such subjective and descriptive material to the factual literature of education: [18]

> The temptation is strong to turn to the increasing volume of educational literature purporting to be the result of rigidly scientific investigation, presented with mathematical accuracy and embellished with a redundancy of statistical refinements. But the curious absence of thought in much of this stuff has been often the subject of comment.
>
> The fact that most of the current criticism of higher education appears in the "lay magazines" is not the result of accident. Whether from timidity or from preoccupation with pseudo-science, the bulk of the educational periodicals are inhospitable to critical contributions. Let us have more critics, lest we forget how to treat them honestly and capitalize their services. To be sure, the man who applies the acid sometimes burns his own fingers; but the corrosive agent is necessary for the reduction of dross. No professional literature can progress without liberal and continuous infusions of cauterizing criticism.

Although there is much truth in the foregoing statement, the

18 Rococo Facade, "Acid in the Literature of Education," *School and Society*, XXXIV (September 19, 1931), 401-3.

material assembled in this chapter is evidence of numerous careful attempts to provide critical evaluations of educational literature and procedure. The type of reflective thinking and analysis suggested in the preceding quotation must not be taken as a substitute for factual investigation and experimentation, but as complementary and supplementary to (really a component part of) scientific studies of educational problems. Students of objective methods will agree that at intervals critical analyses and evaluations, even though subjective in part, are needed to synthesize the progress made in given fields and to project probable future lines of development and study. Numerous illustrations of this type of thinking dealing with authoritative statements of accomplishment, analyses of educational trends, critiques of research, and educational prophecies are given in Chapter II.

A check-list of questions, used by the editorial board of the *Journal of Educational Research* to encourage better writing, is suggestive as an instrument of evaluation, whether applied to one's own work or to the writing of others.

1. Have you given a clear and concise statement of the problem that you have chosen to discuss?

2. Have you explained, in a few words, the importance of the problem?

3. Is the method of research employed in your investigation appropriate to the problem studied?

4. Is the sample used in your investigation adequate? (Most experimental research involves in one form or another the matter of sampling. Conclusions, to be of general value, should be based upon adequate samples.)

5. Have you given an adequate description of the subjects used in your investigation? (If the results of your investigation are to be of value to others, your report should contain a concise, objective description of the subjects used.)

6. Have you supplied an adequate description of the materials, processes, or procedures under investigation? (It is not ordinarily sufficient merely to indicate these by name, as: the project method versus the traditional recitation; supervised study versus unsupervised study; etc. The thing under investigation will need careful and objective definition.)

7. Have you given a careful statement of the procedure followed

in your investigation, so that any one else might repeat the experiment from the description given?

8. Have you provided adequate controls for such factors as may materially affect the results of your experiment?

9. Have you validated the data-gathering devices used in your investigation? (Tests, questionnaires, observations, interviews, etc.)

10. Are the tabular and graphical means of analysis used in your investigation the appropriate ones? (Check tables for numbering, titles, etc. Each table should be clear and complete in itself.)

11. Are the statistical methods employed in your investigation applicable to the materials in hand? Are the computations correct? (Many errors occur in statistical computations.)

12. Is there a brief summary of your findings at the end of the paper? (These findings can frequently be summarized in one-two-three, serial order.)

13. Are your findings and conclusions supported by the data presented? (Articles frequently carry conclusions not at all supported by the data presented.)

14. Have you read your manuscript for spelling, punctuation, and grammatical construction?

15. Have you checked the footnotes and the bibliography for accuracy and completeness? (The mere listing of references by title and author is not sufficient.)

Evaluation of theses. Statements made at the beginning of the present chapter suggest that preceding chapters of this book contain information of value in the formulation of criteria for use in the evaluation of educational research, including graduate theses. A useful summary of points to be considered in the analysis of graduate theses has been based on the judgments of sixty-one leaders in educational research, distributed among forty-two higher institutions of learning, state departments of education, and national offices:[19]

STANDARDS FOR THE CONTENT OF AN EDUCATIONAL RESEARCH PROJECT

(From the viewpoint of the graduate student and his adviser)

I. Properly delimits the problem (Value)
   (1) Defines the problem attacked adequately and (2) places it definitely in the particular field of research in which the student is working.

19 F. L. Whitney, "The Evaluation of Educational Research," *School and Society*, XXXI (March 1, 1930), 289-90.

II. Uses appropriate methods (Value)
Employs (1) the historical, (2) experimental or (3) predictive types of investigation carried perhaps on to the level of (4) philosophical analysis, each applied specifically to the field of endeavor engaged in.

III. Exhibits originality (Value)
(1) The problem attacked is either new or distinctive; (2) the techniques used are adequate to the conditions of the study; (3) the method of reporting illustrates a high type of ability in discussion and interpretation of material presented.

IV. Uses proper thinking methods (Value)
(1) Determines actual ultimate aim, (2) states title correctly, (3) carefully states the problem, (4) discovers the thesis, (5) insures continuity with previous research by checking the findings of all other workers in the field entered, (6) arranges procedures with the ultimate objective in view, (7) selects the best methods for each item of procedure, (8) sets up the form of report logically and psychologically as chapter heads and section titles, (9) maintains an open-minded and critical attitude at every stage of progress through the research, (10) provides for continuity of research onto the next level of reflective thought by the next research worker.

V. Presents a worth-while contribution to education (Value)
The study results (1) in generalizations on a higher level of scientific thought, which takes the form of (*a*) hypotheses, (*b*) theories, (*c*) principles, (*d*) laws, (*e*) standards, (*f*) historical trends or (*g*) prognoses—all presented in terms of definite meaning; (2) in new data presented or old information and materials organized into new forms and relationships with adequate interpretations; (3) in better methods in educational research or the development of new techniques or the validation of old techniques, or their use in new fields; (4) in new tools of precision for use in handling educational concepts; (5) in the application of findings to concrete educational problems.

Wilson reports an attempt to classify research to indicate relative values and applies his standards to the studies selected for review in two summaries of arithmetic investigations. The classification follows:[20]

[20] G. M. Wilson, "Research: Suggested Standards for Summarizing and Reporting Applied to Two Recent Summaries of Studies in Arithmetic," *Journal of Educational Research*, XXVIII (November, 1934), 187-94.

1. *A Major Research.* There should be an important problem, a profitable technique, and data sufficient to leave little doubt as to the correctness of the conclusion. In a methods research there should be several rooms and appropriate grades, let us say not less than twenty rooms for experimental and twenty for control group, carried over a sufficient period of time. In case the findings are inconclusive, the experiment should be repeated. Case studies or intensive room studies could be accepted on the basis of less numbers. For a conclusion with reference to curriculum material, there should be the objective check supplied by social usage, and the number of cases should run into the thousands, or be so widely spread as to leave little doubt as to the answer.

Should a research be called a "major research" unless it gets the answer (positive or negative) to the problem set? At any rate, this is a question very much worth considering.

2. *Minor Research.* The same general conditions as for a major research, except that any sizeable amount of data pointing to significant conclusions or even trends may be profitably reported and used as a problem for further study.

3. *Partial Report of a Large Study.* Justified when the findings are running strongly in a single direction and point to a decided modification of current practice.

4. *Case Study.* Due to the fact that so little has been reported under "case studies," there is justification for report on a single case, provided it is done adequately. Twenty case studies in reading, arithmetic, spelling, or writing should no doubt be judged a major research, if relating to a single problem.

5. *Library Study.* As the name implies, a significant study or summary from available sources.

6. *Discussion.* Chiefly concerned with interpretation or points of view. Valuable in proportion to how fully all of the relevant facts have been kept in mind, and how judiciously they have been interpreted.

SELECTION AND EVALUATION OF TEXTBOOKS

There are numerous occasions on which school workers must participate to some extent in the selection and evaluation of textbooks; therefore, it seems justifiable to devote a section of the present chapter to this problem. Comment has been made in this chapter, concerning location of reviews of textbooks. The rating of textbooks as a normative-survey type of procedure was described in Chapter VIII. The availability of

an annual list[21] of elementary and secondary textbooks and other reasonably complete information concerning methods of locating titles of textbooks were discussed in Chapter III, and may be supplemented by examining another helpful source.[22] Fortunately a comprehensive analysis of the textbook problem, from a much broader point of view than the mere selection of textbooks, is available in the year-book of the National Society for the Study of Education, which includes a detailed score card for use in rating textbooks. The conclusions reached by the committee are as follows:[23]

1. The educational interest of the pupil must at all times be the primary consideration in appraising plans for making and selecting textbooks.

2. The principle is cardinal that the selection of textbooks is the prerogative of the educational personnel of our schools. Hence the Committee urges that educational administrators should defend their exercise of this prerogative against the claims or the interference of others, whether they be publishers, members of school boards, politicians, or other laymen. The Committee believes that the superintendent should take the final responsibility in recommending textbooks.

3. School administrators should be aggressive in demanding high standards of practice on the part of selecting committees and on the part of publishers and their representatives. The Committee invites the Department of Superintendence of the National Education Association to frame standards of practice for the selection of textbooks and to place these standards in the hands of textbook publishers.

4. The Committee likewise invites publishers to frame standards of practice for their field representatives and to place these standards in the hands of school administrators and selecting agencies.

5. Unethical practices are so clearly detrimental to the public welfare that, in the judgment of the Committee, state or regional commissions representing the profession should be created which will be charged with the duty of investigating complaints, whether made against bookmen, schoolmen, or others, and with the further duty of making public all pertinent facts in the event that the complaints are justified.

21 M. E. Herriott and Others, "Textbooks of 1934," *Society for Curriculum Study News Bulletin*, VI (January 15, 1935), 9-46.
———, "Textbooks of 1935," *Curriculum Journal*, VII (February, 1936), 15-43.

22 Carter Alexander, *op. cit.*, pp. 216-22.

23 J. B. Edmonson and Others, *The Textbook in American Education*. Thirtieth Yearbook of the National Society for the Study of Education, Part II, pp. 305-8. Bloomington, Ill.: Public School Publishing Co., 1931.

6. The cost of textbooks is so negligible a part in the total cost of education, especially when account is taken of the value of good textbooks, that further increase in cost is fully warranted where necessary to secure better instructional material for pupils.

7. Free textbooks should be provided in all public schools in the interests of better educational opportunities for the children and of economy to the general public.

8. State adoption of textbooks often gives rise to questionable practices in connection with the selection and prescription of the texts. This Committee believes that our profession should seek to modify existing legislation in such a way as to eliminate these practices. The Committee believes, indeed, that the state is not a desirable unit for textbook adoption, that, on the contrary, the unit for adoption should be the local unit of schoool administration and supervision.

9. State publication of textbooks is unwise, uneconomical, and educationally unsound. Our profession should continue to resist its extension.

10. In making the two preceding statements with respect to state adoption and state publication, the Committee does not wish to be interpreted as condemning the principle of state uniformity in courses of study; the Committee recognizes that many facts, particularly with respect to the mobility of our population, point to the desirability of some degree of uniformity in subject-matter and in grade placement among the schools of a state or even of a larger area than the state. Reasonable uniformity in subject-matter and grade placement, particularly in the elementary school, would greatly facilitate the provision of adequate textbooks and need not destroy the values inherent in diversity of textbook approach and treatment.

11. Publishers should feel obligated to refuse to publish manuscripts that do not meet high standards in textbook-making.

12. There is much need for careful research on problems relating to the mechanical features of textbooks. Publishers should be encouraged to carry forward such research.

13. The critical trial of instructional materials in classrooms before publication in textbook form is commended.

14. Publishers have real cause for protest against some of the practices of school administrators as listed in this Yearbook in the chapters entitled "Current Practices in Selecting Textbooks for the Elementary Schools" and "The Problems of Publishers in Making and Marketing Textbooks." In particular, the Committee believes that the publishers have cause for protest and grounds for legal action against those schoolmen who engage in the practice of reproducing copyrighted material without securing the consent of the publishers.

15. The use of the plan of secret committees in textbook selection is not good educational practice.

16. For authors who are in educational work to use their positions to secure adoptions of their textbooks is likely to invite criticism endangering the good repute of our profession.

17. The use of a score card for the evaluation of textbooks has certain obvious advantages in directing attention systematically to various items that should receive consideration. On the other hand, seeming numerical precision may be misleading, in that the qualitative whole is seldom to be measured by the sum of its quantitative parts. Score cards devised in terms of a particular book should not be used in the selection of textbooks.

18. Teachers, as the users of textbooks, should have a voice in their selection, but the Committee calls attention to the fact that effective participation on the part of the teachers requires special competence.

19. The choice of textbooks is so important an educational task that the study of approved methods and standards for selection should be emphasized in the professional preparation of teachers.

20. Supervisors of teachers in service and instructors in professional schools should show teachers how to follow and also to supplement the book intelligently with respect to both content and method.

21. American publishers are entitled to much praise for producing textbooks that represent high qualities of book-making and generally also of qualities of content and organization not found in textbooks of other countries. The Committee believes that too much praise cannot be given to the reputable publishers of the United States for the meticulous care with which manuscripts are examined and with which errors in form and content are detected and corrected.

22. The Committee lends its full endorsement to the conclusion that the standards of practice in the selection of textbooks not only are higher to-day than formerly but also are relatively higher than those which prevail in many other lines of business. This conclusion is in agreement with the returns reported in the chapter entitled "The Ethics of Marketing and Selecting Textbooks." The Committee further believes that this trend is full of encouragement and that it points to the possibility of an early solution of certain problems in making and marketing of textbooks.

RATING COURSES OF STUDY

In view of current interest in curriculum problems, including the writing and evaluation of courses of study, no justification of this section of the present chapter seems necessary. As in the case of rating textbooks, the technique employed in evaluating courses of study is normative-survey in character and was discussed in Chapter VIII.

An elaborate attempt has been made at Teachers College, Columbia University, to evaluate elementary courses of study with the aid of judges and scales.[24] The investigation involved 9,000 courses of study. The lists of "excellent" and "very good" courses of study provided have been of value to school people who must depend, at least in part, on the best current practice. This work of evaluation has been continued since the publication of the first bulletin of the Columbia Bureau of Curriculum Research.[25]

Periodical analyses and critiques of current courses of study such as those prepared by Harap are valuable and suggest a type of evaluation which may be done more frequently. His conclusions concerning 242 courses of study issued in 1928-1929 follow:[26]

If I were asked after examining 242 of the most recent courses of study, to give the essential characteristics of a modern course, I should include the following: (1) It states specific objectives of school work. (2) It includes a procedure or a statement of directions for carrying on school activities. (3) It includes active experiences as well as mental experiences. (4) The whole is subdivided into small parts, called units for convenience. A unit here, is a small subdivision of a course of study which has unity or completeness, and the goal of which is an objective or group of related objectives.

A characterization by the same author of courses of study published during 1932-1934 is as follows:[27]

24 Florence B. Stratemeyer and Herbert B. Bruner, *Rating Elementary School Courses of Study*. Studies of the Bureau of Curriculum Research, Bulletin No. 1. New York: Teachers College, Columbia University, 1926. Pp. xiv + 194.

25 H. B. Bruner, "Selected List of Courses of Study Published 1932-33," *Society for Curriculum Study News Bulletin*, IV (November 27, 1933), 2-7.

———, "Outstanding Courses of Study of 1934," *Society of Curriculum Study News Bulletin*, VI (January 15, 1935), 2-8.

———, and Mabel V. Cassell, "Annual List of Outstanding Courses of Study," *Curriculum Journal*, VI (December 2, 1935), 1-9.

26 Henry Harap, "A Critique of Public School Courses of Study 1928-1929," *Journal of Educational Research*, XXI (February, 1930), 109-19.

———, and Alice J. Bayne, "A Critical Survey of Public School Courses of Study Published 1929 to 1931," *Journal of Educational Research*, XXVI (September, October, 1932), 46-55, 105-9.

27 Henry Harap, "A Survey of Courses of Study Published in the Last Two Years," (1932-34), *Journal of Educational Research*, XXVIII (May, 1935), 641-56.

See also E. M. Draper, *Principles and Techniques of Curriculum Making*. New York: D. Appleton-Century Co., 1936. Pp. xvi + 875.

There is evidence of an increasing attention to the theoretical foundation of programs of curriculum revision. The importance of setting up meaningful goals to give direction to pupil activities is being increasingly recognized. A large proportion of courses appear to be socially useful or functional in character. To a greater degree units of work are being based on social experiences and lifelike interest centers. Although the number of published integrated courses is still small, integration has emerged in the last two years as a significant curriculum trend. Typographically, the bulletins continue to improve, and the same may be said for their literary form. Sections of the country which have hitherto lagged in curriculum revision are beginning to show a lively interest.

What of the future of curriculum making? The abundant output of courses of study, the general practice of offering courses in curriculum making, the common emphasis on the curriculum in programs of professional meetings, the recent emergence of interest in statewide programs of curriculum revision, the uninterrupted flow of published treatises, the sustained interest in the curriculum revision movement, and the recently accelerated drive to revise the curriculum of the secondary schools—these are signs of promise of continued progress in the curriculum of the American School.

Summaries and bibliographies of attempts to evaluate or rate courses of study and textbooks are available.[28]

Concluding statement. As is apparent from a reading of the first paragraph of this chapter, any comprehensive attempt to summarize criteria or standards for evaluation of educational research and the techniques employed would mean repetition of many principles developed in other chapters of this book. Therefore, the immediately preceding pages have been limited to a consideration of criteria for evaluating educational literature in the form of professional books and monographs, periodical articles, graduate theses, textbooks, and courses of study.

Although it is recognized that the educational investigator and field worker who contribute in any significant way to the discovery of truth and its application to educational practice must evolve critical standards of evaluation and incorporate

[28] Henry Harap, "Evaluation of Curricula and Texts," in "The Curriculum," *Review of Educational Research*, I (January, 1931), 43-5.
———, "Evaluation of Courses of Study and Textbooks," in "The Curriculum," *Review of Educational Research*, IV (April, 1934), 194-8.

them in their own professional and scientific background, it will be conceded that assistance and guidance are desirable in the formulation of such criteria. To provide a maximum amount of this assistance to the younger workers in education, with due economy of time and space and without seeming to dictate arbitrary standards of evaluation, is the purpose of this chapter and of the numerous bibliographical references cited.

Problems and Exercises

1. Select a completed study of interest to you, and evaluate it in terms of standards developed in this and other chapters, covering such matters as:
   (*a*) Statement of the problem
   (*b*) Survey of the related literature
   (*c*) Procedures for collecting data
   (*d*) Analysis and interpretation of data
   (*e*) Conclusions and generalizations
2. Choose a professional book in education which has appeared within two years of undertaking this assignment, and locate three reviews of it, comparing them critically in terms of the principles of effective reviewing stated in this chapter or in some authoritative source.

Selected References

* Almack, J. C. *Research and Thesis Writing*, Chapter XI. Boston: Houghton Mifflin Co., 1930.

Ashbaugh, E. J. "Scientific Thinking in Education," *Journal of Educational Research*, XXV (April-May, 1932), 300-1.

Baker, H. J. "The Tower of Babel," *Journal of Educational Research*, XXII (June, 1930), 60-2. Urges that educational workers and teachers be not overwhelmed by new and contradictory theories, philosophies, and fads.

Barr, A. S. "Expressing the Scientific Spirit Through Better Supervision," *Journal of Educational Research*, XXIX (September, 1935), 47-52.

——— "The Scientific Method and Classroom Supervision," *Journal of Educational Research*, XXIV (September, 1931), 141-3.

Blackhurst, J. H. "Do We Measure in Education?" *Journal of Educational Research*, XXVII (December, 1933), 273-6.

* Bode, B. H. "Where Does One Go for Fundamental Assumptions in Education?" *Educational Administration and Supervision*, XIV (September, 1928), 361-70. Emphasizes the philosophical method as of major importance in the solution of educational problems.

* Breed, F. S. "Is a Science of Education Possible?" *Scientific Monthly*, XXXIX (December, 1934), 530-5. Urges that education be placed

on a scientific basis, thus escaping the stagnation of traditionalism and the uncertainties of radicalism.

* BRIGGS, T. H. "A Philosophy of Secondary Education Today," *Teachers College Record,* XXXVI (April, 1935), 593-603.

* ——"Jeremiah Was Right," *Teachers College Record,* XXXII (May, 1931), 679-95. A criticism of secondary and higher education and of educational investigations as now conducted.

* BRIM, O. G. "Research That Prevents Research," *Journal of Educational Research,* XXII (October, 1930), 161-71. Urges the application of research methods to more difficult and fundamental problems.

BROOKS, Fowler D. "Criteria of Educational Research," *School and Society,* XVIII (December, 1923), 724-9. Discuss standards by which any piece of research is evaluated; the exact delimitation of the problem; its analysis into constituent elements of subordinate problems; its historical background; selection and use of methods of investigation; collection and evaluation of data; interpretations of data; reaching a solution or conclusion. Points out current errors and deficiencies made in following these procedures.

BROWN, C. H. "A Hazard to Research," *Journal of Higher Education,* II (November, 1931), 420-6.

* BUCKINGHAM, B. R. "The Philosophy and Organization of Research," *School and Society,* XXIX (June 15, 1929), 755-64. Discusses research as a method, as a means of discovering new truth, and as a contribution.

* BURTON, W. H. *Introduction to Education,* Part II. New York: D. Appleton-Century Co., 1934.

CALDWELL, O. W. "Science—Truth or Propaganda," *School and Society,* XXXVII (February 11, 1933), 169-74.

CHARTERS, W. W. "Fads," *Educational Research Bulletin,* VII (October 31, 1928), 326-7. Points out that national interest in educational ideas has a span of three or four years—project method from 1917 to 1920, curriculum from 1924 to 1927, and next character education seemed popular.

——"Measures of Research," *Educational Research Bulletin,* XI (October 12, 1932), 309-20. Analyzes the work of the Bureau of Educational Research at Ohio State University.

——"Rating Scale for Class Reports," *Journal of Higher Education,* I (June, 1930), 341-3.

CLARKE, E. L. *The Art of Straight Thinking.* New York: D. Appleton and Co., 1929. Pp. xi + 470.

CLEMENTS, F. O. "Evaluating Research Ideas," *Scientific Monthly,* XXII (May, 1926), 441-4. Treats of the possible contributions of research to society, and the consequent responsibility on the research personnel for the selection of worth-while problems and for scientific procedure throughout an investigation. Discusses some criteria of a good problem.

COREY, S. M. "We Need Less Logical and More Empirical Evidence," *School and Society,* XXXIII (June 20, 1931), 831-2.

* COUNTS, G. S. "Criteria for Judging a Philosophy of Education," *School and Society,* XXX (July 27, 1929), 103-7. States that a good philos-

ophy should be systematically empirical in foundations, comprehensive in outlook, consistent in its several departments, practicable in its provisions, and satisfying to its adherents.

COURTIS, S. A. "Education—A Pseudo-Science," *Journal of Educational Research*, XVII (February, 1928), 130-2.

COURTIS, S. A. "The Evolution of Individualization: An Interpretation," *Educational Method*, XV (March, 1936), 291-8.

* ——— "Significant Criteria for the Appraisal of the Validity of Contemporary Educational Philosophy," *Educational Method*, IX (November, 1929), 66-72.

COX, P. W. L. "The Research Racket," *Junior-Senior High-School Clearing House*, VII (January, 1933), 260-5. A criticism of questionable practices in educational investigation.

——— "Twenty Theses Regarding Educational Research," *Educational Service*, III (July, 1931), 14-5.

* COXE, W. W., and Others. *The Grouping of Pupils*. Thirty-fifth Yearbook of the National Society for the Study of Education, Part I. Bloomington, Ill.: Public School Publishing Co., 1936. Pp. x + 315.

DEMIASHKEVICH, M. J. "The Science of Education," *Phi Delta Kappan*, XIV (April, 1932), 184-90.

DICKEY, J. W. "Statistical Ability Necessary to Read Educational Journals," *Journal of Educational Psychology*, XXVII (February, 1936), 149-54.

EGINTON, D. P. "Tests and Measures of Satisfactory Growth," *Educational Method*, XV (December, 1935), 145-9.

ENGELHART, M. D. "Educational Research at the Crossroads," *American School Board Journal*, LXXXVII (October, 1933), 15-7.

FOLEY, J. L. "Progressives and Experimentalists as Allies," *Progressive Education*, VII (May, 1930), 191-4.

FOWLKES, J. G. *Evaluating School Textbooks*. New York: Silver, Burdett and Co., 1923. Pp. 34.

FRANZEN, R. H., and KNIGHT, F. B. *Textbook Selection*. Baltimore: Warwick and York, 1922. Pp. 94.

* FREEMAN, E. M. "Criteria for Judging a Science of Education," *School and Society*, XXX (July 13, 1929), 48-52.

FREEMAN, F. N. "An Analysis of the Basis of the Activity Curriculum," *Elementary School Journal*, XXXV (May, 1935), 655-61.

* ——— "Psychology as the Source of Fundamental Assumptions in Education," *Educational Administration and Supervision*, XIV (September, 1928), 371-7. Describes the psychological method as fundamental.

——— "Teaching as an Applied Science," *Educational Method*, IX (May, 1930), 448-55.

FULLER, Florence D. *Scientific Evaluation of Textbooks*. Boston: Houghton Mifflin Co., 1928. Pp. xvi + 88. An experiment in coöperative evaluation of junior high-school mathematics texts.

GANS, Roma. "Evaluation of the Work of the New School," *Education*, LV (May, 1935), 530-4. Lists twelve questions to be answered.

GOOD, Carter V. "Educational Yearbooks and Annual Professional Programs," *School and Society*, XXXI (May 3, 1930), 604-6. Suggestions for the improvement of year-books and scientific meetings.

* GOODENOUGH, Florence L., and ANDERSON, J. E. *Experimental Child Study,* pp. 50-4. New York: The Century Co., 1931. Criteria for evaluation of scientific work.

* GRAY, J. S. "Scientific Postulates for Educational Research," *Educational Administration and Supervision,* XIX (January, 1933), 18-24.

GRAY, Olive. "A Teachers' Convention—Diary of a Participant," *School and Society,* XXXIV (December 12, 1931), 809-10. Criticizes lack of planning in the management of teachers' convention programs.

HALL-QUEST, A. L. *The Textbook: How to Use and Judge It,* Chapters IV, V. New York: The Macmillan Co., 1918.

HARTOG, Philip, and RHODES, E. C. *An Examination of Examinations.* London: Macmillan and Co., Ltd., 1935. P. 81.

HISSONG, Mary C., and HISSONG, Clyde. "The Scientific Movement and Progressive Education," *Education,* LI (September, 1930), 1-9. Reveals difficulties in measuring the results of the new schools.

HUGHES, W. H. "Two Educational Philosophies—Are They Compatible?" *Nation's Schools,* XIV (December, 1934), 25-8. Stresses that the "new" school will provide for individual differences and that measurement will develop in the field of personality rather than be discarded.

HULLFISH, H. G. "A Crucial Problem for Philosophy of Education," *Educational Administration and Supervision,* XVI (April, 1930), 241-8. States that the crucial problem in a world of change is to work out an educational program so that the individual may leave the school with at least an emerging philosophy of life.

HUNKINS, R. V. "Two Things Wrong with the Literature of School Administration," *American School Board Journal,* LXXXIV (March, 1932), 41, 100, 102. States that the literature in this field is confined almost exclusively to principles of school organization, and all but ignores operative technique or managerial art and smaller schools.

HUNTER, W. L. "Check List for Evaluating Research," *Industrial Education Magazine,* XXXVI (January, 1934), 41.

——— "Rating Scale for Research Reports," *Industrial Education Magazine,* XXXVII (January, 1935), 51-2.

HUTCHINS, Robert M. "The American Educational System," *School Review,* XLI (February, 1933), 95-100.

HUTSON, P. W. "Testing the Guidance Program," *Nation's Schools,* XV (June, 1935), 21-3.

* JUDD, C. H. "In Defense of American Secondary Schools," *School Review,* XLI (April, 1933), 257-65.

* ——— "The Development of the Science of Education in the United States," *International Education Review,* IV (1932-1933), 475-96.

KELLEY, T. L. "A Defense of Science in Education," *Harvard Teachers Record,* I (1931), 123-30.

KILPATRICK, W. H. "A Defense of Philosophy of Education," *Harvard Teachers Record,* I (1931), 117-22.

KNISS, F. R. "Selecting a Textbook in Tenth Grade World History," *Educational Administration and Supervision,* XXI (September, 1935), 465-70.

KNUDSEN, C. W. "Experience versus Experimentation," *Peabody Journal of Education,* VII (January, 1930), 242-3. Points out that certain new movements, such as the junior college and the junior high school, have been promoted by propaganda and tested indiscriminately at public expense rather than by subsidized experimentation.

LAMBERT, A. C. "The Research Point of View in Education," *American School Board Journal,* LXXXVI (March, 1933), 16.

LATHROP, Edith A. *Aids in Book Selection for Secondary School Libraries.* Office of Education Pamphlet, No. 57, 1934. Washington: Office of Education, 1934. Pp. 28.

LOOMIS, H. B. "Educational Philosophy: Change, Invariance, or Both?" *School Review,* XXXVIII (April, 1930), 256-62.

MCCLURE, Worth, and Others. *The Evaluation of Supervision.* Fourth Yearbook of the Department of Supervisors and Directors of Instruction. New York: Teachers College, Columbia University, 1931. Pp. 182.

MCCONN, Max. "Educational Guidance: Progress Towards Scientific Procedures," *School and Society,* XL (October 27, 1934), 537-42.

MCCONNELL, R. E. "Book Selection for a Teachers College Library," *Educational Administration and Supervision,* XXI (October, 1935), 551-4.

MANUEL, H. T. "Evaluating Present Educational Practice: An Illustration," *Educational Administration and Supervision,* XIV (October, 1928), 493-8. Calls attention to the need for educational research and suggests some of the techniques available.

MAXWELL, C. R. *The Selection of Textbooks.* Boston: Houghton Mifflin Co., 1921. Pp. 138.

MELBO, I. R., and WATERMAN, I. R. "Evaluation of Textbook Materials in Handwriting," *Elementary School Journal,* XXXVI (November, 1935), 204-10.

* MONROE, W. S. "Hazards in the Measurement of Achievement," *School and Society,* XLI (January 12, 1935), 48-52.

* MORRISON, H. C. "Sincerity in the Present Situation," *Educational Administration and Supervision,* XX (April, 1934), 273-81.

NOBLE, S. G. "The Beginnings of a Science of Education," *School and Society,* XXXVIII (December 23, 1933), 835-6.

NORRIS, O. O. "Some Major Postulates for a Philosophy of Education," *Educational Method,* XI (May, 1932), 449-61.

* ORATA, P. T. "Begging the Question in the Name of Science," *Educational Administration and Supervision,* XX (April, 1934), 241-63.

* ——— "The Insignificance of the Statistically Significant," *Educational Administration and Supervision,* XX (May, 1934), 321-40.

PATTY, W. W., and PAINTER, W. I. "Improving Our Method of Selecting High-School Textbooks," *Journal of Educational Research,* XXIV (June, 1931), 23-32.

* PETERS, C. C. "Educational Sociology as a Source of Fundamental Assumptions in Education," *Educational Administration and Supervision,* XIV (September, 1928), 385-92. Indicates possibilities in the utilization of the methods of sociology in the solution of educational problems.

PRUNTY, Merle. "Evaluating Curriculum Reconstruction," *School Executive*, LV (February, 1936), 234-5, 239.

* REISNER, E. H. "Science and Faith—Their Claims in Contemporary Education," *School and Society*, XXXV (January 16, 1932), 78-83.

——— "What Is Progressive Education?" *Teachers College Record*, XXXV (December, 1933), 192-201.

REYMERT, M. L. "An Attempt at a Rating Scale for Psychologists," *Psychological Bulletin*, XXX (January, 1933), 63-79.

ROEMER, Joseph. "Proposed Revisions of Secondary School Standards," *High-School Teacher*, XI (May, 1935), 132-4.

RUSK, R. D. "The Conflict of Science and Art," *Scientific Monthly*, XXX (May, 1930), 458-64. Points out how science makes art more truly an accurate representation of nature.

SACKETT, E. B. "Is Research an Expense?" *American School Board Journal*, LXXXVI (April, 1933), 19-20.

SEARS, J. B. "Technique and Procedure for Surveying the Curriculum," *California Journal of Secondary Education*, X (January, 1935), 123-31. Suggests ways for discovering weaknesses in the curriculum.

SKAGGS, E. B. "The Limitations of Scientific Psychology as an Applied or Practical Science," *Psychological Review*, XLI (November, 1934), 572-6.

SKEELES, A. G. "Research and Thinking," *Educational Administration and Supervision*, XVII (April, 1931), 294-305.

——— "What Is an Educational Philosopher?" *School and Society*, XXXII (July 12, 1930), 62-4. Includes definitions of educational philosophy and its function in a program of education.

SLESINGER, Donald. "Standards for Evaluating Research Programs," *Journal of Home Economics*, XXVI (April, 1934), 206-11.

SMITH, F. W. "The Meetings of the Department of Superintendence," *School and Society*, XXXIII (May 2, 1931), 591-2. Deplores the duplication of programs and the consequent waste of time and energy.

SMITH, V. T. "An Educational Philosophy," *Educational Administration and Supervision*, XVI (February, 1930), 88-98. States a philosophy consisting of four propositions: that education is possible, that it is possible in varying degrees with different individuals, that education is democratic, and that education is living.

THAYER, V. T. "When Science Goes Wrong in Education," *Journal of Educational Research*, XXIV (June, 1931), 67-70.

TYLER, R. W. "A Plea for Scientists in Education," *Educational Research Bulletin*, IX (April 16, 1930), 222-3. Deplores extreme and inexact statements in educational literature and emotional unwillingness to consider all the facts involved.

* ——— "Defining and Measuring the Objectives of Progressive Education," *Educational Record*, XVII (January, 1936, Supplement No. 9), 78-85.

* ——— "Evaluation: A Challenge and an Opportunity to Progressive Education," *Educational Record*, XVI (January, 1935), 121-31.

——— "Evaluation: A Challenge to Progressive Education," *Educational Research Bulletin*, XIV (January 16, 1935), 9-16. Emphasizes the

need for setting up appropriate objectives and adequate methods for attaining them, as well as measuring the extent to which the goals are achieved.

——— "The Need for Adequate Data," *Educational Research Bulletin*, VIII (December 4, 1929), 404-6. Lists information concerning standard tests which publishers should furnish: method by which test items selected, correlations between test results and other criteria, reliability coefficients, examiner's manual and scoring key, cost, and time required.

WADDELL, C. W. "Some Basic Considerations in Evaluating the Activity School," *Educational Administration and Supervision*, XVI (October, 1930), 481-94.

WATERMAN, I. R., and MELBO, I. R. "A Plan of Procedure for the Evaluation of Textbooks in Reading," *Elementary School Journal*, XXXV (May, 1935), 662-74.

——— "Evaluation of Spelling Textbooks," *Elementary School Journal*, XXXVI (September, 1935), 44-52.

WHIPPLE, G. M. "The Improvement of Educational Research," *School and Society*, XXVI (August 27, 1927), 249-59. Discusses the essentials of scientific work with illustrations of prevalent errors and shortcomings involved in: the formulation of suitable problems; direct observation; experimental technique; preliminary trial; use of the questionnaire; measurement and statistics.

——— "What Price Curriculum-Making?" *School and Society*, XXXI (March 15, 1930), 367-68. Points out some of the dangers in curriculum making by committees and by amateurs.

* WHITNEY, F. L. *Methods in Educational Research*, Chapter VIII. New York: D. Appleton and Co., 1931.

WICKENDEN, W. E. "Science and Every-Day Philosophy," *Science*, LXXVIII (November 24, 1933), 467-71.

WITTY, P. A., and LEHMAN, H. C. "The Educational Conference—To What End?" *School and Society*, XXXIV (December 12, 1931), 807-9. A criticism of the conduct of educational meetings such as those held in connection with the Department of Superintendence.

WOOD, B. D., and BEERS, F. S. "Knowledge Versus Thinking," *Teachers College Record*, XXXVII (March, 1936), 487-99.

WOODBRIDGE, F. J. E. "Contrasts in Education, II: Education and Philosophy," *Teachers College Record*, XXXI (November, 1929), 121-36.

——— "Contrasts in Education, III: Education and History," *Teachers College Record*, XXXI (January, 1930), 339-56.

WOODY, Clifford. "Dangers Facing the Science of Education," *Educational Method*, X (April, 1931), 385-6. Discusses the two dangers of: (1) acceptance of "half baked" findings as scientifically established and (2) premature stabilization of educational procedure.

——— "Whither Educational Research?" *Journal of Educational Research*, XXVI (October, 1932), 136-7.

WORKS, G. A. "A New Basis for the Accreditment of Higher Institutions," *Educational Record*, XVI (July, 1935), 321-30.

WYMAN, H. B. "Junior College Comprehensive Examinations," *Junior College Journal*, VI (April, 1936), 347-52.

ZOOK, G. F. "Accreditation of Secondary Schools in the Light of the North Central Report," *Educational Record*, XVI (January, 1935), 70-81.

Columbia Associates in Philosophy, *Introduction to Reflective Thinking*. Boston: Houghton Mifflin Co., 1923. Pp. vii + 351.

"In Research of a Chair," *Journal of the National Education Association*, XX (May, 1931), 155-6. A burlesque on non-essential research in the face of practical problems requiring an immediate solution.

Selected References in Education, 1935. Supplementary Educational Monographs, No. 43. Chicago: Department of Education, University of Chicago, 1936. Pp. x + 198.

CHAPTER XV

THE TRAINING AND SUPERVISION OF RESEARCH WORKERS

This chapter will discuss several problems of concern to apprentices in educational investigation, whether in the field or the graduate school, and to those who supervise research, whether directors of research bureaus, administrators, supervisors, or graduate professors. Among these topics are productive scholarship, educational leadership, relation between effective teaching and research, qualifications and characteristics of research workers, requirements for graduate degrees in education, coöperative and coördinated investigation, bureaus and departments of educational research, and other organizations which play a part in the promotion and direction of research.

Promotion of productive scholarship and utilization of research ability. The available evidence reveals that the level of scholarship and productivity, even in higher institutions, is lower than it should be. A questionnaire survey, conducted by the American Historical Association, indicates a lack of productivity in colleges, although they are placing more stress on research due to the method of training Doctors of Philosophy, the emphasis on the dissertation, the place of research in the sciences and in modern industrial life, and the belief that research involves a desirable method of education. The lack of productivity is attributed to the level of ability of candidates for the Ph.D. and the fact that the degree has become a commercialized teaching degree, the low social value placed on productive scholarship in the United States as compared with European countries, and a widespread belief that the research worker is not adequately rewarded for his efforts. Remedies for the comparatively low level of productive scholarship are sug-

gested as follows: the development of a greater interest in research, greater encouragement of Doctors of Philosophy who are capable of advanced work, more "weeding out" of candidates for the degree, more money for travel and publication, and greater recognition of scholarship in the professional world. These conclusions apply especially to the field of history, but they have a similar significance for the field of education.[1]

One writer suggests thirteen reasons for the backwardness of scholars in doing the "big things" of the world and in productivity.[2]

1. Most scholars will say that they are too busy to produce works beyond the completion of their daily round of tasks.
2. Poverty is frequently a companion of scholarship.
3. Laziness is often associated with scholarly ability.
4. Stupidity ought never to be harnessed with scholarship, but unfortunately it is.
5. Poor writing and speaking may handicap persons who are otherwise creditable scholars.
6. Small-mindedness may be a congenital limitation or a habit.
7. Popularity may prevent potentially great personalities from becoming what they might.
8. Formality and tradition often kill genius.
9. Love of learning for learning's sake is the rock on which some founder.
10. Cowardice keeps many a scholar from amounting to something.
11. Abnormal standards, too high or too low, prevent scholarly accomplishment.
12. Conceit is often a fault of scholars.
13. Lack of encouragement dampens the ardor of many an enthusiastic scholar who might be a producer.

A survey of 688 higher institutions concludes that if recommended or desirable practice is a valid indication of the probable trend of actual practice, the requirement of participation in research or "productivity" will obtain in from one third to more than one half of the colleges in the immediate future.[3]

1 "Productive Scholarship," *School and Society*, XXVI (October 22, 1927), 518.
2 A. S. Pearse, "Productive Scholarship," *School and Society*, XXXI (April 12, 1930), 493-6.
3 C. H. Thompson, "Some Administrative Requirements Governing the Appointment and Promotion of College Teachers," *School and Society*, XXXVIII (September 9, 1933), 347-52.

However, only five per cent of the college presidents actually required this productivity as a prerequisite for a salary increase, and only eleven per cent required this activity for promotion in rank.

An analysis of the scholarship and productivity of the faculties of American teachers colleges and normal schools reveals that they have only one third of the expected copyrighted publications, one seventh of the expected representation in *American Men of Science* and in the *American Botanical Society*, and one half of the expected listing in the *American Psychological Register*, as compared with universities and colleges in general. The pointed concluding statement of this report is as follows: [4]

> The facts pointed out in previous paragraphs should not be construed as an attempt to build up a destructive criticism of American teacher-training institutions. The writer gladly admits that there are definite limitations in the statistical comparisons made in this study. Obviously there are many other highly important factors to be considered in determining the quality of the scholarship of faculties; it is also possible that there are matters of greater importance affecting the contribution which teachers colleges and normal schools will make to American education than the scholarship of its faculties. In spite of these limitations, however, it will be recognized that faculties of American teachers colleges and normal schools have serious scholastic shortcomings which must be overcome in the very near future. Consideration of the far-reaching educational influence of these institutions, as pointed out in the opening sentences of this paper, demands the highest scholastic standards of its faculties.

Faculty inbreeding, that is, the practice of selecting former students of an institution as faculty members, has been found dangerous for both the individual and the institution in terms of the probabilities of academic advancement, scholarly productivity, and outside professional recognition.[5] Such academic

[4] P. V. Sangren, "The Scholarship of Faculties in American Teachers Colleges and Normal Schools," *School and Society*, XXXIII (May 8, 1931), 642-4.
Also see P. V. Sangren, "An Arraignment of Productivity," *Journal of Higher Education*, II (February, 1931), 87-92. A criticism of the lack of productivity of American teachers colleges, based on an analysis of twenty-two journals.

[5] W. C. Eells and A. C. Cleveland, "Faculty Inbreeding," *Journal of Higher Education*, VI (May, 1935), 261-9.
———, "The Effects of Inbreeding," *Journal of Higher Education*, VI (June, 1935), 323-8.

inbreeding has increased markedly, especially during the decade from 1925-1935; more than one third of the faculty members in 219 institutions of higher learning in the United States possess one or more degrees from the schools in which they are employed.

Adams quotes H. G. Wells who concluded that every professorial chair should hold three occupants and represent three important functions (research, teaching, and textbook preparation).[6]

However, it must be admitted that not all workers agree with the strong pleas for productivity and research voiced in preceding paragraphs. Certainly where specialization and concentration render one narrow, usefulness in an applied field such as education is limited to that extent. Snedden maintains that there are four good reasons why scholars (defined as those who specialize in some field of science or art on a plane remote from the everyday work of elementary, secondary, or undergraduate collegiate schools) now exert very detrimental influences on policy-making for public schools and undergraduate colleges: (1) the strong and even dominating personalities of many of these persons, (2) their influence on curriculum making through committees, textbooks, and addresses, (3) their subject-matter preoccupation, and (4) their failure to think of their specialties in terms of real, rather than imagined functional values.[7]

The future of popular education, both at school and at college levels, must increasingly be determined by educators who can see and use the complex and elaborated sciences and esthetic arts of our day as *means*. Scholars we shall continue to have and to need—perhaps the more of them the better. But if popular education is to become more fully functional for culture or for any one of several kinds of material utility than it is now—and its present condition is far from happy or satisfying—the influence in its organization of those highly specialized minds here called scholars must be diminished and that of educators

[6] John Adams, "Professors and Books," *School and Society*, XXXI (March 15, 1930), 347-51.

[7] David Snedden, "The Hurtful Influences of Scholars on Useful Educations," *School and Society*, XXXI (February 1, 1930), 133-8.

who can use subjects of study as fruitful means towards ends of proved value be increased.

Of special significance to all who have pursued graduate programs of instruction is an urgent plea that the worker go forward in his given field of training and specialization, conserving and extending the scholarship and research ability represented.[8]

A certain limited number of high-grade students obtain Ph.D. degrees every year. At the moment of receiving the degree it is not unlikely that each of them is better posted concerning some aspect of his major field than any other man in the country. Yet, after taking their degrees, only a few Ph.D. students—and these are the wisest of them—pursue the topic which of all others they may pursue with the greatest likelihood of success. Much the same may be said of those who secure their Master's degree. They have majored in a certain field and very likely have written a thesis in that field. No other area is for them so important as the one to which they have just given major attention. This particular topic offers them a greater chance than any other of securing recognition among their contemporaries. Differing in degree but not in kind is the major subject of the undergraduate student. Recent studies concerning the training of teachers have shown that too many of those who have fitted themselves abundantly to teach a certain subject enter some other line of service, thus dissipating their energies and incurring both for themselves and for society an unremunerative expense.

Fortunately there are a number of instances in which the young Ph.D has had the insight urged in the preceding paragraph. For purposes of illustration, certain titles of Doctors' dissertations, together with the subsequent and present activities of the recipients of the degrees, will be cited:

1. "The Indexing of a Mental Characteristic"; teacher, author, and investigator in the field of statistics and factor analysis.

2. "An Experimental Study of the Eye-Voice Span in Reading"; teacher of educational psychology and author of a number of analytical

8 B. R. Buckingham, "The Greatest Waste in Education," *School and Society*, XXIV (November 27, 1926), 653-8.

"The Greatest Waste in Education," *Journal of Educational Research*, XII (November, 1925), 311-4.

V. L. Strickland, "Causes of Waste in Education," *School and Society*, XXV (January 1, 1927), 15-6.

laboratory studies of the school subjects, utilizing extensively the technique of photographing eye-movements.

3. "Studies of Elementary-School Reading through Standardized Tests"; teacher, author, and investigator in the field of reading, including surveys, tests, and summaries.

4. "The Administration of Secondary-School Units"; teacher, author, investigator, survey worker, and editor in the secondary field, including the junior high school and junior college.

5. "The Progress of English Grammar in American Schools to 1850"; teacher, author, and investigator in the area concerned with the teaching of English, especially summaries of the factual literature.

6. "A Study of School Postures and Desk Dimensions"; research adviser and consulting expert to a large manufacturer of school seating equipment.

Of course, it is true that a change in the interests of the individual or a shift of emphasis in the field of education may result in subsequent activity quite different from the thesis problem. For example, the young man who investigated "Arithmetic Tests and Studies in the Psychology of Arithmetic" twenty years ago has since turned to sociological and economic problems and comparative cultures as they affect education.

Characteristics of scientists and leaders in education. The need for productive scholarship and research has been stated in preceding paragraphs. More definite information concerning the qualifications and characteristics of scholars, scientists, research workers, and leaders is of interest to those in training for such fields of activity and to those who supervise the instructional and investigational programs involved. The qualifications of a successful research worker have been listed as follows:[9]

1. Emotional factors—drive
   One cannot do successful research work unless (*a*) he has the urge that comes from curiosity, (*b*) he takes pleasure in self-expression, in creation, (*c*) he feels that such work will be of real value either to himself or to others.

[9] National Committee on Research in Secondary Education, *An Outline of Methods of Research with Suggestions for High-School Principals and Teachers*, p. 11. Bureau of Education Bulletin, No. 24, 1926. Washington: Bureau of Education.
S. A. Courtis, "The Development of Ability in Research," *Studies in Education*, pp. 85-93. Yearbook Number XV of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1926.

2. Knowledge—efficiency
   No one is ready to do effective research until he has developed the following:
   (*a*) Ability to find quickly, to select, and to utilize the results of previous research
   (*b*) Knowledge of and facility in using approved experimental procedures, inductive and deductive processes, logic and experimentation
   (*c*) Skill in using approved educational measuring instruments
   (*d*) Skill in analytical methods, statistical and graphic
   (*e*) Ability to generalize, to know when and how to make safe generalizations
   (*f*) Skill in verification involving criticism and prediction
   (*g*) Ability to select and organize the materials used in the investigation and to report the methods and results
3. Volition—control
   The volitional factors necessary may be outlined as follows:
   (*a*) Visible evidence
      (1) Courage
      (2) Persistence
      (3) Open-mindedness
      (4) Humility
      (5) Faith
   (*b*) General powers
      (1) Self-direction—independence in thought
      (2) Self-appraisal—power to know one's strength and limitations
      (3) Self-control—power of self-control
   (*c*) Convictions
      (1) About nature—unity of law, evolution, cause and effect
      (2) About self—potentialities, social consciousness, control of self
      (3) About opportunity—reality and possibility of discovery of truth, possibilities of growth in self and progress of society

Standards suggested for work in the natural sciences should be used to the extent possible in attacking educational problems, although it is recognized that such criteria cannot be transferred bodily to the social sciences.[10]

1. Detachment
2. Holds results as provisional

[10] J. M. Hughes, "The Educational Worker and Scientific Ideals," *American School Board Journal*, LXXVIII (March, 1929), 60, 142.

3. Dislikes philosophical speculations
4. Honest in reporting his work
5. Carries his ideal of evidence, conception of proof, and attitude of detachment into every situation and subject that concern him
6. Refuses to take sides on issues amenable to investigation
7. Unwilling to reason by analogy
8. Differentiates between emotion and objective truth in his beliefs
9. Dissatisfied with knowledge that is not verifiable

Kelley has sketched an interesting composite picture of the mental traits of men of science.[11] He believes there are no exceptions to the first nine statements. Items 10-14 are common but not universal traits, items 15-22 are not uncommon, and items 23-27 are not unknown in men of science.

1. The great man of science is industrious, shows great mental energy, and is persistent on the trail of a discovery.
2. He questions authority, at least in the one line of his greatest achievement.
3. He is apt at drawing inferences and is therefore ingenious in making hypotheses.
4. His sense of logic is sound, so that he is perspicacious in making deductions.
5. He is a keen observer of natural phenomena.
6. He is dependent on observed facts.
7. He is inventive in the matter of techniques.
8. He is rich in his variety and number of hypotheses.
9. He is not "inspirational" in his chosen field, i.e., his feet are always on the ground—his hypotheses are always amenable to some tests of a factual or observational sort. But he is inspirational in the sense that a vision not the common property of fellow-men urges him on.
10. He lacks personal attachment to a hypothesis—he will slay his own mental offspring, or if he does not actually kill an erroneous hypothesis that he has given birth to, he will let it die from inattention.
11. He is disputatious.
12. In his person much transfer of training takes place, for he adapts to one field a device, method, or hypothesis drawn from another field.
13. He is versatile in his interests, and even in his native abilities.
14. He is tolerant.

[11] T. L. Kelley, *Scientific Method*, pp. 182-83. Columbus, Ohio: Ohio State University Press, 1929.
———, *Scientific Method*, pp. 228-29. New York: The Macmillan Co., 1932.

15. In his person erroneous transfer takes place, for he reasons by analogy without warrant.
16. He has a good memory.
17. He has good mathematical ability, even though mathematics is not his major activity.
18. He has excellent motor coördination and manipulative ability.
19. He has a thorough knowledge of antecedent work.
20. He has a deep religious feeling.
21. He is generous.
22. He is precocious in his development.
23. He is egotistical.
24. He is modest.
25. He has hobbies.
26. He is not sociable.
27. His ancestors are of more than ordinary distinction.

In a helpful discussion of the qualities and aptitudes demanded of the scholar, Spahr and Swenson emphasize consideration of: intellectual honesty; the influence of heredity, environment, and education; objectivity; use of his own nature as a key in studying others; danger of magnifying recently discovered facts; preconceived conclusions and cherished hypotheses; emotional difficulties; tendency to impair objectivity because of personal and pecuniary interests; optical illusions and peculiarities of hearing; confounding observation with inference; drawing important conclusions from insignificant tests; inadequate conceptions due to wide distribution of data in space and time; liking for one's work; great patience; accuracy; and prudence, judgment, and good sense.[12]

A fuller statement of two of the most important characteristics of the scientist, desire to know the truth and honesty in reporting results, follows:[13]

> But what is a scientist? Not simply one who works the microscope, the telescope, or the retort; not simply one who works in the field of chemistry or physics or biology or astronomy. A scientist is one who is distinguished by two characteristics. First an insatiable desire to know the truth and, second, an absolute honesty in reporting what he finds.

12 W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research*, Chapter II. New York: Harper and Bros., 1930.
13 "Research," *Educational Research Bulletin*, VI (April 13, 1927), 164-5.

These will characterize Galileo and Newton, Faraday, Pasteur, and Michelson. They will also characterize Plato, Savonarola, Luther, Pestalozzi, and Thorndike. If we are to have a science of education, research must play a big part in the things we do. This means we must be scientists. We must have the characteristics of the scientist.

Probably the vast majority of people fail to qualify on one or both of these characteristics. They have no insatiable desire to know the truth. Gossip is quite as satisfactory as fact. They prefer to take their opinions, ready made, from others, for it requires less effort than thinking. Prejudices are more easily acquired than knowledge. It is easier to express an opinion than to pass judgment upon it; easier to repeat than to revise one's position on the basis of more information. Also, it seems more consistent.

The second characteristic—absolute honesty in reporting what we find—is equally important. Recently a professor of geography in a university was heard to say, "I don't care what the evidence shows, I don't believe it." On another occasion the dean of a graduate school remarked concerning some data reported in a Master's investigation, "I don't believe it, and if it is true, it should never be published." An editorial, which appeared in an educational magazine a number of years ago, said this, regarding a certain investigation: "The study ought never to have been made. Having been made, it ought not to have been accepted as a Doctor's dissertation. Having been accepted, it ought never to have been published." These statements are illustrative of the non-scientific attitude of mind which sometimes appears even among those whom we ordinarily suppose to be scientific. All of us have our prejudices. All of us have our limitations, especially outside of our own field. The true scientist, however, reports with absolute honesty his findings whether or not they agree with tradition, with the findings of his colleagues, or with the theories and philosophy which he holds. Truth is acknowledged and reported regardless of how it cuts across personal inclinations.

With regard to the characteristic of absolute honesty in reporting results, a qualifying statement should be made. There may be times, audiences, and places more appropriate than others for reporting truth. It is questionable whether all known information concerning instruments of destruction, such as poison gas, should be broadcast to become the weapons of criminal individuals and groups or even of ruthless nations. It is said that a somewhat premature publication of a school survey of the rural section of a given state, recommending consolidation of schools, delayed the desired objective for many

years. Probably a program educating the public to the advantages of consolidation should have preceded or accompanied the release of the survey findings. Certainly some facts serve their purpose best when handled by those with the necessary interpretative background rather than when disseminated promiscuously where they may be misinterpreted or misused by ignorant or unscrupulous persons.

Boyd has presented and illustrated what he considers the desirable qualifications for conducting research: youth, curiosity, imagination, the experimental attitude, enthusiasm, patience, persistence, faith, courage, common sense, honesty, and modesty.[14] As illustrations of the accomplishments of youth, he cites the exploits of a large number of men under thirty years of age: Lindbergh, Columbus, Livingston, Stanley, Alexander the Great, Caesar, Hannibal, Charlemagne, Napoleon, Newton, James Watt, Eli Whitney, McCormick, and Westinghouse. Of course, the important work of older and more mature men with almost a lifetime of experience and background must not be overlooked. The traits of intellectual curiosity and honesty have already been discussed in this chapter. Imagination and common sense are involved in the formulation and testing of hypotheses, as discussed in Chapter IV. The characteristics of experimentation were outlined at some length in Chapter IX. Enthusiasm, patience, persistence, faith, and courage are represented in the work of Pasteur who took five years to find his remedy for hydrophobia, of Charles Goodyear who worked ten years before a lucky accident taught him how to vulcanize rubber, and of Faraday who spent ten years in his effort to "change magnetism into electricity." As for courage, the fields of medicine and exploration have furnished the world with hundreds of illustrations too numerous to mention here. Although modesty is not a universal attribute of research workers, it is a trait definitely present in the makeup of many great scientists.

The hardships and difficulties encountered by experimenters

14 T. A. Boyd, *Research*, Part IV. New York: D. Appleton-Century Co., 1935.

are almost proverbial.[15] The Curies made their long search for radium in a tumbledown shed that had been a dissecting room. Bell worked on his telephone in a Salem cellar and in a Boston attic. Morse made every foot of the insulated wire he used by winding cotton around bare wire. Having shown the world how to vulcanize rubber, Goodyear was in debt to the amount of two hundred thousand dollars at the time of his death.

If not actual physical hardships, scientists frequently have encountered laughter, ridicule, and even persecution in some instances—Fulton's steamboat, Stephenson's locomotive, Franklin's experiments with electricity, and the Wright brothers' flying machine. Not even daring to reveal his thoughts and discoveries in conventional form, Leonardo da Vinci used reversed or mirror writing. Galileo was forced to "recant" with respect to his discoveries under threat of torture. However, it is true that the path of the research worker has been made much easier in late years through the good offices and support of such agencies as those cited in Chapter III and later in the present chapter.

It should not be assumed from the foregoing analyses of the characteristics of scientists, scholars, and research workers that the whole of educational leadership consists of frequent participation in, and application of, investigational procedure, important as this activity is. It has been suggested that, in addition to the work of the investigator, there are the important activities of those who devote their major energies to the functions of administration or interpretation of schools,[16] or to the development of "innovations" in educational procedure.[17] Education needs the services of all of these workers.

Alexander gives some rather practical advice to the young worker who is trying to decide between a field or an institu-

[15] *Ibid.*, pp. 43, 53, 292-4.

[16] J. E. Morgan, "Educational Interpretation and the Printed Word," *School and Society*, XXX (July 20, 1929), 79-83.

———, "The Need for Educational Interpretation," *Journal of the National Education Association*, XIX (February, 1930), 37-8.

[17] "Invention and Appraisal," *Educational Method*, IX (December, 1929), 129-30.

tional career, the latter of course involving more emphasis on research and publication.[18]

A fair percentage of men consider going into one side and transferfering later to the other. Such transfers do sometimes occur, but they are not numerous or easy to make. After ten years in the field, a man is not regarded seriously by an institution, as compared with a youngster who gives promise of research and publication abilities and will start at a low salary and grow up. Any field man called to an institution usually owes the place to the fact that he has become so prominent and influential in his state or section that his outside contacts can be capitalized for bringing to the institution educational opportunities that would not come to its regular inside faculty. It is not easy for institutional men to go to good field positions, although we have some successful superintendents who changed from universities or normal schools. They had, however, so impressed the public mind by their activities that their being from an institution did not label them as "academic." Some of them have returned to institutional work from the field. But the writer cannot recall a single such case where the man had not all along deliberately kept up the research and publication so dear to institutional heads. For any man contemplating riding two horses this way, the best advice is to keep one foot securely on the field work horse, and the other foot on the institutional horse of research and publication, until he decides on which steed to put both feet. Otherwise, as regards a real career in educational work, he is sure to be indeed unhorsed. This means very different work for both feet, with the gaits and characteristics of the two horses always in mind. It is far more strenuous than riding a single steed. But riding two horses at the same time always means just that.

Possibly the task of "riding the field and institutional horses," as described by Alexander, is not hopelessly impossible. At least, knowledge of practical school problems and procedure and ability to work with people, on the one hand, and acquaintance with scientific method on the other hand are considered important characteristics of a leader in educational research.[19]

In this plea for leadership in research I have asserted that due to the educational conditions of to-day, there is need of quantity pro-

18 Carter Alexander, "Field Versus Institutional Careers," *Phi Delta Kappan*, XI (February, 1929), 144-5; also *Teachers College Record*, XXX (April, 1929), 682-5.

19 B. R. Buckingham, "Leadership in Educational Research," *Journal of Educational Research*, XV (April, 1927), 239-45.

duction in research. In order to produce the verified and scientifically defensible body of knowledge which is thus demanded, there must be leaders and followers. I have tried to give some of the qualities of leadership which seem to me to be desirable. The leader should have practical school experience. He should be able to enlist the support and win the confidence of teachers. He must be able to train workers. He must have the ability to analyze larger problems into their simpler elements and to combine selected parts of complex problems for the purpose of coöperative research. He must be a scholar in his chosen field and must be able to state problems with authority. If he is a real leader he will have what I have called "extractive power." He will be able to put his program over and to secure from people who would otherwise be indifferent the information he needs. He will be well informed as to the nature of scientific method and will know how to apply such a method to educational data. On the other hand, he will know the limitations of strictly objective treatment. He will be expert in thinking as well as in figuring. He will follow the figures where they lead, impartially and without bias or prejudice, but he will know how to interpret them and to supplement them. Finally, he will study a question long enough and hard enough to bring out something more substantial than tentative conclusions or a timid turning over of his chosen question to the educational public for further study.

In addition to the preceding analyses of scholars, research workers, and educational leaders, attention should be directed to similar references, used in another connection in Chapter III, and in the selected bibliography (under the names of Barr, Cooper, Edwards, Keys, Loofbourow, Noll, Snedden, Traxler, and Tyler) of the present chapter. Chapter I also has a bearing on the problem under discussion. At this time space may be taken for more specific mention of investigations of: vocational routes taken by 546 people in reaching certain educational positions of leadership,[20] and leadership in curriculum making in 168 school systems.[21]

Relationship between teaching, administrative, supervisory, and research activities. It is assumed at this point that preceding portions of this volume have shown clearly the need for, and the contribution of, research. It is also assumed that

[20] Ruth Strang, "Vocational Paths to Certain Educational Positions," *School and Society*, XXXVI (October 15, 1932), 508-12.

[21] Margaret A. Norton, "Leadership in Curriculum Building in 168 Large City School Systems," *School and Society*, XXXIII (January 3, 1931), 17-20.

properly qualified teachers (at all levels of instruction), as well as administrators and supervisors, should have training in, and contribute to, problem solving in their respective areas of activity and responsibility. This statement is hardly debatable, although the question of an appropriate balance between training in teaching or administrative duties, on the one hand, and problem-solving or investigational procedure on the other has been discussed frequently and vigorously in the educational literature.

The point of view that virtually all research should be conducted in graduate schools, laboratories, or research bureaus is hardly defensible in terms of the desirability of the intellectual quickening of the million teachers in this country, ready application of the results of educational investigation, or discovery of important field problems pressing for solution. Certainly workers adequately prepared, through graduate school or other training programs, in their instructional, supervisory, or administrative fields and in problem-solving procedures appropriate to their areas of responsibility have a dual rôle and obligation of great importance and promise. It is recognized that in public schools and undergraduate colleges heavy teaching loads and the lack of facilities for research have been limiting factors, yet the individual with a keen intellectual curiosity will press forward in the search for truth in spite of obstacles. These dual responsibilities of teaching (or supervision, or administration) and of problem-solving seem not incompatible in the properly trained worker. There can be no doubt concerning the stimulating influence such a person brings to classroom or conference. It seems not unreasonable to suggest that teachers properly trained in methods of investigation should be able to direct more intelligently a problem-solving approach to intellectual growth on the part of pupils.

The discussion found in Chapter II and the extended lists of problems for study (in the appendix) suggest the wide range of topics available for investigation. A symposium on the participation of the field worker in educational research shows

how the teacher, administrator, or supervisor may share in curriculum programs, instructional research, school surveys, and historical studies.[22] In most such instances the field worker may add to his own professional understanding and training, while at the same time making some contribution to the solution of important educational problems.

The preceding paragraphs should not be interpreted to mean that all field workers are to be producers of research, without regard to their training and qualifications. In making these statements it is conceded that scientific experimentation is a difficult and complicated problem, much more so than the average lay or even professional worker realizes. It is recognized that not all teachers will rise to the level of making contributions to the science of education. This, of course, is also true of many so-called research workers.

As pointed out in the preceding chapter and in the preface, the majority of field workers should be critical consumers of research rather than actual producers. There is really a tendency on the part of the educational practitioner to put entirely too much faith in the training researches of both teachers and research workers. Unfortunately, in too many instances, supervisors and professors seem to assume that they alone are to see problems, solve problems, and do the educational thinking prerequisite to the successful management of school systems. They hand down their solutions in the form of methods to be applied, textbooks to be used, courses of study to be followed, and policies for teachers and students to put into

22 W. A. Brownell, "The Field Worker as a Consumer and Producer of Research," *Journal of Educational Research*, XXIX (October, 1935), 144-8.

H. R. Douglass, "Scientific Investigation of Instructional Problems," *Journal of Educational Research*, XXIX (October, 1935), 130-8.

H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, XXIX (October, 1935), 148-53.

J. Paul Leonard, "Teacher Participation in Recent State Curriculum Programs," *Journal of Educational Research*, XXIX (October, 1935), 117-26.

A. K. Loomis, "Needed Research in the Curriculum," *Journal of Educational Research*, XXIX (October, 1935), 126-30.

Jesse B. Sears, "The School Survey as a Means of Training Field Workers in Education," *Journal of Educational Research*, XXIX (October, 1935), 138-43.

Clifford Woody, "Stimulating Instructional Research in Michigan Schools," *Journal of Educational Research*, XXIX (October, 1935), 93-104.

operation. The teachers, then, only teach, acting neither as consumers nor producers of research. If one were to visit a classroom and find the teacher doing all of the thinking, entertaining all of the points of view, and solving all the problems, the observer would characterize such a worker as inefficient. Judged from this point of view, much of the supervision, administration, and instruction of to-day is ineffective.[23]

Another word of caution concerning wholesale encouragement and initiation of research among classroom teachers was written in answer to the suggestion that teacher-training institutions use their staffs and facilities to provide guidance centers for teachers who were using their classrooms as research laboratories.[24]

Such a plan is certainly worthy of serious consideration. However, it involves certain elements which cannot be overlooked. Vigorous scientific attack on educational problems means the expenditure of energy. If energy is to be available for this purpose, it must be provided by the public, which is to profit through research. At the present time boards of education and the public do not recognize the importance of continuous research in order to keep the educational system at a high level of efficiency. Research and certain very essential phases of central supervision are limited by the fact that the public is willing to have the schools move along traditional lines and makes little or no demand for innovation. Under such conditions teachers will be very slow to follow the plan suggested by the writer quoted, but public complacency is certainly no adequate justification for inaction on the part of teachers. Perhaps the most promising suggestion is that concrete examples of school improvement supplied to the public by voluntary work on the part of teachers will do more than anything else to bring the kind of support necessary for a change in the whole situation.

The reader who wishes to pursue this subject further will find numerous references in the chapter bibliography under the names of Alexander, Ayres, Barr, Carlson, Chamberlain, Chase, Courtis, Davidson, Ganoe, Goodman, Hepburn, Holmes, Jones, Jorgensen, Judd, Kearney, Kelley and Anderson, McMurry, Miller, Monroe, Newlon, Pace, Rogers, Sangren,

23 A. S. Barr, "Research for Teachers," *Journal of Educational Research*, XX (June, 1929), 42-3.

24 "Educational Research by Teachers," *Elementary School Journal*, XXVI (April, 1926), 564-6.

Trow, Weidemann and Rugh, Weld, Whipple, White, Woody, and Wykoff.

Graduate training programs. It is to be expected that the majority of those who contribute in any significant way to the solution of educational problems have pursued some type of graduate instruction. The preceding discussion of the relation between teaching and investigational activities has emphasized the need for training in both areas, which means that graduate training programs must provide the necessary instruction. As has been said, teachers, supervisors, and administrators need training in problem solving for their own intellectual stimulation and growth, to facilitate ready and rapid application of the results of research, and to aid in the solution of numerous and pressing field problems. For a consumer or a producer of research, training in the fundamental principles of investigation is necessary, although more technical and more intensive specialization may be required for the producer. On the other hand, Doctors of Philosophy require instruction in sound educational principles, since approximately three fourths of them enter teaching.[25] Therefore, the authors have neither the inclination nor the space to discuss the much debated question of whether there should be separate graduate degrees for proficiency in teaching, or in administration, or in research. This question apparently resolves itself into one of proper balance in graduate programs in terms of the needs of a given worker rather than of the total absence of research training. Nor does the determination of a label (M.A., M.S., Ed.M., Ph.D., Ed.D.) for use at the completion of a given period of graduate instruction seem especially significant for purposes of the present

25 W. W. Charters, "Editorial Comment," *Educational Research Bulletin*, IX (February 5, 1930), 79.

———, "Graduate Schools and College Teaching," *Educational Research Bulletin*, VII (November 14, 1928), 348-9.

M. E. Haggerty, "Occupational Destination of Ph.D. Recipients," *Educational Record*, IX (October, 1928), 209-18.

J. L. LaPoe, "The Significance of the Doctorate in the Preparation and Selection of College Teachers." Unpublished Doctor's thesis, Ohio State University, 1934.

M. O. Wilson, "What the Chicago Doctors of Philosophy Are Doing," *School and Society*, XXIX (June 22, 1929), 815-8.

discussion, although a number of references in the chapter bibliography deal with this question.

A vigorous statement of the desirability of retention of scientific training in graduate programs of instruction cautions school workers against a return to speculation, authority, and practice in the determination of educational policies and procedures.[26]

> The scientific movement in education during the last thirty years has produced an entirely new type of literature. School teachers and administrators have a body of factual data on which to build practices which was almost completely lacking thirty years ago. A good beginning has been made, scarcely more than that. In contrast with the development in education through all the years when wishful thinkers have propounded their reforms, the progress of the past thirty years needs no defense. Yet, because the way of science is slow and tedious, impatient reformers now demand that we renounce it as a method, that we create a school for the new social order out of whole cloth, that creation rather than scientific achievement is now the order of the day.
>
> The open discussion of these views in the educational press is stimulating and obviously useful. The changes in practice of some of our leading graduate schools of education in reducing the amount of emphasis upon scientific work is to be viewed with concern.
>
> If the offering of a non-research degree, such as the Doctor of Education, results in shifting the emphasis to practice rather than research, the number of people who are competent to contribute to the scientific knowledge in this field will be notably decreased. In view of the advances in educational practices which even a short thirty years of scientific research have made possible, it seems unthinkable that educational leaders will now turn back to speculation and authority. Yet, with science gone, what else remains but these?
>
> The time for scientific contributions to education was never so opportune as now. The age of easy expansion in education is over. We have witnessed in successive waves popular interest in achievement tests, mental tests, new-type examinations, ability grouping, curriculum revision, project and activity movements, and administrative schemes without number. Popular exploitation of these is past. Real scientific achievement is now possible.

A statement concerning graduate work as continued professional preparation for teachers implies less emphasis on

26 G. T. Buswell, "After Science—What?" *Phi Delta Kappan*, XVII (February, 1935), 114-5.

production of research than is advocated in the preceding quotation, but with some stress on use of research findings.[27]

Graduate work for teachers may be looked at from two angles. The first considers graduate study as a continuation of the period of professional preparation during which the teacher may supplement his previous preparation. The second considers graduate work as a distinctly different element in the teacher's preparation emphasizing research about education rather than the acquisition of additional teaching skill or teaching materials. It appears obvious from the list of suggestions just reported from those in charge of graduate and undergraduate units in education that the second of these points of view—the research side of graduate work—predominated. There is little doubt concerning the desirability of having a public-school teacher able to conduct research studies in his special field of teaching if the time spent in preparing him to conduct such studies is not out of all proportion to the value received. In other words the teacher's primary responsibility is to teach and if training in research produces a greater improvement in his teaching than would the same amount of time spent in other phases of his professional preparation or in obtaining additional knowledge of the subjects he teaches the research emphasis in graduate work for teachers is justified. Public-school teachers should be open-minded about their work and ready to accept or try out new methods of teaching or new subject-matter content when such methods or content arrangement have resulted from researches in those fields. It is not necessary that a teacher be a trained research worker in order to have this attitude toward educational experimentation. It is conceivable that too much interest in educational research may even interfere with the efficiency of the teacher's classroom worok.

Those who are responsible for training research workers in education will find an analysis of deficiencies in such training (Table XV) and of needed types of training (Table XVI) suggestive.[28] Only categories are listed which were mentioned by five or more of the investigators canvassed. The limitations of such an analysis are in its subjectivity.

Before taking up a more detailed discussion of the requirements for the Master's degree and the Doctor's degree, a brief

27 E. S. Evenden, *Summary and Interpretation*, pp. 138-9. National Survey of the Education of Teachers, Vol. VI. Office of Education Bulletin, No. 10, 1933. Washington: Office of Education, 1935.

28 R. W. Tyler, "Training Courses for Research Workers," *Educational Research Bulletin*, XI (March 30, 1932), 169-79.

TABLE XV

TYPES OF DEFICIENCY IN TRAINING FOR RESEARCH

	Number Reporting
Lack of an integral philosophy of education to which each research problem is related	29
Lack of knowledge of actual conditions which define research problems	22
Lack of training in the use and interpretation of statistics	17
Lack of wide acquaintance with techniques for collecting information which are adapted to particular problems	16
Too few types of research problems attacked while in training	13
Inadequate training in reporting research	13
Lack of training in interpreting findings	12
Too little field work	10
Too little training in discovering significant problems	9
Lack of development of social personality	8
Too much course work	7
Lack of training in planning research	6
Too little supervision of students of research	5

TABLE XVI

TYPES OF TRAINING NEEDED FOR RESEARCH

	Number Reporting
Training in the use and interpretation of statistics	43
The development of an integrated philosophy of education	31
Training in reporting research	26
Broad training in fundamental fields of scholarship as well as in education	24
Practice in attacking a variety of types of educational problems in real situations	14
Participation in field work	13
Practice in recognizing problems	12
Teaching or administrative experience	10
Training in techniques for collecting data which are adapted to particular problems	9
Training in controlled experimentation	9
Training in the construction and use of tests	9
Practice in interpreting research findings in a variety of fields	8
Apprenticeship in research	7
Training in planning research	5

review of the expansion and problems of graduate work in this country is in order.[29]

With the extraordinary expansion of such fields as agriculture, industry, commerce, and education, graduate study and research turned in the direction of applications of truth and knowledge to immediate problems rather than toward general principles. This meant the study of many local and regional problems and the development of research in American institutions rather than to attend German and French universities. Such factors explain in a large measure the decrease in emphasis on foreign languages as requirements for the Ph.D. degree and the establishment of professionalized Doctors' degrees such as Ed.D., Sc.D., Eng.D., J.S.D., etc.

There has been considerable overexpansion of graduate departments in American institutions, raising a question as to how many of the seventy-five or more universities and colleges which grant the Ph.D. degree should do so and to what extent work should be duplicated. Undoubtedly five or ten strong centers in a highly specialized field would be much better than fifty weak departments covering this area. The Master's degree is awarded by 160 schools.

The discovery each year of some 3,000 Doctors' problems and of 12,000 Masters' topics is a matter of no small significance, suggesting that the graduate student in many instances must do considerable searching before locating an acceptable thesis problem.

The foregoing facts imply that a rather difficult problem of articulation exists between the graduate institutions and some 1,000 undergraduate colleges. The choice of a graduate school requires real thought and guidance, for which some assistance is available in the classified lists of higher institutions prepared by the Association of American Universities, and in the report prepared . . . for the American Council on Education.[30]

The Master's degree. A general statement of requirements for the Master's degree, without special application to education, follows:[31]

There has been little change in the formal standards set up for the Master's degree since 1900.

The quantitative standards and requirements for the M.A. and M.S. degrees are practically identical.

29 W. C. John, *Graduate Study in Universities and Colleges in the United States.* Office of Education Bulletin, No. 20, 1934. Washington: Office of Education, 1935. Pp. xiv + 234.

30 R. M. Hughes, "Report of the Committee on Graduate Instruction," *Educational Record,* XV (April, 1934), 192-234.

31 W. C. John, *op. cit.,* pp. 151-2.

With the exception of three institutions that have endeavored to bring the Master's degree to a level two years above the Bachelor's degree, there is everywhere a general agreement of a minimum requirement of one scholastic year's work above the baccalaureate. The quantitative requirement of thirty semester-hours, including a thesis, or twenty-four semester-hours plus the thesis is a conventional practice.

In general, a foreign language requirement involving the knowledge of at least one foreign tongue is essential, but a few institutions or departments in certain institutions may waive this requirement.

The thesis is still required in most schools. Only a few exceptions to this requirement have been observed. There appears to be little or no uniformity in the matter of the requirement of the final examination or in the method of conducting it.

The Master's degree has come to be highly differentiated, as far as designation is concerned.

In 1930, there were 139 institutions that offered graduate degrees in education.[32] Of these twelve offered the A.M. in education; seventeen, the M.S. in education; and twenty-four, the Master of Education. At least 101 of the above-mentioned institutions also offered the A.M. degree and fifty-six the M.S. degree. In most of these cases a major in education was permitted. Data giving the distribution of these institutions, with the Master's as well as the Doctor's degree offered, can be found in the Survey of the Education of Teachers.[33] The number of Masters' degrees in education, involving a thesis, granted in 1933 was 3229 and in 1934, 2763.

Detailed information is available in another source concerning the administration and requirements of the Master's degree in education in sixty-four institutions: name of the degree, administrative unit offering the degree, prerequisites to candidacy, differentiation of graduate from undergraduate work, credits accepted by transfer, advisement of students, administration of the thesis (fifty-one schools require it, eight permit substitutes, and five do not require it), final examination

32 *Ibid.*, pp. 149-50.

33 W. C. John, "Graduate Work in the Education of Teachers," *Teacher Education Curricula*, National Survey of the Education of Teachers, Vol. III, Part VI. Office of Education Bulletin, No. 10, 1933. Washington: Office of Education, 1935.

(forty-one schools require it and thirteen do not), major and minor requirements, courses other than majors and minors, total credits required, requirements of specified courses such as statistics (thirty-one schools) and research methods (twenty-five schools), course credit for the thesis, foreign languages (not typically required), and opinions concerning the purpose of the degree (a period of advanced study in fifty-two schools, and a research degree in twenty schools).[34]

The fact that a number of graduate schools have made of the Master's program merely another year of training for teaching beyond the Bachelor's degree and have eliminated the thesis as a requirement is not in keeping with the emphasis on training for problem solving, as expressed frequently in this book. It is vigorously maintained in a personnel study of 242 students who received the Master's degree in education at the University of Chicago that the major responsibility of the graduate school is to give a competent group of workers the scientific training which will result in critical productive scholarship.[35]

Numerous problems are suggested by the facts which have been presented. However, in the writer's judgment, the major problem revealed is that of the selection of graduate students. A redefinition of graduate work is being forced. The efforts of the graduate school must be focused either upon the task of stimulating fundamental research on educational problems or upon the task of providing an additional period of training beyond the bachelor's degree, but with emphasis upon practice rather than research. If the former purpose is adopted, the selection of students will need to be much more rigid than if the latter purpose is accepted. Both purposes are worthy; but the mixing of the two in the same department and the granting of the same degree for each will become increasingly difficult as the demand for the Master's degree continues to increase. The Master's degree needs definition. Either it stands for preliminary training in research or it does not. Perhaps it may be desirable to consider it a

[34] J. O. Powers, "The Administration and Requirements of the Master's Degree in Education," *Practices of American Universities in Granting Higher Degrees in Education*, Chapter II. Yearbook Number XIX of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1931.

[35] G. T. Buswell, "A Personnel Study of Students Who Have Received the Master's Degree from the University of Chicago," *School and Society*, XXV (June 18, 1927), 730-6.

teaching degree. The writer does not so believe. The same type of outside pressure which now makes the Master's degree in great demand will in another generation or sooner be applied to the Doctor's degree. The problem is fundamental. Education must have men for scientific research; it must also have men skilled in teaching and administration. But the degrees which have formerly represented scientific achievement are more and more being desired by a selection of students whose chief interest is practice rather than research. The writer believes that a clear-cut differentiation between students interested in research and students interested in practice is essential in a subject as new as education. Whatever may be the decision of the graduate school regarding its obligation to give training in practice and regarding its recognition of such training by a degree, its principal obligation will be the selection of a competent group of students and the giving to this group a rigid scientific training which will cumulate in critical, productive scholarship. This type of interest is utterly foreign to many first-year graduate students as now selected.

Although this type of scholarship is too much to expect of the majority of first-year graduate students, the Master's thesis has indirect values of importance as one measure of the level of scholarship attained, even though the contribution made to knowledge is only a minor one.[86]

The administrators and supervisors of our public schools show more interest in research than ever before. Fifteen years ago the educational conference which based its program on the findings of research attracted the attention only of specialized research workers. To-day at the meetings of the National Education Association the sections dealing with scientific investigation attract the largest audiences. Again, a decade ago professional magazines which reported research studies had a very limited subscription list. To-day these same magazines are found on the desks of high-school principals, superintendents, and other practical workers in the field.

What has brought about this change of attitude? Could it be that these schoolmen have had sufficient experience in writing the Master's thesis to learn respect for research and the research worker? Could it be that they started with one point of view and after collecting data throughout the year came to a realization that their previous judgment had been wrong? If it has done nothing more than to cause our administrators to collect all the facts before rendering decisions, the training is thoroughly worth while and should be continued.

[86] "The Master's Thesis," *University of Pittsburgh School of Education Journal*, III (May-June, 1928), 100-1.

One institution which required no Master's thesis over a period of years has since 1929 changed the former policy, in view of the values expected to accrue to the student in the preparation of a thesis.[37]

The practice is expected to give the student some training in the application of scientific method; to enhance the student's knowledge and skill in reading scientific studies through this application of principles of scientific techniques in the preparation of one such study; to develop the understanding and appreciation of the concept of scientific method through the preparation of a study in which the principles of scientific method are involved; to give practice in sensing, defining, and solving problems through the employment of scientific method; to give the student some training in using the principles and techniques of research in the hope that he may attack his future problems scientifically and engage to some extent in creative research work in the field of his special interest. It should be noted that the major emphasis in these statements of objectives is on training in the application of appropriate methods of research rather than in the intrinsic value of the contribution made.

The Doctor's degree. Until recently the Doctor's degree had not changed its requirements for three quarters of a century; even now few changes have been made outside of professional fields such as education, despite the great educational and cultural changes of the intervening years. A brief introductory statement of the standards and requirements for the Ph.D. degree in general follows:[38]

There has been little change since 1900 in the formal standards set up for the Ph.D. degree.

The standards and requirements for the Ph.D. degree are being modified in the direction of flexibility. Qualitative standards are taking the place of mere quantitative requirements.

The requirements for the Ph.D. degree show considerable uniformity with respect to such general items as admission to candidacy and minimum residence requirements. That is, the regulations for admission to candidacy provide in nearly all cases an adequate period for testing the candidate's ability as a graduate student, and also providing a period in which an acceptable program involving a primary and

[37] Clifford Woody, "The Master's Thesis," *University of Michigan School of Education Bulletin*, VI (October, 1934), 9-12.

[38] W. C. John, *Graduate Study in Universities and Colleges in the United States*, *op. cit.*, pp. 213-4.

secondary interest may be worked out. The thesis or dissertation is required in all cases, but there is considerable difference of view as to what constitutes a thesis which adequately measures or tests the originality and scholarship of the candidate and the value of the contribution.

The publication of the Doctor's dissertation in some form is everywhere required, with one exception. Only one institution requires full publication before the degree can be granted. But the requirements for the publication of the thesis in many universities are so full of alternatives as to discourage a serious attempt at full publication. In a considerable number of schools the method of publishing a university series of thesis abstracts seems to be an interesting compromise. This may help the finances of the student, but it also reduces the significance of full responsibility on the part of the student in completely fulfilling his principal objective in the graduate school.

While not altogether uniform as to procedure, the final oral examination or defense of the thesis continues to be the universal practice. This is usually preceded by a comprehensive written examination.

The creation of new types of Doctor's degrees similar in general character to the Ph.D. degree has become increasingly popular. These new degrees are largely controlled by professional considerations and in a number of instances require of the candidate a period of practical professional or field experience. The emphasis is placed on the applications of knowledge rather than upon the discovery of new knowledge or truth. These degrees are now fully recognized by a large group of leading universities and are on the whole considered to be the equivalent of a Ph.D. degree.

The comparatively recent Doctor of Education degree is found to vary in certain respects from the Ph.D. degree.[39]

The degree of Doctor of Education is offered by twenty-one universities and colleges, or in one third of all the colleges and universities, excluding teachers colleges, that offer the Ph.D. degree with specialization in education. The Ed.D. degree is not offered as the only Doctor's degree in the twenty-one institutions mentioned, but it is offered parallel with the Ph.D. which is also offered in the same institutions.

The characteristics of the Ed.D. degree may be summarized as follows:

1. It gives major emphasis to the constructive solution of difficult practical problems by well-proven methods or techniques.

2. It gives great emphasis to the mastery of educational subject-matter in specialized fields rather than in prosecuting original research.

The emphasis of the Ph.D. with a major in education tends in the

[39] *Ibid.*, pp. 189-90.

direction of historical or scientific studies of education, including the development of new theories and new techniques.

As yet there is no complete agreement of authorities as to the different functions of the Ed.D. and Ph.D. degrees, as we find many cases in which the Ph.D. includes all of the functions indicated for both degrees.

From the standpoint of administration the control of these degrees tends to be almost entirely separated. The Ph.D. with major in education comes under the control of the graduate school of arts and sciences or equivalent, and the Ed.D. comes under the control of the school of education.

A major objective of the Ed.D. degree seems to be the advanced training of administrators and supervisors, and the preparation of master-teachers. Variations from the Ph.D. requirements involve less emphasis on the foreign-language requirement, teaching experience, special knowledge of the techniques of educational research, and in certain cases preliminary demonstration of ability to undertake graduate work.

According to Raup, a working distinction between Doctor of Philosophy research and Doctor of Education professional attainment, stressing the functions of the latter degree and training program, is as follows: [40]

1. Increased understanding and improved conceptions of the deliberative act itself
2. Reconsideration of general principles of conduct and policy, especially as these apply more directly to the professional field
3. Advancement of the candidate's and the profession's understanding of fact, theory, and law
4. Insight into the relation of systematic reasoning to the success of the educator's everyday decisions
5. Provision for reincorporation of the foregoing newly considered generalizations into the process of deliberation

In tools of research, especially foreign languages, revision of requirements has been slow. Bay, as a result of an analysis of 204 theses in the series, *Teachers College Contributions to Education*, Columbia University, raises a question concerning

[40] R. B. Raup, "Division of Labor in the Study of Education," *Teachers College Record*, XXXVII (November, 1935), 119-29.

the desirability of the foreign-language requirement for the Doctor's degree in education. Stated in terms of percentages employing a given tool, the results of his analysis are: 1905-1915, foreign languages 38, statistics 41, neither foreign languages nor statistics 30; 1916-1926, foreign languages 16, statistics 78, neither foreign languages nor statistics 18.[41] This trend probably has continued during the past decade.

Betts insists that a number of factors be considered in a given field before deciding upon the merits of a foreign-language requirement for the area involved.[42]

> The foreign language question for Ph.D.'s is not settled—it is just opening up. The report of the present inquiry already referred to contains much of both fact and opinion. A further study is still needed. Let each separate field of scholarship appoint a fact-finding commission to discover: (1) the amount of significant material appearing over a given period in each foreign language; (2) the proportion of this which is translated into English within a given time; (3) the amount and adequacy of the abstracting done; (4) the practicability of a system of departmental translators; (5) workable plans for making more practical use of foreign language materials in courses, seminars, and researches in the graduate school.
>
> Then let some agency bring these fact-studies all together and give us their results. With this done we should be nearer the solution of the language question than we are at present.

The oral examination, which is commonly required of Masters' and Doctors' candidates, has been subjected to experimental evaluation with a real need for improvement indicated in terms of objectivity, reliability, and validity.[43] Another investigator finds the oral examination not "so objectionable" as a measuring device when definitely planned, carefully prepared

41 James C. Bay, "Tools of Research Needed in the Preparation of Dissertations for the Doctorate in Education," *School and Society*, XXV (January 8, 1927), 53-4.

42 G. H. Betts, "Language Requirements for Doctors of Philosophy," *School and Society*, XXXI (March 8, 1930), 343-6.

———, and R. A. Kent, *Foreign Language Equipment of 2325 Doctors of Philosophy*. Northwestern University Contributions to Education, No. 2. Bloomington, Ill.: Public School Publishing Co., 1929. Pp. 152.

43 Elinor J. Barnes and S. L. Pressey, "The Reliability and Validity of Oral Examinations," *School and Society*, XXX (November 23, 1929), 719-22.

S. L. Pressey, L. C. Pressey, and Elinor J. Barnes, "The Final Ordeal," *Journal of Higher Education*, III (May, 1932), 261-4.

for (by all concerned), and systematically administered.[44] Pressure of time is forcing more written Masters' examinations.

An analysis of limitations affecting the candidate when he is working on his Doctor's dissertation includes: (1) the short period of time available for graduate study, (2) the cost of carrying on a comprehensive piece of research, (3) the limited professional training of the student at the time he must select the subject for his dissertation, and (4) the lack of mastery of the techniques which the student must use in his research. Suggestions for meeting these difficulties are: (1) earlier selection of the problem, (2) more careful supervision of the selection of the problem by the faculty, (3) greater coördination of research projects, (4) devotion of more time in departments of education to informal but critical courses dealing with the techniques of research at the time candidates are making their selection of problems, and (5) an attempt by institutions to provide subsidies for important and desirable types of research which are too expensive to be undertaken by an individual student.[45]

Symonds criticizes graduate studies, with special applications to Doctors' dissertations, in terms of six common shortcomings:[46] (1) that the emphasis on the gathering of facts has been poorly correlated with the application of these facts to the educational program, (2) that the background of information and understanding of the student is often meager and shallow, (3) that certain fundamental assumptions which are often tacitly understood give the research a particular bias and make it of limited value, (4) that theses sponsored by and often financed by groups or theses addressed to certain groups are often biased, (5) that choice of methods of investigation

[44] O. C. Trimble, "The Oral Examination: Its Validity and Reliability," *School and Society*, XXXIX (April 28, 1934), 550-2.

——, *The Final Oral Examination*: Its Limitations and Its Possible Improvement as a Major Academic Hurdle in the Graduate School. Studies in Higher Education, XXV. Lafayette, Ind.: Purdue University, 1934. Pp. 38.

[45] G. T. Buswell, "Research and the Degree of Doctor of Philosophy in Education," *Journal of Educational Research*, XXIII (February, 1931), 146-52.

[46] P. M. Symonds, "Common Faults in Graduate Research in Education," *Journal of Educational Research*, XXVII (March, 1934), 481-92.

or of the instruments to be used in the investigation is often faulty, and (6) that there are a number of technical faults which are commonly seen in the statistical methods used and in the preparation of the manuscript.

Certain criticisms of educational research, with special application to theses, as conducted in some institutions, are cited as follows: [47]

1. Graduate students work on theses in which they are not interested and do not comprehend in order to satisfy the thesis requirement for the doctorate and their adviser's personal interest in a subject which is a part of his major work.
2. Studies are begun, but not completed, as evidenced by phrases introducing conclusions, such as, "It would seem," "It appears," "As far as we were able to proceed, we may conclude," etc.
3. Investigators are shying away from significant problems on the grounds of their prohibitive comprehensiveness, although teachers must meet and solve these problems.
4. Students lack broad and thorough training in research technique.
5. Studies are too hurried.
6. Students fail to classify their research along the lines of the major divisions of research.

A list of criteria for educational dissertations, based on characteristics common to twenty-five good dissertations includes: [48]

1. Creativeness
2. Wise choice of topic
3. Evidence of ability
4. Fundamental assumptions considered and justified
5. Appropriateness of procedures to the topic
6. Quality and quantity of data
7. Sound analysis of data
8. Interpretation of data
9. Presentation

Another suggested list of standards for the dissertation in education includes these essential characteristics: [49]

47 T. W. H. Irion, "Criticism of Present-day Educational Research," *North Central Association Quarterly*, I (December, 1926), 390-3.

48 P. M. Symonds, "Characteristics of a Good Dissertation in Education," *Teachers College Record*, XXXIV (January, 1933), 312-26.

49 L. B. Rogers, "Desirable Standards for the Doctor's Dissertation: Should the Dissertation be Based on Other Forms of Productive Work in Addition to Research?" *Educational Administration and Supervision*, XVI (December, 1930), 683-92.

1. Based on a discernment of and responsiveness to social needs
2. Presents a clear, concise formulation of a problem or working hypothesis
3. Reveals a definite placement of the problem
4. Makes evident the relevancy and adequacy of the materials and techniques used
5. Observes continuity and unity in organization of materials
6. Uses the most effective means available for a clear, forceful presentation
7. Gives a complete and consistent interpretation of the data
8. Indicates the bearing of the results on accepted principles and practices, and the need for further research

Stated in another way, three fundamental criteria for the Doctor's dissertation in education have been suggested, which represent fairly well the departmental policy of one of the major graduate institutions:[50]

First, the basic requirement of any research is a body of objective data. Speculation, a priori theorizing, or hypothetical statements are never substitutes for facts. Unless a problem is susceptible to factual treatment, it is not a suitable topic for research. There are such topics. Certainly, the possibility of scientific research on such a question as, "Does education through discipline produce greater individual satisfaction than education through freedom?" is doubtful. One may speculate and philosophize about this question, but it is difficult or impossible to find facts from which one may answer the question. It may be possible to do more than philosophize about the problem if one is willing to cease the exclusive use of opinions regarding satisfaction and to gather some objective facts from the observation of behavior of persons variously educated. This is not to be interpreted as a denial of the value of philosophical thinking, but rather as a vigorous objection to the substitution of such thinking for objective data. Furthermore, the process of dealing with a problem without first securing a body of facts is a different process from that connoted by the term *research.*

Second, objective facts are necessary, but a simple tabulation of facts does not constitute acceptable research at the doctoral level. Until some degree of generalization is reached, the project is unfinished. One might collect facts regarding any school practice and organize them into frequency tables, but until some general relationships among these facts are discovered the project is still incomplete. The nature of the generalizations may vary from field to field, but

[50] G. T. Buswell, "The Doctor's Dissertation," *Journal of Higher Education,* III (March, 1932), 139-46.

regardless of whether the problem be in the history of education, in administration, in methods, or in psychology, until some degree of generalization is reached, the investigation has not passed beyond the bounds of clerical industry. Needless to say, much of this industrious routine work may be useful, but it is not research. The essential characteristics of the research worker are the intellectual insight necessary to see relationships which are not obvious to the lay observer and the ability to generalize concerning these relationships.

Third, a routine application of scientific principles to a practical problem is not research. For example, in one of the letters the location of school plants as a thesis problem was suggested. This might or might not involve research. If the commonly known rules relating to population centers, dangerous highways or railroads, and the like, only were applied to the selection of school sites, no discovery of new truths and no advancement of general scientific knowledge would result. This problem might be attacked, however, in a way which involved a high type of research. Through an analytical study of all the factors affecting the location of school buildings some new factors that generally affect the location of school plants might be discovered; a new technique by which to obtain or to interpret the facts gathered might be developed. The objection to many so-called "practical problems" is that they are merely applications of well-known procedures—the truth that is "discovered" is too often new only to the man who discovers it.

A canvass of the practices of twenty-nine institutions which gave more than one Doctor's degree during the decade from 1918 to 1927 resulted in the following recommendations:[51]

1. A minimum of twelve to fifteen semester hours of undergraduate work in education for admission to graduate study
2. A written preliminary examination to be given toward the end of the second year of graduate study
3. A final examination, at least partially written, and general in scope rather than confined to the thesis or to the thesis and related matters
4. Conservative restriction of the amount of work carried by assistants, instructors, and other students who have either part-time or full-time employment
5. The requirement of one or two carefully planned sequences of courses
6. The requirement of a few basic courses, such as educational

[51] W. S. Monroe, "A Survey of the Requirements for the Doctor of Philosophy in Education," *School and Society*, XXXI (May 17, 1930), 655-61.

philosophy or theory, educational statistics, thesis-writing, and educational research

7. Supervision of thesis work by a committee, probably a committee of three, rather than by a single member of the staff (This supervision should begin with the selection of the thesis problem.)

Studies of supply and demand in the graduate field indicate that too great specialization is undesirable on the part of the Doctor's candidate, since he may have to carry on his future work in some area other than university teaching and research.[52] Business, politics, social service, and secondary schools have been suggested as future fields of activity for the Doctor of Philosophy in this country and in Europe.[53] It has been recommended that psychologists be trained to provide professional psychological service in the fields of business personnel, student personnel, industrial psychology, vocational guidance, and child welfare.[54]

Other surveys of requirements for the Doctor's degree in education [55] and in psychology [56] are available. Of course, the wise prospective graduate student will examine in the catalogues the specific requirements for degrees of the institutions in which he is interested. Some evidence concerning the rating or standing of graduate departments of education is available, although the method used (opinions of a committee of fifty-four "scholars" in the field represented) has met some criticism.[57] Sixty-one institutions conferred 1300 doctorates in

52 W. S. Monroe, "Doctor's Degrees in Education, 1928-1933," *School and Society*, XXXVII (March 3, 1933), 289-90.

53 C. A. Ruckmick, "The Future of the Doctoral Degree," *School and Society*, XXXVII (February 18, 1933), 201-6.

G. E. Carrothers, "The Secondary School as a Career for the Doctor of Philosophy," *North Central Association Quarterly*, IX (April, 1935), 424-32.

54 E. D. Sisson, "Twenty Years After," *School and Society*, XL (December 8, 1934), 781-4.

55 F. N. Freeman and Others, *Practices of American Universities in Granting Higher Degrees in Education*. Yearbook No. XIX of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1931. Pp. viii + 158.

T. L. Reller, "A Survey of the Requirements for the Degree of Doctor of Education," *School and Society*, XXXIX (April 21, 1934), 516-20.

56 W. S. Hunter and Others, "Standards for the Ph.D. Degrees in Psychology," *Psychological Bulletin*, XXXI (January, 1934), 67-72.

57 R. M. Hughes, "Report of the Committee on Graduate Instruction," *Educational Record*, XV (April, 1934), 192-234.

W. C. Eells, "American Graduate Schools," *School and Society*, XXXIX (June 2, 1934), 708-12.

education between 1928 and 1932; of this number thirty schools were rated as adequately prepared to do so, and only ten were considered "distinguished." The number of Doctors' degrees conferred in education during 1933 was 370; in 1934 the number was 469.

It should not be assumed that the research worker's training is finished on completion of the doctorate program. An increasing amount of post-doctorate training is being encouraged by higher institutions, research organizations, and fellowships.[58]

Problems involved in graduate training programs are discussed in numerous other references in the chapter bibliography, a part of which appear under the names of: Alexander, Almack, Ashbaugh, Barr, Bay, Betts, Briggs, Brown, Buchanan, Buckner, Buswell, Cooke, Crawford, Dale, Eaton, Edwards, Fenton, Fernberger, Ford, Freeman, Good, Greene, Harris, Heller, Higbie, Hill, Hills, Hunt, Jones, Judd, Kunkel, Lowell, McCall and Ruger, Mathews, Mead, Nelson, Newcomb and Watson, Palfrey, Pechstein, Pressey, Robertson, Rogers, Ruediger, Russell, Seashore, Smith, Symonds, Tufts, Walker, Watson, Williams, and Wykoff.

Coördination and coöperation in research. The condition deplored in 1927 by an editorial writer, who urged that some central coördinating agency make known the various investigations completed and under way, in order to avoid competitive research and duplication of effort, has been partly corrected by the guides enumerated in Chapter III; however, the problem is not yet completely solved.[59] The movement toward integration of the efforts of educational investigators is significant for all who participate in, direct, or apply the results of research. Illustrations of the results of coördinated investigational effort are found in Chapter III in the form of nation-wide surveys of various fields, the year-books and publications of great foundations and professional groups, comprehensive summa-

58 F. R. Lillie, K. T. Compton, and R. L. Wilbur, "Post-Doctoral Training for Productive Scholarship," *School and Society*, XLII (November 23, 1935), 689-98.

59 "Competitive Research," *Journal of Educational Research*, XV (January, 1927), 52-3.

ries of research, and the work of research bureaus and organizations.

Three requirements for coöperative investigation have been named: (1) a well-selected committee to define major issues in the field of investigation, to suggest methods of investigation, and to review findings previous to publication; (2) a personnel to conduct the investigation sponsored by the committee; and (3) some provision for travel expense.[60]

Provided with these essentials, group research bears fruit. It avoids some of the weaknesses which frequently characterize individual effort. The topics of investigation are likely to be well chosen, and bias in the interpretation of results is reduced. The best methods of investigation are likely to be employed. Most important of all, a group of people with prestige are familiar with the findings of the study which, therefore, is far more likely to get over into practice. It is at this point that many individual investigations fail. Every time one prepares a comprehensive bibliography he is struck by the number of significant researches already in existence which have received little or no attention as far as modified school practice is concerned.

Four types of coöperating groups have been proposed:[61] (1) intra-institutional groups in which tasks are assigned by administrative officials with little or no consideration for the wishes of individuals; (2) intra-institutional groups in which tasks are chosen by the group concerned in accordance with the principle of the majority rule; (3) inter-institutional groups in which the tasks are assigned by administrative officials, committees, etc.; and (4) inter-institutional research conducted by self-initiated groups of individuals of like interests.

Doubtless each of these methods of securing group activity has its own peculiar values, depending upon the nature of the problem, and the competency and the attitude of the individuals concerned, but the writers should like to emphasize the merits of the last. The real advantages of this type of coöpera-

[60] J. K. Norton, "Coöperative and Individual Research," *Journal of Educational Research*, XVII (March, 1928), 216-8.

[61] A. S. Barr, "Coöperative Research," *Journal of Educational Research*, XXVIII (January, 1935), 362-4.

tion are: (1) It arises out of each individual's own felt needs, difficulties, and interests; the advantage of having individuals work at research that they think important is tremendous. (2) It is for the most part independent of financial considerations. Far too many persons appear to have the idea that research depends upon money. Although money is always a convenience, the essential element in any piece of research is the thinking, and when money is employed to remove an otherwise intelligent and competent research worker from immediate contact with his data, the stimulation and the constant checking and rechecking afforded by these data are removed. In the main, the extensive use of the so-called statistical clerk is based upon a misconception of the nature of research. And (3) this type of coöperation is independent of committee appointments and political preferences. Out of the confusion between political and intellectual leadership many persons otherwise competent to do research are heard to attribute their inactivity to failure to secure official preferment. Again, the authors would like to say that, aside from the personal gratification which always arises from these official preferences, they in no way enhance the individual's ability to do research. The type of coöperation urged is free and unlimited except by the capacity, initiative, and leadership of those who undertake it.

Specific suggestions concerning how graduate theses may involve a unified pattern or be parts of a larger, planned program of research end as follows: [62]

> Here, then, is the line of development which the administration of educational research in America will probably find it wise to follow. It will diligently avoid any semblance of imposition of a topic from above as well as the tendency to follow too literally the personal preferences of the individual student by merely regulating his fancies when they become too unrealistic. In place of these obsolescent devices, it will move to substitute a system of group or coöperative planning of an extended research program wherein the work of each member falls into its prescribed niche. Continuity rather than discrete-

62 G. W. Hartmann, "Laissez Faire Versus Planning in Educational Research," *School and Society*, XXXIX (May 12, 1934), 600-3.

ness will be its watchword. So far our educational activities have been hit-or-miss shotgun forays into the territory of the unknown; henceforth, we must have mass invasions moving toward the deliberately arranged conquest of key positions.

Another worker criticizes the poor contacts which thesis advisers experience with the schools studied in educational research and the resultant ill effects on the theses and educational progress. He submits a plan of research organization which unites the skill of the technical investigator and the need for more definite knowledge felt by teachers. A new officer, the Coördinator of Research, is to be placed in the school system, with these duties: [63]

1. To make himself known in the area
2. To familiarize himself with research needs in the area
3. To assay the caliber of graduate students doing research in the institution with which he is connected
4. To bring into contact the research opportunities and the properly qualified students

The preceding discussion has stressed the merits of cooperative or coördinated investigation. It is not to be assumed from such statements that there is no longer any place for the individual or pioneer type of research, but rather, that a proper balance between individual initiative and large-scale planning should be established in research. Two extremes—at least, widely divergent schemes—in educational investigation are represented in the largely individualistic research of America and in the current coöperative plan of Australia. In Australia, where educational research is rather new, a planned program has been proposed which will coördinate the work of the various individuals and direct it toward goals set up by the educational authorities and leading workers. However, the coördinating agency, the Australian Council for Educational Research, does not seek to centralize completely or control research, but rather to articulate the efforts of individual investigators and of committees covering problems on a state-

[63] W. N. Durost, "The Missing Link in Educational Research," *Progressive Education*, XII (January, 1935), 35-8.

wide basis. The work of the Council, such as testing, is carried out in the schools on a coöperative rather than a compulsory basis.[64]

Both the American and Australian plans have their advantages as well as disadvantages. One need but survey the wide variety of research that has been undertaken in this country to appreciate that the independent worker has made large contributions to the body of available scientific information dealing with educational problems. In many fields there have been highly important findings that have been incorporated into our educational practices. The independent worker has felt free to explore leads of interest to himself. It must be admitted that some of these studies have not appeared to be immediately pertinent; however, one must admit that this may be because of our inability to see the possible relationships rather than the lack of value of the findings.

A combination of the American and Australian plans seems highly desirable. On the one hand, one would want to do nothing to crush the fine spirit of independent individual research which has resulted in the development of an ever-growing body of educational truth. On the other hand, there is every reason to believe that a planned program of coöperative research dealing with crucial issues in present-day education would be most helpful. This end might well be accomplished through the coördinated action of the various scientific bodies, both state and national, dealing with aspects of educational problems The accomplishment of such an end demands real educational statesmanship. Unless this is done, the alternative may be the establishment of some central authority which might arbitrarily take upon itself the setting up of standards and criteria for evaluation.

When the educational history of the first half of the twentieth century is written, the third decade of this period will be credited with the initiation of a program of coördination or coöperation in educational research. This type of coördinated investigation and publication should break down excessive isolation in research, prevent wasteful and unnecessary duplication of effort, and distribute the results of major scientific studies to field workers. It seems entirely reasonable to expect within the next decade in each of the subject-matter fields a survey similar to the Modern Foreign Language Study

64 L. J. Brueckner, "Planned Programs of Research," *Journal of Educational Research*, XXVI (January, 1933), 364-6.

and a summary of the available factual studies similar in comprehensiveness to that of Gray in reading.[65] Whatever the future may hold, however, in the development of coördinated, large-scale research, there is encouragement for the present in the progress reported. The obligation of the field worker is to keep informed of important studies in progress, to coöperate wherever possible, and to use the findings reported in the improvement of teaching, curricular, or administrative procedures.[66]

Bureaus and departments of research. Bureaus and departments of research in city school systems, state departments of education, state educational associations, and higher institutions constitute important agencies in the supervision of research, and in the coördination of the investigational effort of both field worker and graduate student. An excellent summary statement of the organization, functions, and investigational work of research bureaus follows:[67]

Growth in number of bureaus. It has been shown that the movement for organized research in education is comparatively recent, for it was not until the survey and testing movement was under way that city school systems and State universities began the organization of bureaus of research. From the establishment of the first bureaus about 1912 the number has grown rapidly until there are at present about 150 bureaus in city school systems and about ninety-five others divided among State departments of education, State educational associations, State universities and colleges, teachers colleges, and secondary schools. About half of the bureaus have been established since 1925 and about a fourth since 1928.

The director of research. Exactly half of the full-time directors of research have ranks equivalent to that of assistant superintendents of schools. Part-time directors devote the remainder of their time to a diversity of other duties. The directors are usually responsible to the superintendent of schools and since many of them are in the line of

65 W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementary Educational Monographs, No. 28. Chicago: Department of Education, University of Chicago, 1925. Pp. viii + 276. Annual supplements since 1925.

66 Carter V. Good, "Coördination of Educational Research," *Journal of Educational Research*, XXV (January, 1932), 44-5.

67 W. H. Zeigel, *Research in Secondary Schools*, Office of Education Bulletin, No. 17, 1932, Monograph No. 15, National Survey of Secondary Education. Washington: Office of Education, 1933. Pp. vi + 72.

———, "Research in Secondary Schools," *School Review*, XLI (January, 1933), 27-39.

authority they are given the right both by authorization and implication to investigate problems in any field of education. The directors have had on the average less educational experience than superintendents or principals, but about the same as other administrative staff members. However, some directors of research have not worked in types of school positions that would give them a basis of practical school experience. Almost three fourths have never taught in city elementary schools; about three fifths have not been principals of elementary schools; and the same proportion have not been principals of secondary schools. On the other hand, directors of research, in terms of academic degrees held, are considerably better trained than other school officers. More than half of them hold Masters' degrees, and more than a fourth hold Doctors' degrees. In addition, most of them have earned their advanced degrees in the field of education. At the time of inquiry the median salary paid full-time directors was about $4,000.

The staff of research bureaus. The staff of the median research bureau consists of the director and three assistants; the helpers are about equally divided between professional and clerical grade. About half of those professional assistants in the bureaus, who devote only part time to research, are elementary-school teachers. Part-time clerical assistants are frequently high-school pupils.

The budget of research bureaus. The median salary and operating budgets of research bureaus were about $9,700 and $2,000 respectively. In view of the fact that the median bureau conducts twenty-one studies a year, it is difficult to see how comprehensive investigations can be made with the personnel and the resources available for research work. The financial resources must explain in part the limited types of researches reported. Classification and analysis of researches reveal that many of the studies involve merely the compilation and presentation of facts, and that the staffs of many bureaus are absorbed in duties and functions which are more of an administrative and supervisory type than of a truly research character. [Such work is useful, but is not the major function of a research bureau.]

Administrative and supervisory functions performed. As already indicated, large proportions of the directors of research perform duties and functions which are not of a research nature. No attempt is made in this report to show that these administrative functions are not important. However, analysis supports the belief that these functions are not always in the nature of true research nor inevitably functions which should be delegated to research bureaus. The compilation of data, the administration of achievement and intelligence tests, and the classification of school children are important functions, but the administration of these activities is not research in the strict sense. At least school authorities should not confuse these activities with research and

assume that, having provided bureaus so engaged, substantial research contributions are being made.

Studies which bureaus may make. Bureaus of research are authorized to make studies of pupil failures, promotions, and testing more frequently than of certain other problems such as employment service, clerical service, teaching methods, and supervision. The data did not permit an analysis of the reasons why some types of studies are authorized more frequently than are others, but size of the system seems to influence the scope of activities.

In general, bureaus of research have actually made studies most frequently in the fields in which the greatest proportions of systems have been authorized to conduct investigations. Large numbers of studies have been made in the fields of testing, promotion, retardation, and elimination, and relatively few studies have been made in such fields as teaching methods, supervision, and library service.

Studies made during 1929-30. Directors of research of fifty-three city bureaus reported a total of 1,116 studies in progress during the year 1929-30. The median bureau had in progress about twenty-one researches. As previously pointed out, the type of assistance furnished the director and the amounts which may be spent for the operating expenses of the bureau raise a presumption of doubt concerning the quality of many of these researches. Half of the studies in progress during the year were reported as relating primarily to the field of secondary education. Slightly more than half of the studies in progress during 1929-30 were later mimeographed, but relatively few have been either printed or published in educational periodicals. Only a few of the studies conducted in city bureaus have been submitted as theses for advanced degrees and about 10 per cent were reported by the directors of research as affecting, in any marked way, school organization and practice. The data do not permit an analysis of the extent and manner in which these studies have actually affected educational practices. This problem should be a fruitful field for further investigation.

Coördination of research activities. Research activities of city bureaus are coördinated with those of other agencies inside or outside the system in only three fifths of the cases. The research bureau provides such coördination as is attempted within city school systems by outlining the projects, by advising the staff members, and by exchanging the results of investigations with other bureaus or research agencies. A number of directors indicate that the bureaus attempt to develop a program of research activities and to guide and direct research work of teachers within the system.

State departments of education and State education associations have an opportunity of developing state-wide programs of educational research. Only a few States have attempted much along these lines

Research by persons not connected with research bureaus. Research has come to be considered by educational leaders as a function of teachers and principals, but to date few boards of education have made provisions enabling teachers to carry on research activities on school time. The number of researches carried on by staff members not connected with research bureaus is small and relatively few are ultimately mimeographed or printed. The real incentive for more than a third of the studies made by individuals unconnected with bureaus is the earning of advanced degrees. Research within individual secondary schools is even more limited in extent. Large proportions of the high-school principals, both of the schools reported as outstanding in research and of those selected at random, stated that no research was being conducted in the schools. As a result, if the contention is that teachers and principals should carry on research, practice lags far behind theory. At present little research is being carried on in secondary schools except by city bureaus of research, and in general even the investigations of these bureaus do not interpret the data and recommend improvements in school practice.

Classification and analysis of researches made. In general, the reports of investigations submitted to the Survey indicate that bureaus of research in city school systems devote the major portion of their time and energies to the compilation of facts and statistics. However, this conclusion is not unexpected in view of the many administrative and supervisory functions delegated to these bureaus. They do not have the time or the resources to permit many investigations of a true research nature. It is admitted that facts and statistics concerning the school systems should be available to the superintendent and board at all times, but it is highly unfortunate that more bureaus do not conduct investigations of educational problems holding more promise of modifying and improving school administration, class-room techniques, teaching methods, and other educational practices. If bureaus of research in city systems are to lead the way to a sounder educational program, they will find it necessary to place emphasis on fundamental problems of educational practice rather than on the mere compilation and publication of facts and statistics.

Conclusion. The first impression from the evidence of this report is one of discouragement. The upshot of the facts presented is that the total extent and the quality of the research carried on within schools and systems is not highly commendable. The second thought on the situation disclosed is, however, more encouraging The research movement in education, after all, is relatively new and each bureau and each school have had to work out their own problems and doubtless must at first justify their existence by rendering obvious services to administration. Performance of these functions which frequently resort to the procedures of research should gradually lead to committal to

substantial programs of research in these bureaus, and these, in turn, should stimulate larger proportions of individual members of school staffs not officially connected with the bureaus to carry on significant studies. Much assurance may be taken from the fact that at least a small number of bureaus in city systems of the country are prosecuting estimable investigative programs. The existence of a large number of bureaus of research which have made beginnings and of at least a small number of bureaus with strong investigative programs is a prophecy of generous spread of research activity outside higher institutions that will help to elevate education to unquestioned professional status.

Four ways of promoting research among field workers have been stressed by research bureaus in state departments of education, especially New York State: [68]

1. Preparation of bibliographies of studies which pertain particularly to state educational conditions
2. Gathering of occasional statements from educators concerning needed research in the state
3. Assistance, through bibliographies and actual conducting of studies, to committees at work on such problems as tenure, salaries, curriculum, health education, radio education, correspondence courses, etc.
4. Aid to individuals such as graduate students and field workers, by criticizing and planning studies

From the point of view of the higher institution and its bureau of research, with respect to the administration of investigational projects, three types of field research have been distinguished.[69]

1. Individual research
   (*a*) The graduate thesis
   (*b*) The minor problem, worked out with the guidance of an adviser on the campus staff
2. A coördinated program of minor studies through guidance of the investigators, who select problems with some relation to a larger pattern or whole
3. Major programs of research formulated by the institution which permits students to work on individual sections, for example, school

[68] Warren W. Coxe, "Functions of Research Bureaus in State Departments of Education in Promoting Research Among Field Workers," *Journal of Educational Research*, XXIX (October, 1935), 110-4.

[69] W. W. Charters, "Institutional Promotion of Field Research," *Journal of Educational Research*, XXIX (October, 1935), 114-7.

building construction costs and rates of obsolescence, and curriculum building

Numerous other discussions of research bureaus and of foundations, scientific societies, and professional organizations which play a part in the direction and coördination of research are represented in Chapter III and in the bibliography of the present chapter under the names of Bain, Chapman, Charters, Coxe, Cubberley, Gee, Herbst, Hunter, Ogg, Rankin, Sears, Spahr and Swenson, Withers, and Wright.

Concluding statement. The need for productive scholarship and research ability as one of the highest types of educational leadership has been indicated, although recognizing the existence of other important types of leadership in the areas of teaching, administration, interpretation, and innovation. It has been urged that to be most effective, the teacher, administrator, or supervisor requires training in problem solving and investigational procedures, finding nothing incompatible in this proposal that both field service and research activity are important functions of the best prepared types of educational workers. The possible contribution of the graduate school to the training of such workers has been outlined. The movement toward coördinated and coöperative research has been reviewed, together with the part played by research bureaus and organizations in the direction and supervision of educational investigation.

Problems and Exercises

1. Select two recognized graduate departments of education and compare their requirements for the Master's degree in terms of the principles stated in this chapter. It may be necessary to secure catalogues from the schools selected, if such information is not in the library.

2. Choose a bureau or department of educational research (university, state, city, or otherwise), and prepare a statement of its organization and activities current at the time this assignment is undertaken. The annual reports (where issued) of such research agencies and the Department of Research News of the *Journal of Educational Research* may be consulted as starting points.

Selected References

Agunod, Nemesio L. *The Bureau of Research and Reference in American School Systems: Its Possible Adaptation and Application to Philippine Educational Conditions.* New York: Teachers College, Columbia University, 1931. Pp. 80.

Alexander, Carter. "A Professional Library for a City Superintendent of Schools," *Teachers College Record,* XXXII (May, 1931), 724-9.

——"Directing Administrative Research," *Journal of Educational Research,* XXI (May, 1930), 331-6. Discusses preparation for research, choosing a problem, outlining the problem, causes of trouble and waste, research training in surveys.

——"The Library Professor and Educational Research," *School and Society,* XXXIX (April 14, 1934), 457-64. Describes the program in this field at Teachers College, Columbia University.

*——"The Place of Instruction in Library Methods in Educational Research," *Journal of Educational Research,* XXIX (October, 1935), 104-10.

*Almack, J. C. "Research and Courses in Education," *School and Society,* XXXIII (June 27, 1931), 841-6.

Angell, J. R. "The Yale Institute of Human Relations," *Educational Record,* XI (January, 1930), 3-11. The object of the Institute is to provide a research and teaching center for those university divisions directly concerned with the problems of man's individual and group conduct; to promote understanding of human life from the biological, psychological, and sociological viewpoints.

Ashbaugh, E. J. "Statistics for Educational Workers," *Journal of Educational Research,* XXI (May, 1930), 374-6. Suggests that teachers and supervisors need "applied" statistics, administrators "interpretative" statistics, and research specialists "creative" statistics; emphasizes that teacher-training courses should be organized with such needs in mind.

Ayres, L. P. "Business and Educational Research," *Elementary School Journal,* XXIX (May, 1929), 657-65. Discusses research in the physical sciences, medicine, business, and education.

Bain, L. C. "The Function of the Department of Statistics and Research in the Public Relations Program," *Educational Research Bulletin,* VII (October 31, 1928), 317-24; VII (November 14, 1928), 350-5. Draws on the Cleveland system for numerous illustrations of the work of a bureau of research.

Baker, H. T. "English and the Ph.D.," *English Journal, College Edition,* XVII (December, 1928), 820-4. Questions the value of the Doctor's degree in the teaching of English.

Baldwin, T. W. "Normal Amount of Teaching and Research: Second Report of Committee T," *Bulletin of the American Association of University Professors,* XVII (March, 1931), 213-9.

Barr, A. S. "A Background for Research," *Journal of Educational Research,* XXI (February, 1930), 138-40. Lists certain scientists who have contributed to the techniques of experimental research and lists

both foreign and American sources of information on research.

——— "Research," *Journal of Educational Research,* XIX (January, 1929), 56-7. Lists practices of careful research workers.

——— "Research in Education," *Journal of Educational Research,* XIX (May, 1929), 353-4. Discusses two notions concerning the purpose of educational research: (1) to evaluate educational materials and processes and (2) to discover relations between pupils and materials and processes of learning and teaching.

* ——— "The Training of Research Workers," *Journal of Educational Research,* XXIX (October, 1935), 90-3.

BAY, J. C. "The Training of a Research Worker in Education," *School and Society,* XXV (March 5, 1927), 274-8. Recommends as part of the training of a research worker in education a year of philosophy, a year of mathematical analysis at the college level, and a year of statistics with emphasis on statistical analysis.

BETTS, G. H. "General Information Possessed by Graduate Students in Education," *School and Society,* XXXVII (June 24, 1933), 821-4.

——— "Subsidizing Graduate Study," *Journal of Higher Education,* III (November, 1932), 415-8.

BLAKESLEE, A. F. "Honorary Degrees and a Suggested Opportunity," *Science,* LXIX (May 31, 1929), 574-6. Criticizes certain practices in the granting of honorary degrees and suggests that such degrees might well be given more frequently to men of scientific standing who do not have the Doctor's degree in course.

BOWDEN, A. O. "Quo Vadis, Ph.D.?" *Journal of Education,* CIX (June 17, 1929), 671-4. Discusses purposes, requirements, and practices in granting Doctors' degrees.

BOWMAN, Isaiah. "A Design for Scholarship," *School and Society,* XLIII (March 21, 1936), 377-86.

BRANDENBURG, G. C., and TRIMBLE, O. C., "What the Public School Administrator Thinks of Professional Training in Education," *School and Society,* XL (December 22, 1934), 850-6.

BRIGGS, T. H. "Some Characteristics of Secondary-School Principals," *School Review,* XLII (March, 1934), 205-9. Covers the professional and cultural activities engaged in by 337 principals and prospective principals during the school year.

BROOM, M. E. "Statistics and the Classroom Teacher," *High School Teacher,* VIII (January, 1932), 13-5.

* BROWN, Ralph. *Mathematical Difficulties of Students of Educational Statistics.* Teachers College Contributions to Education, No. 569. New York: Teachers College, Columbia University, 1933. Pp. 64.

BUCHANAN, R. E. "Graduate Work in Land-Grant Institutions," *Journal of Higher Education,* II (November, 1931), 433-40.

BUCKNER, C. A. "Some Distinctions between Graduate and Undergraduate Work in Education," *University of Pittsburgh School of Education Journal,* II (March-April, 1927), 75-9. Based on the judgments of students, judgments of teachers, and catalogues.

BURGUM, E. B. "The Modern Dry-as-Dust," *English Journal, College Edition,* XVIII (June, 1929), 465-75. Discusses scholarship, research, and human interest in the field of English.

BURKE, A. J. "Professional Courses for Secondary-School Principals," *Educational Administration and Supervision,* XX (October, 1934), 506-12.

BUSWELL, G. T. "The Preparation of Theses in Education," *Elementary School Journal,* XXXI (September, 1930), 67-9. A critical review of Reeder's *How to Write a Thesis* and Almack's *Research and Thesis Writing.*

——"Review of Bixler's *Check Lists for Educational Research,*" *Elementary School Journal,* XXIX (June, 1929), 787-9. A critical discussion of research and the training of the research worker, together with a warning against "recipes" for conducting research.

CARLSON, A. F. "Research as a Method of Education," *Science,* LXV (February 4, 1927), 125-8.

CARPENTER, W. W., and ROSENSTENGEL, W. E. "Participation of State Universities in School Plant Surveys," *School Executives Magazine,* LII (November, 1932), 122-3.

CARR, W. G. "Staffs and Salaries in City School Research Divisions," *Journal of Educational Research,* XXIX (January, 1936), 369-71.

CARROLL, P. P. "Comments on Graduate Work," *School and Society,* XXXII (September 13, 1930), 362-3. A defense of the value of graduate degrees, especially in education.

CHAMBERLAIN, J. S. "Teaching and Research," *Journal of Chemical Education,* VI (April, 1929), 710-4. Urges that neither is complete without the other.

CHAMBERS, M. M. "The State Regulation of Degree Granting," *Journal of Higher Education,* VII (March, 1936), 152-8. Based on the decisions of the higher courts.

CHAPMAN, H. B. "Bureaus of Research and Statistics in State Departments of Education," *Educational Research Bulletin,* VII (October 3, 1928), 276-80. Lists certain studies, services, titles, and other information of fifteen state bureaus of research.

*——*Organized Research in Education.* Bureau of Educational Research Monographs, No. 7. Columbus, Ohio: Ohio State University Press, 1927. Pp. x + 222.

CHARTERS, W. W. "Institutional Research," *Journal of Higher Education,* VI (May, 1935), 281-2. Urges investigation of the processes, techniques, and programs of the college as of equal importance with research in academic fields.

——"The Value of a Research Organization," *Educational Research Bulletin,* XI (October 26, 1932), 351-2.

CHASE, E. P. "Research or Administration," *Journal of Higher Education,* I (April, 1930), 216-9. Shows that research as a field of work has to offer greater satisfactions and rewards than teaching or administration.

CONFREY, Burton. "Preparing for Research in the Junior College," *Junior College Journal,* IV (January, 1934), 185-7.

COOKE, D. H. "Current Conceptions of Research Applied to Public School Systems," *American School Board Journal,* LXXXIII (July, 1931), 40.

——"Two Experiments in Learning Educational Statistics," *Journal of Educational Research,* XXVI (May, 1933), 674-8.

COOPER, W. J. "Professional Leadership in Education," *School and Society*, XXXVII (March 11, 1933), 305-12.

——— "The Scientific Work of the Government of the United States," *Scientific Monthly*, XXXVI (February, 1933), 121-30.

COURTIS, S. A. "The Contributions of Research to the Harmonization of Opinion," *School and Society*, XXIII (June 5, 1926), 707-10.

* COXE, W. W. "The Coördination of Research by State Departments of Education," *School and Society*, XXXVII (June 10, 1933), 729-35.

——— "The Function of a Research Bureau in a State Department of Education," *Journal of Educational Research*, XXI (January, 1930), 7-14.

CRAWFORD, A. B. "Too Much Knowledge," *Educational Record*, XII (April, 1931), 144-59. Emphasizes importance of good teaching for undergraduates rather than to allow research interests to dominate.

* CRAWFORD, C. C. "Thesis Writing and Training in Research at the University of Southern California," *School and Society*, XXVIII (October 6, 1928), 426-8. Outlines a plan for guidance of candidates for the Master's degree in education; involves a number of seminars with an enrolment of not more than twenty, taught by different instructors.

——— "Training Research Workers," *Journal of Educational Research*, XIII (May, 1926), 366-70.

CROSS, W. L. "The Improvement of College Teaching," *Association of American Colleges Bulletin*, XVI (March, 1930), 84-94. Discusses the training of college teachers, that is, graduate requirements.

CUBBERLEY, E. P. *Public School Administration*, Chapter XXIV. Boston: Houghton Mifflin Co., 1929 (revised and enlarged). A chapter on educational research and efficiency, historical development of the reseach movement, and special research bureaus or departments.

CULP, V. H. "The Ph.D. Fetish," *Journal of Education*, CVIII (September 10, 1928), 182-4. An arraignment of certain practices in graduate work.

DALE, Edgar. "The Training of Ph.D's," *Journal of Higher Education*, I (April, 1930), 198-202. Shows that most Doctors of Philosophy enter college teaching, and urges adequate preparation for this work.

DAVIDSON, H. F. "The Puzzled Professor," *School and Society*, XV (May, 1922), 559-61. Compares the teacher with the physician in suggesting that the college instructor need not do research.

DEWEY, John. "Political Interference in Higher Education and Research," *School and Society*, XXXV (February 20, 1932), 243-6.

DOLCH, E. W. "Graduate Work of Superintendents," *Elementary School Journal*, XXXIV (November, 1933), 203-8. Based on data collected for 1932-1933 in Illinois.

* EATON, T. H. "Research and the Training of the Researcher," *Science*, LXVII (June 22, 1928), 619-20. Describes policies in guiding the research of candidates for the Doctor's degree: (1) where the candidate participates in the staff research of the university, (2) where the research of students is sharply differentiated from the research of the staff, (3) and an intermediate policy where the candidate keeps in touch with the work of a competent staff member and later when judged competent participates in staff research.

EAVEY, C. B. "A Study of the Relation of the Doctor's Degree in the Field of Education to Preparation for the Teaching of Undergraduate Education," Unpublished Doctor's thesis, New York University, 1931.

EDMISTON, R. W. "Research Activities of the High School Principal," *Peabody Journal of Education*, IX (May, 1932), 339-44.

EDMONSON, J. B. "A University's Program of Research in Elementary Education," *Elementary School Journal*, XXXIII (October, 1932), 106-11.

EDWARDS, Newton. "Educational Leadership," *Phi Delta Kappan*, XII (April, 1930), 187-8. States that a leader should have a sense of value, know his facts, possess courage, have force of personality, and be somewhat of a partizan.

* ——— "The Reorganization of Graduate Study in the United States," *School and Society*, XLII (October 5, 1935), 469-72. Suggests a new doctor of arts degree.

EGINTON, D. P. "The Urgency of Research in the State Department of Education," *Peabody Journal of Education*, XI (January, 1934), 171-4.

EISENHART, L. P. "Graduate Study and Research," *Science*, LXXXIII (February 14, 1936), 147-50.

ELLIS, Elmer. "Graduate Work for High-School Teachers of the Social Studies," *School and Society*, XXXIV (September 5, 1931), 322-3.

ENGELHARDT, Fred. "The Professional Education Program for School Executives," *American School Board Journal*, LXXXIII (November, 1931), 49-51. Covers degrees, ages, positions, community, etc.

EVERSULL, F. L. "The Director of Research in High School Administration," *American School Board Journal*, LXXVII (September, 1928), 41-2. Outlines the program of work and qualifications of a director of research in secondary education in East St. Louis, Illinois.

FARRIS, Ellsworth. "Too Many Ph.D's?" *American Journal of Sociology*, XXXIX (January, 1934), 509-12. Discusses supply and demand for teachers of sociology.

FENTON, Norman. "A Clearing-House for Theses in Education," *School and Society*, XXXI (May 10, 1930), 645-6. Suggests the establishment of a central collecting station or library for indexing and circulating such material.

FERNBERGER, S. W. "Objective Control of One Factor in the Granting of Post Graduate Fellowships and Scholarships," *School and Society*, XXXVII (June 17, 1933), 787-92.

FORD, G. S. "The Function of a Graduate School," *Problems of College Education*, pp. 177-81. Edited by Earl Hudelson. Minneapolis, Minn.: University of Minnesota Press, 1928.

FRAZIER, E. F. "Graduate Education in Negro Colleges and Universities," *Journal of Negro Education*, II (July, 1933), 329-41.

FREEMAN, F. N. "The History of a University (Chicago) Department of Education," *School Review*, XLI (November, 1933), 650-6.

FROST, Norman. "To Err is Human," *Peabody Journal of Education*, VII (January, 1930), 245-6. Urges the elimination of bias in research.

GANOE, J. T. "The Problem of the Ph.D. in the Small College," *School and Society*, XXXI (April 26, 1930), 555-8. Discusses the relationship

between graduate training and effective teaching, and the types of teachers in small colleges.

GATES, W. B. "In Defense of the Ph.D. in English," *English Journal, College Edition,* XVIII (June, 1929), 482-7. Meets a number of criticisms of graduate work and the Ph.D. degree in English.

* GEE, Wilson. *Research Barriers in the South.* New York: The Century Co., 1932. Pp. x + 192.

* ——— *Social Science Research Organization in American Universities and Colleges.* New York: D. Appleton-Century Co., 1934. Pp. x + 276.

GIRDLER, John. "The Iniquitous Questionnaire," *School Executive,* LV (March, 1936), 256, 270. A caustic, yet humorous, discussion of the way in which graduate students have abused this instrument in the preparation of theses.

GOOD, Carter V. "Cautions to the Beginner in Educational Research," *Journal of Educational Research,* XXVI (December, 1932), 302-4.

——— "Graduate Study and Research in Education," *High School Teacher,* V (May, 1929), 148-51, 164.

GOODE, J. P. "The Doctor of Philosophy and His Business," *Science,* LXIX (March 22, 1920), 318-21. Discusses the training of the Ph.D. and the subsequent research activities of the Ph.D.

GOODMAN, N. G. "More about Ph.D.'s," *School and Society,* XXIV (October 2, 1926), 429-30. Advocates a greater interest in the world of human affairs on the part of graduate students and teachers.

GREENE, H. W. "Negro Holders of the Ph.D. Degree," *School and Society,* XXXV (April 16, 1932), 542-4.

——— "The Present Status of Negro Doctorates," *School and Society,* XL (September 22, 1934), 388-9.

HAGGERTY, M. E. "Improvement of College Instruction through Educational Research," *Educational Record,* XII (January, 1931), 43-69.

* HAGGERTY, M. E. "Occupational Destination of Ph.D. Recipients," *Educational Record,* IX (October, 1928), 209-18. Reports data from three public and four private universities concerning the professional work taken up by Doctors of Philosophy on leaving the university.

——— "The Professional Training of College Teachers," *North Central Association Quarterly,* II (June, 1927), 108-23.

HALE, Genevieve. "Desirable Types of Advanced Training for Teachers of English in Secondary Schools," *Educational Administration and Supervision,* XXII (January, 1936), 61-71.

HARRIS, R. G. "The Doctorate and the Depression," *School and Society,* XXXVI (October 15, 1932), 498-500.

HELLER, Otto. "The Assumption of Graduate Work by Undergraduate Institutions," *School and Society,* XXXIX (March 24, 1934), 353-8.

——— "The 'Teaching Degree,'" *School and Society,* XXXV (January 30, 1932), 135-40. Discusses the problems involved in offering graduate degrees for teachers.

HEPBURN, S. B. "Teacher or Researcher—Which? Another Point of View," *Phi Delta Kappan,* XVI (October, 1933), 93-4, 100.

HERBST, R. L. "Bureau of Research in Public School Systems with Reference to Cities of 100,000 Population or Less." Unpublished Doctor's thesis, Harvard University, 1930.

——"The Functions of Bureaus of Research," *Journal of Educational Research,* XXIV (December, 1931), 372-6. Based on returns from some sixty bureaus in cities of 100,000 population or less.

HIATT, L. R. "Provisions Made in Teachers Colleges for Graduate Work," *Educational Administration and Supervision,* XVI (October, 1930), 507-18. A catalogue analysis of public teachers' colleges.

HIGBIE, E. C. "Protect the Ph.D.," *Educational Administration and Supervision,* XIV (November, 1928), 555-8. Urges the desirability of a teaching graduate degree for those who have neither the capacity for, nor the interest in, a research degree.

HILL, C. M. "Progressive Procedures in Graduate Study," *Progressive Education,* XII (May, 1935), 352-7. Describes the Yale plan of graduate study.

HILLS, E. C. "Foreign Language Requirements for the Doctor of Philosophy," *Bulletin of the American Association of University Professors,* XIV (March, 1928), 186-9. States the practices at various institutions.

HOLMES, H. N. "The Place of Research in the College," *Science,* New Series, LXVII (June 1, 1928), 539-43. Lists intellectual immoralities, ways to promote research in colleges, and functions of the research committee.

HOSIC, J. F. "Appropriate Graduate Work for Elementary School Principals," *Teachers College Record,* XXXIII (October, 1931), 45-51.

——"Qualification for Research," *Journal of Educational Method,* VIII (February, 1929), 247-8. Emphasizes the need for mastery of both the subject-matter field and the technique of research involved in an investigation.

——"Science or Art?" *Educational Method,* VIII (May, 1929), 433-4. Emphasizes the danger in neglecting the art of teaching in the current scientific movement in education.

HOWELL, C. E. "The Functions of a Research Department," *American School Board Journal,* LXXXV (November, 1932), 50, 64.

HUNT, R. D. "The Doctor of Philosophy Degree," *School and Society,* XXIII (January 9, 1926), 31-7. Discusses a number of problems of the graduate school, including residence requirements, preliminary examination, dissertation, language examinations, and final oral examination.

HUNTER, F. M. "What Does the Superintendent Expect of the Research Department?" *Journal of Educational Research,* XVII (May, 1928), 324-34. Discusses the functions of a research department, including appraisal, measurement, investigation, experimentation, and administration of highly specialized fields.

HUNTER, W. L. "The Value of the Master's Degree," *Industrial Education Magazine,* XXXVI (September, 1934), 201-2.

JACK, June. "A Rejoinder to 'Instruction in Our Graduate Schools—A Protest,'" *School and Society,* XXXIV (October 17, 1931), 535-6.

JOHNSON, E. H. "The Ministers' Degree," *School and Society,* XXXIII (March 14, 1931), 371-2.

JOHNSON, P. O. "The Benefactions of Philanthropic Foundations and Who Receive Them," *School and Society,* XXXV (February 20, 1932), 264-8.

JONES, A. J. "The Superintendent of Schools and Research," *Educational Administration and Supervision*, XV (February, 1929), 81-92. Discusses research from the following angles: meaning, method, steps, value to superintendent, etc.

JONES, C. L. "University Training for Government Work in Economics and Statistics," *University Training for the National Service*, pp. 273-80. Proceedings of a conference held at the University of Minnesota, July 14-17, 1931. Minneapolis, Minn.: University of Minnesota, 1932.

JORGENSON, A. N. "The Necessity for Research in Education," *American School Board Journal*, LXXIII (August, 1926), 41-2.

JUDD, C. H. "A National Program of Educational Research," *Educational Record*, XI (July, 1930), 164-72. Describes the possibilities for research of the Committee on Educational Problems and Plans of the American Council on Education.

——"Educational Research and the American School Program," *Educational Record*, IV (October, 1923), 165-77.

——"How Can American Educational Forces Coöperate More Effectively?" *School and Society*, XXXIII (March 14, 1931), 351-6. Through strenuous effort, differentiation of functions and sequences, vision, and intelligent endeavor.

——"The Place of Research in a Program of Curriculum Development," *Journal of Educational Research*, XVII (May, 1928), 313-23.

*——"The School of Education," *Higher Education in America*, Chapter VI. Edited by R. A. Kent. Boston: Ginn and Co., 1930.

——"The Systematic Organization of Courses in Education," *School Review*, XLV (October, 1933), 575-84.

KEARNEY, N. C. "Teacher or Researcher—Which?" *Phi Delta Kappan*, XVI (August, 1933), 67, 72.

KEFAUVER, G. N. "A Challenge to Educational Leadership," *Phi Delta Kappan*, XVII (April, 1935), 177-80.

KELLY, R. L., and ANDERSON, R. E., "Great Teachers and Some Methods of Producing Them," *Journal of Educational Research*, XX (June, 1929), 22-30. Based on inquiries sent to 349 representative college and university executive officers.

KEMMERER, W. W. "Does Research Bring Disrespect?" *School Executives Magazine*, LI (February, 1932), 258-9.

KEYS, Noel. "Research, Service, and Leadership in Education," *School and Society*, XXXVIII (October 14, 1933), 490-5.

KIRK, R. E. "Research for the Undergraduate," *Journal of Chemical Education*, IX (February, 1932), 280-5.

KITSON, H. D. "A Further Study of the Turnover of Psychologists," *Journal of Applied Psychology*, XVII (October, 1933), 542-9.

KUNKEL, B. W. "The Representation of the Colleges in Graduate and Professional Schools," *School and Society*, XXV (March 12, 1932), 364-70.

*LAING, G. J. "The Doctor of Philosophy and College Teaching," *Association of American Colleges Bulletin*, XVI (March, 1930), 95-113. Points out the rare combination of qualities which make for most successful college teaching.

LARSON, E. L. "Major Problems Relating to the Master's Degree in Education," *Educational Administration and Supervision,* XVIII (December, 1932), 699-711.

LOOMIS, C. P. "The Group Method in Rural Studies," *Sociology and Social Research,* XX (November-December, 1935), 127-35. Discusses how a group of students may study family and village life coöperatively.

LOUTTIT, C. M., and PATRICK, J. R. "A Study of Students' Knowledge in the Use of the Library," *Journal of Applied Psychology,* XVI (October, 1932), 475-85.

LOOFBOUROW, G. C. "Leadership: A Pragmatic Substitute for Authority," *Phi Delta Kappan,* XIII (February, 1931), 130-3.

LOWELL, A. L. "The College and the Graduate School," *Educational Record,* IX (January, 1928), 3-8. Suggests that candidates for the Doctor's degree should not be required to take the Master's degree, since they may be delayed and diverted in attaining their real objective by doing so.

MCCALL, W. A., and RUGER, G. L. "The Reliability of a Ph.D. Research Dissertation in Educational Psychology," *School and Society,* VII (April 13, 1918), 441-9.

MCMURRY, F. M. "The Biggest Thing in Teaching," *Teachers College Record,* XXVIII (November, 1926), 215-9. Emphasizes friendship and close personal relations with students as the most important thing in teaching.

MALONE, Kemp. "English Linguistics and the Ph.D.," *English Journal, College Edition,* XVIII (April, 1929), 312-20. Shows that modern English literature is studied in Doctors' dissertations rather than linguistics and Old English.

* MACNEEL, J. R. *Admission of Students as Candidates for the Master's Degree.* Teachers College Contributions to Education, No. 524. New York: Bureau of Publications, Teachers College, Columbia University, 1932. Pp. viii + 91.

MANWARING, W. H. "Our Contemporary Research 'Aces,'" *Science,* LXXI (April 4, 1930), 361-2. Comments on the contribution of the large number of unexploited contemporary medical scientists as compared with the spectacular performances of so-called geniuses.

MARTENS, E. H. *Organization of Research Bureaus.* Bureau of Education City School Leaflets, No. 14, 1924. Washington: Bureau of Education. Pp. 16.

MATHEWS, C. O. "The Introductory Course in Educational Measurements," *Educational Administration and Supervision,* XXI (September, 1935), 431-47.

MEAD, A. R. "Shall the Master's Degree be Conferred Honoris Causa?" *School and Society,* XXIII (April 17, 1926), 502-4.

MERIAM, J. L. "Graduate Courses in Education," *Educational Administration and Supervision,* XVII (November, 1931), 574-82. Covers state universities.

MERRILL, W. A. "The Ph.D. Fetish," *School and Society,* XXX (December 14, 1929), 813. Suggests that those who criticize the Doctor's degree as a qualification for teaching fail to consider that this is not the only qualification involved in making an appointment;

a majority of desirable positions are filled from the ranks of Ph.D.'s, although not all the holders of such a degree receive appointments.

MILLER, J. C. "Educational Administrators Must Be More Highly Trained," *Nation's Schools*, XII (November, 1933), 37-40. Suggests the type of training which should be given by the school of education to principals and superintendents.

MILLER, L. W. "Professional Talents and Faculty Assignments," *School and Society*, XXXII (November 29, 1930), 729-31. Urges that work be assigned according to ability, whether in administration, research, or teaching.

MONROE, W. S. "Service of Educational Research to School Administrators," *American School Board Journal*, LXX (April, 1925), 37-9, 122, 125.

MORLAN, George. "Instruction in Our Graduate Schools—A Protest," *School and Society*, XXXIV (July 11, 1931), 58-9. A criticism of graduate work in literature.

* MORT, P. R. "Organization for Effective Educational Research in Colleges and Universities," *Teachers College Record*, XXXVI (April, 1935), 541-58.

NELSON, R. W. "Theaetetus Ph.D.," *Journal of Higher Education*, IV (May, 1933), 234-40. Criticism of restrictions placed upon doctorate candidates in working out their programs and theses.

NEWCOMB, T. M., and WATSON, Goodwin. "An Experiment in Having Graduate Students of Education Score Their Own Test Papers," *Educational Administration and Supervision*, XVI (January, 1930), 29-33. Involved 238 students in educational psychology; reports a total of fifty-one papers raised in score from one to eight points by students.

NEWLON, J. H. "A Background for Practical Research," *Phi Delta Kappan*, VIII (April, 1926), 1-6.

——— "What Research Can Do for the Superintendent," *Journal of Educational Research*, VIII (September, 1923), 106-12.

NOLL, V. H. "Measuring Scientific Thinking," *Teachers College Record*, XXXV (May, 1934), 685-93.

——— "Teaching the Habit of Scientific Thinking," *Teachers College Record*, XXXV (December, 1933), 202-12.

——— "The Habit of Scientific Thinking," *Teachers College Record*, XXV (October, 1933), 1-9.

O'BRIAN, R. E. "The Minister's Degree," *School and Society*, XXXIII (January 17, 1931), 87-9. Discusses degrees appropriate for graduate work in religion.

——— "The Preacher's Degree," *Religious Education*, XXVII (January, 1932), 66-9.

ODAM, G. A. "Research in State Teachers Colleges and Normal Schools of the United States." Unpublished Doctor's thesis, New York University, 1932.

OGDEN, R. M. "The Relation of Undergraduate to Graduate Study," *School and Society*, XLIII (February 1, 1936), 137-43.

* OGG, F. A. *Research in the Humanistic and Social Sciences*. New York: The Century Co., 1928. Pp. 454.

PACE, E. A. "Does Research Interfere with Teaching?" *The Effective College*, Chapter XI. Edited by R. L. Kelly. New York: Association of American Colleges, 1928.

——"Does Research Interfere with Teaching?" *Association of American Colleges Bulletin*, XIII (April, 1927), 167-74. Concludes that research is the first consideration of the professor in the graduate school, and that the professor who conducts graduate work, as well as teaches undergraduates, has a combination which requires research. However, he considers teaching as the primary function of the instructor in the separate college; only when teaching skill has been demonstrated and there is assurance of continued effectiveness in teaching should research be undertaken.

PALFREY, T. R. "The Master's Degree in Modern Foreign Languages," *Modern Language Journal*, XIX (April, 1935), 489-500.

PECHSTEIN, L. A. "Seminars for Graduate Study," *Journal of Higher Education*, VII (January, 1936), 23-8.

PECHSTEIN, L. A., and Others. "The Cincinnati Seminar Plan," *School and Society*, XLI (June 1, 1935), 736-9.

* PRESSEY, S. L., PRESSEY, L. C., and Others. *Research Adventures in University Teaching*, pp. 140-7. Bloomington, Ill.: Public School Publishing Co., 1927. Studied current opinions relative to the requirements for the Doctor's degree by circularizing 214 recipients of Ph.D. degrees who belonged either to the American Psychological Association or the Educational Research Association; majority of time went to teaching; many made no use of foreign languages in their work, and considered changes desirable in requirements for the Ph.D. degree in terms of the foreign-language requirement, adaptation of training to future needs, and greater freedom from detailed requirements.

RANKIN, P. T. "How an Instructional Research Department Can Assist Teachers," *Journal of Educational Research*, VIII (October, 1923), 187-98.

REED, Anna Y. *The Effective and the Ineffective College Teacher*. New York: American Book Co., 1935. Pp. xiv + 344. Considers graduate study and research in relation to effective college teaching.

REEDER, W. G. "Making Educational Research Function," *American School Board Journal*, LXXXIII (November, 1931), 29-30, 92.

RICHARDSON, L. B. "Training for College Teaching," *Journal of Higher Education*, I (November, 1930), 425-35.

* ROBERTSON, D. A. "The Graduate School—Its Functions and Criteria," *Problems of College Education*, pp. 164-76. Edited by Earl Hudelson. Minneapolis, Minn.: University of Minnesota Press, 1928.

ROELLINGER, F. X. "The Graduate Student Looks at the Professor and Graduate Study," *English Journal, College Edition*, XXIV (January, 1935), 55-8.

ROGERS, L. B. "Honorary Degrees for Distinction in the Field of Education," *School and Society*, XXXII (September 6, 1930), 325-6. Based on a canvass of the practice in leading graduate institutions.

ROGERS, L. B. "The Place of Schools of Education in the Program of Improvement of University Instruction," *School and Society*, XXXVI (August 27, 1932), 257-64.

ROSS, C. C. "Relation of Leadership to Research and Service," *Phi Delta Kappan*, XII (April, 1930), 188.

RUEDIGER, W. C. "English and the Ph.D.," *School and Society*, XXX (November 30, 1929), 742-3. Suggests that the science type of research is not entirely appropriate for English and that themes for poems, dramas, novels, short stories, and essays may serve the same purpose in English as the so-called scientific thesis in certain other fields of learning.

RUGG, Harold. "The American Experimental School," *Teachers College Record*, XXX (February, 1929), 407-24. Emphasizes the need for greater scholarship and a more truly experimental attitude of mind.

RUSSELL, J. E. "Teachers College and Research," *Teachers College Record*, XXXIII (November, 1931), 92-5.

RUSSELL, W. F. *Report of the Dean of Teachers College for the Year Ending June 30, 1934*. Teachers College Bulletin, November, 1934. New York: Teachers College, Columbia University. Pp. 140. Describes a proposed plan for training advanced graduate students, influenced by procedures in use at the University of Paris, involving an Ed.D. degree at Columbia University.

SANGREN, P. V. "The Participation of the Classroom Teacher in Educational Research," *Educational Administration and Supervision*, XV (November, 1929), 593-601. Discusses the place of research in education, values of teacher participation in research, and practicability of, and overcoming difficulties of teacher participation in, research.

* SCATES, D. E. "Training for Research in the Light of Field Requirements," *Elementary School Journal*, XXXIII (October, 1932), 96-105. Points out that in addition to research, four types of routine service are commonly rendered by research bureaus: reports; testing programs; construction of the curriculum, of tests, and of instructional plans; and reference work, including bibliographies and summaries.

SEARS, J. B. "The Administration of Public School Research Policies," *Journal of Educational Research*, XXVI (November, 1932), 186-98.

——— "The Function of Research in Curriculum Making," *California Quarterly of Secondary Education*, VIII (January, 1933), 147-53.

SEASHORE, C. E. "Printer's Copy for Master's Thesis," *Journal of Higher Education*, III (March, 1932), 146-7.

SKAU, O. K. "The Ph.D. Fetish," *School and Society*, XXXI (March 29, 1930), 432. Comments on the overemphasis, even in India, of formal qualifications in terms of academic degrees, to the neglect of additional practical qualifications for teaching.

SLICHTER, C. S. " 'Debunking' the Master's Degree," *North Central Association Quarterly*, III (March, 1929), 463-7. Lists suggested standards for the improvement of work for this degree, including certain restrictions on credit for summer, extension, and correspondence work.

SMITH, D. E. "Necessary Steps in the Solution of Certain Problems in American Schools of Education," *Teachers College Record*, XXXVI (April, 1935), 566-92.

SMITH, F. M. "The Ph.D. and the Research Fetish," *School and Society*, XXX (October 26, 1929), 559-62. Discusses the pettiness of many research studies and theses in the field of literature.

SMITH, H. L. "The Growing Demand for Research Workers in Bureaus of Educational Research," *Eighteenth Annual Conference on Educational Measurements,* pp. 33-47. Bulletin of the School of Education of Indiana University, Vol. VII, No. 5. Bloomington, Ind.: Indiana University, 1931.

SNEDDEN, David. "Aspirational Notions of Leadership," *School and Society,* XXXI (May 17, 1930), 661-4. A criticism of indiscreet use of the term, leadership.

* SPAHR, W. E., and SWENSON, R. J. *Methods and Status of Scientific Research,* Chapters XV-XVIII. New York: Harper and Bros., 1930.

STENQUIST, J. L. "Better Schools Through Research," *Baltimore Bulletin of Education,* IX (October, 1930), 25-7. Discusses the need for information concerning what to teach and how to teach it.

——— "The Work of the Bureau of Measurement, Statistics, and Research (Baltimore)," *Baltimore Bulletin of Education,* XII (November, 1933), 4-9.

STODDARD, G. D. "The Lag Between Practice and Research," *Phi Delta Kappan,* XVII (April, 1935), 180-2.

* STRATTON, Dorothy C. *Problems of Students in a Graduate School of Education.* Teachers College Contributions to Education, No. 350. New York: Teachers College, Columbia University, 1933. Pp. x + 168.

STRAYER, G. D. "The Scientific Approach to the Problems of Educational Administration," *School and Society,* XXIV (December 4, 1926), 685-95.

STRICKLAND, V. L. "Causes of Waste in Education: Reply to B. R. Buckingham," *School and Society,* XXV (January 1, 1927), 15-6. Discusses reasons for failure of learning to function in after-school life.

SYMONDS, P. M. "A Course in the Technique of Educational Research," *Teachers College Record,* XXIX (October, 1927), 24-30.

THEISEN, W. W. "The Function and Value of a Public-School Research Bureau," *American School Board Journal,* LXXVIII (April, 1929), 47-8, 142. Discusses the task, types of service, division of functions between bureaus, and improvement of research bureaus.

THOM, W. T., and FIELD, R. M. "The Achievement of Geology through Coöperative Research," *Science,* LXXII (August 1, 1930), 117-8.

THORNDIKE, E. L. "The Value of Research in Education," *Teachers College Record,* XXXIII (November, 1931), 96-9.

TOOPS, H. A. "The Selection of Graduate Assistants," *Personnel Journal,* VI (April, 1928), 457-62. Deals with the principles which should obtain in evaluating evidences of occupational fitness.

TOOPS, L. C. "Research for Teachers in Training," *Teachers College Record,* XXXIV (December, 1932), 228-34. A plan for coördinating coöperative and individual research, applied in a research program for a class of prospective teachers in nursery schools.

TRAXLER, A. E. "The Educational Status of Phi Delta Kappans," *Phi Delta Kappan,* XIV (August, 1931), 50.

TOWNSEND, Marion E. "The Organization and Function of Public-School Departments of Research in Cities in the U. S. of 100,000 and over." Unpublished Master's thesis, Teachers College, Columbia University, 1927.

TROW, W. C. "Dangers of the Doctorate," *Educational Review,* LXIX (January, 1925), 35-8. Deplores the narrowing influence of graduate specialization and the dissertation.

* TUFTS, J. H. "The Graduate School," *Higher Education in America,* Chapter XI. Edited by R. A. Kent. Boston: Ginn and Co., 1930.

TYLER, R. W. "Ability to Use Scientific Method," *Educational Research Bulletin,* XI (January 6, 1932), 1-9. Describes a series of tests to determine how well students at Ohio State University have learned to apply scientific method.

UPHAM, A. H. "Educating College Teachers," *Association of American Colleges Bulletin,* XVI (March, 1930), 75-83. Describes a number of plans for the improvement of college teaching; comments on the relation between good teaching and research.

UPSHALL, C. C. "Responsibilities of Research Workers in Teachers Colleges, *School and Society,* XLIII (February 15, 1936), 223-26. Practical suggestions for stimulating research on the part of faculty members.

VOELKER, P. E., and Others. "A Program of Demonstration and Research," *Educational Record,* XVI (April, 1935), 207-16. Presents a plan for demonstration and experimentation in education throughout the State of Michigan.

WALKER, Helen M. "College Instruction in Statistics, 1933-1934," *Teachers College Record,* XXXVII (March, 1936), 527-39.

WALKER, Helen M. "Problems in the Training of Research Workers," *Journal of Educational Research,* XXVI (February, 1933), 442-8.

WATSON, Goodwin. "The Demand for Psychological Counselors in the Public Schools," *School and Society,* XXXIII (June 27, 1931), 871-2.

WEIDEMANN, C. C. "Research Bureaus Should Be Centered in School Organization," *Nation's Schools,* XII (September, 1933), 27-30.

———, and RUGH, C. E. "Professionalized Research in Education," *Phi Delta Kappan,* XVI (October, 1933), 77-8.

WELD, L. D. "The College Teacher and Research," *Science,* LII (July 16, 1920), 45-8. Emphasizes the value of research to the teacher, even in the smaller institutions.

WETZEL, W. A., and ASHBAUGH, E. J. "The Work of the National Committee on Research in Secondary Education," *School and Society,* XLI (April 27, 1935), 580-2.

WHIPPLE, G. M. "The Improvement of Educational Research," *School and Society,* XXVI (August 27, 1927), 249-59.

WHITE, N. I. "Teaching Versus Research," *School and Society,* XXV (January 23, 1932), 109-13.

WILBUR, R. L. "The Educational Mill," *Progressive Education,* VII (May, 1930), 167-9. A discussion of the need for better teaching as well as for fundamental research.

WILLIAMS, S. R. "Strategical Periods for the Encouragement of Research Students," *Science,* New Series, LXVIII (September 14, 1928), 244-5. Within or immediately after college days.

WITHERS, J. W. "Professional Education of Directors of Research in City School Systems," *Journal of Educational Research,* XVII (May, 1928), 335-44. Lists type of work done by research bureaus, training

of directors of research, and principles in the organization of research bureaus.

———"The Scientific Method in the Study of Education," *Journal of Educational Research,* XXI (March, 1930), 212-20. Discusses in detail the possibilities for research in public-school systems, bureaus of research, and the qualifications of the director of research.

———"The Scope and Function of a School of Education," *Journal of Educational Sociology,* V (May, 1932), 538-46.

WOOD, W. E. *A Study of Performance on the Graduate Level Based upon Subject Marks and Intelligence Test Scores: Ages 20 to 60.* Danville, Ind.: Published by the author, 1931. Pp. 56.

WOODY, Clifford. "Specifics Versus Generalities for Field Workers," *Journal of Educational Research,* XXIX (January, 1936), 372-3. Urges that definite problems, with suggested techniques of investigation, be brought to the attention of field workers.

WOODY, Clifford. "The Values of Educational Research to the Classroom Teacher," *Journal of Educational Research,* XVI (October, 1927), 172-8.

* WRIGHT, Edith A. *Organization and Functions of Research Bureaus in City School Systems.* Office of Education Leaflet, No. 2, 1931. Washington: Office of Education, 1931. Pp. 14.

WYKOFF, G. S. "On the Revision of Ph.D. Requirements in English," *English Journal, College Edition,* XVII (March, 1928), 213-20. Urges that both teaching and research degrees be offered in English, and suggests the requirements for the teaching Ph.D. degree in English: (1) three years of satisfactory graduate study, (2) no thesis, (3) intensive survey courses of the whole field of English and American literature, (4) broad but thorough survey courses of other literatures by means of English translations, (5) broad survey courses of fields allied to literature, (6) a reading knowledge of two modern languages, (7) a group of courses in education, (8) a year of actual experience or teaching interneship, and (9) a high standard of scholarship in all courses pursued.

———"Should the College Teacher of English Publish?" *School and Society,* XXII (November 28, 1925), 687-8. Discusses the value of research in English and the attitude the college teacher of English should assume toward doing research.

ZOOK, G. F. "The Present Position of Graduate Studies in the United States," *School and Society,* XLIII (January 11, 1936), 41-9.

"The Adventures of Alice through the Looking Glass: The Graduate Formula," *School and Society,* XXXIX (January 20, 1934), 84-6. A caustic criticism of non-essential routine and formalism.

"Are Ph.D's a Drug on the Market?" *Bulletin of the Association of American Colleges,* XX (November, 1934), 337-44. A symposium by deans of graduate schools, indicating the extent to which doctoral candidates are placed in employment.

"The Consumer's Demand," *Journal of Higher Education,* I (February, 1930), 114-5. States that the colleges which employ the output of the graduate school are insisting on good teachers rather than a product with major emphasis on research.

"Graduate Instruction: Three Viewpoints," *Peabody Journal of Education*, VII (May, 1930), 373-7. Discusses specifications for a program of graduate study and for material facilities, research as compared with teaching, and high standards of scholarship.

"Pedagogical Research," *English Journal, College Edition*, XIX (October, 1930), 665-6. Describes research in terms of too great credulity, complexity of the teaching-learning situation, and expense involved.

"The Producer's Reply," *Journal of Higher Education*, I (February, 1930), 115. States the attitude of the graduate school with respect to the training of college teachers.

"Training for Research in the Social Sciences," *Educational Record*, XIV (April, 1933), 152-61. Discusses requirements for graduate degrees.

"What Should I Do About It?" *School and Society*, XXXIII (April 25, 1931), 569-70. A discussion of the merits of teaching success and qualifications versus the possession of academic degrees in making educational appointments.

CHAPTER XVI

SUMMARY

To synthesize the conclusions reached in preceding chapters, a brief final statement seems in order; indeed some workers may prefer to read this chapter first as an overview of or introduction to the entire volume.

The nature of scientific thinking. In his search for truth, man came to utilize the methods of science rather late in the history of civilization. Earlier approaches in interpreting natural phenomena were through supernatural beliefs, the voice of authority, syllogistic reasoning, and empirical observations. Scientific method involves both inductive and deductive modes of thinking, with emphasis on facts, analysis, hypotheses, generalization, freedom from bias, and the use of measurement. These characteristics of science have been stated in other words as involving mathematical precision and accuracy, objectivity, verifiability, impartiality, and expertness.[1] The steps in scientific procedure are essentially the same as those employed in good thinking or problem solving, namely, selection and definition of the problem, a survey of pertinent related information, formulation and development of a hypothesis, collection of data, analysis and summarization of data, and formulation of conclusions and generalizations. However, it is granted that the human mind does not always work in such an orderly sequence, but may weave back and forth "shuttle-like." In a flash of insight, the genius may jump intervening steps to a tentative solution of his problem and later work more slowly through the detailed proof of his conclusions. The chapters of

1 S. C. Parker, *General Methods of Teaching in Elementary Schools*, pp. 107-11. Boston: Ginn and Co., 1922.
E. L. Thorndike, *Principles of Teaching*, pp. 265-8. New York: A. G. Seiler, 1906.

this book are arranged approximately in terms of the sequence of steps followed in scientific procedure.

Selection and definition of the problem. A major difficulty of many educational workers lies in recognizing the problems which are plainly discernible to the investigator trained to see such issues. In Chapter II a detailed analysis was made of ways in which this "problem blindness" may be corrected, at least in part. Actual selection of the problem involves consideration of such factors as novelty, the investigator's interest, practical value, the worker's qualifications, availability of data, cost, and time required. After the problem (usually first expressed in general terms or even representing an entire field of investigation) has been selected, it must be more definitely formulated and stated, as well as defined and delimited.

Survey of related information. The canvass of information and literature related to the problem chosen probably has been progressing simultaneously with the actual selection of the problem for investigation. As a matter of fact, this survey of related information may accomplish any one or all of five purposes; it may (1) show whether the evidence already available solves the problem adequately without further investigation; (2) provide ideas, theories, explanations, or hypotheses valuable in formulating the problem; (3) suggest methods of research appropriate in attacking the problem; (4) locate comparative data for use in the interpretation of results and in the formulation of conclusions; and (5) contribute to the scholarship of the investigator. The major types of educational literature, in terms of the kinds of thinking or research procedures involved, from which such assistance may be secured, are: (1) statistical or experimental studies with emphasis on objective methods and mathematical statement of results; (2) theoretical, speculative, or philosophical discussions with emphasis on the methods of logic and rationalization; and (3) historical investigations, based in the majority of cases on documentary evidence. However, library materials and guides, as well as the printed sources, are not classified in such terms.

Therefore, a more practical working classification, as described at length in Chapter III, includes: (1) periodical literature, in journals; (2) printed material in bound form, such as books, monographs, year-books, and bulletins; (3) graduate theses, usually unpublished, except for a limited number of Doctors' dissertations; and (4) certain miscellaneous sources of information.

Use of hypotheses. Once a problem has presented itself or has been sought out by the investigator, one of the distinguishing characteristics of scientific method is the tendency to formulate a shrewd guess explaining the phenomenon under observation. That is, the human mind in many cases does not proceed systematically through a given sequence of steps or wait for the complete enumeration of all the facts before formulating a hypothesis explaining tentatively the situation under investigation. Of course, if the first hypothesis proves fallacious when checked against the observed facts, another one may be formulated and tested until the correct explanation is found. Such a preliminary or tentative concept gives direction to the investigation until proved or disproved, or until displaced by another hypothesis. The formulation and testing of hypotheses are treated in an introductory way in Chapter I, and more fully in Chapter IV.

Collection of data. Obviously, a given problem may be solved, or a hypothesis tested, only by the collection of pertinent data. The organization of Chapters V-X is in terms of methods of collecting data or ways of attacking educational problems.

Historical research examines the evidence of the past, which may be used as an aid in analyzing and interpreting the present, or even the future. Its major processes are: (1) collection of data, with due consideration of documents and relics (or remains), of primary and secondary sources, of bibliographical procedure, and of an adequate system of organizing data; (2) criticism of data collected, including the processes of external (or lower) criticism and internal (or higher) criticism; and

(3) presentation of the facts in readable form, involving problems of organization, composition, exposition, and interpretation.

Normative-survey research involves a canvass of present practice or conditions, or the establishment of norms or central tendencies, utilizing extensively such data-collecting instruments as questionnaires, tests, check-lists, rating scales, and score cards, as well as interviews, activity analysis, textbook analysis, etc. These instruments are not of themselves major approaches to the solution of educational problems, but serve as devices for the collection of data.

As has been suggested in the preceding paragraph, data-collecting instruments, such as are discussed in Chapters VII and VIII, are used most extensively in the normative-survey type of research, although standard tests are useful in experimental research for the equation of groups and for the measurement of gains. Data collected by such instruments also are valuable in making case studies and certain other types of research involving causal relationships.

The six major types of normative-survey research employ (1) survey-testing, (2) questionnaire, (3) documentary-frequency, (4) interview, (5) observational, and (6) survey-appraisal procedures, including school surveys.

Experimental research, under controlled conditions, with manipulation of only a single variable, tries out in classroom or laboratory different educational plans or procedures. Most classroom experimentation employs group methods (one-group, equivalent- or parallel-group, and rotation-group methods). Major considerations in experimentation are definition and restriction of the experimental factor, specification as to the nature and scope of the pupil achievement to be measured, control of non-experimental factors, selection or construction of adequate measuring instruments, extension of the experiment over a sufficient period of time, and the reliability of the obtained difference between gains of the experimental and control groups or individuals involved. In the laboratory type of

experimentation, conditions may be more carefully controlled, suitable apparatus and equipment provided, subjects studied individually, and a more minute analysis of such problems as learning worked out.

Certain other types of investigation, sometimes termed causal research, are especially adapted to studying causal relationships; they observe an effect and seek to determine its cause or pertinent relationships through a study of likenesses and differences (the causal-comparative method), case-study and genetic methods, diagnostic and prognostic procedures and instruments, or correlation techniques.

Analysis and interpretation of data, and generalization. It is in the classification, analysis, summarization, and interpretation of data that statistical method proves especially valuable, including the measures of central tendency, variability, correlation, etc. Statistical procedures are also used extensively as aids in all of the previously mentioned types of research (experimental, survey, and causal), with the exception of historical investigations. Statistical method is considered a way of manipulating data rather than a technique for securing new information, although occasionally an original contribution to the field by way of a new formula, statistical device, slide rule, or calculating machine is forthcoming. Of course, statistical calculations do not take the place of, but are supplementary to, good thinking and sound logic.

In this volume, educational philosophy is considered, not an independent method of collecting data, but a valuable aid in setting up the problem, formulating and testing hypotheses, interpreting data, generalizing, and in developing standards for evaluation.

Preparation of the report, and standards for evaluation of research. It is recognized that the work of writing up the report and the development of standards for critical evaluation of research are not deferred in the actual process of investigation until the study is completed. In fact, the writing, at least in the form of a first draft of notes, may have been progressing

advantageously in connection with each step of the research process. Likewise, it is hoped that critical standards were being developed at the same time. The student of educational problems should adopt, adapt, or develop sound criteria for evaluation, which ultimately become a part of his own professional and scientific equipment: (1) in choosing from the large volume of available current literature, (2) for guidance in the preparation of his own reports, (3) for analysis of practices and innovations in education, and (4) in general for the direction of his own educational thinking.

Training and supervision of research workers. The point of view maintained in this volume is that educational workers (teachers, administrators, and supervisors) should be so trained as to contribute to the solution of problems in their respective areas of responsibility: (1) all as consumers of research, (2) many as participants in the problem-solving approach because of the resulting training value and the increased understanding of the educative process, and (3) a more limited number as real contributors to the existing store of educational knowledge. This statement is made with full recognition of the fact that an ideal balance between investigational procedure, or problem solving, and other elements of the training program for field workers probably has not yet been discovered and certainly has not been effected in practice. It is also conceded that, for many who might otherwise attack their problems more scientifically, there are obstacles in the form of heavy teaching or administrative loads, as well as a lack of facilities for research. However, the real scientist is possessed by a consuming intellectual curiosity which sometimes drives (or leads) him forward to the neglect of his own physical comforts and even of life itself. Without recommending that one make any such extreme of self-sacrifice, it may well be emphasized that in the properly qualified educational worker this dual responsibility of teaching, or administration, or supervision on the one hand, and of problem solving or search for truth on the other, involves no essential incompatibility. The open-mindedness

and the demand for evidence which such a person brings to classroom, laboratory, or conference are indeed stimulating influences and an indication that gradually there is being established at least a firm foundation for a science or practice of education among the million teachers of this country.

APPENDIX I

NEEDED RESEARCH IN EDUCATION[1]

A. HIGHER EDUCATION, TEACHER TRAINING, AND ADULT EDUCATION

Before enumerating detailed lists of problems which require study at the level of higher education, comment may be made concerning the marked increase in attention given educational problems in higher institutions. Current interest in problems of curriculum reorganization, methods of teaching, and administrative procedure at the college and university level is to a considerable extent the result of a rapid increase in student enrolment since the late war. This influx of a less select student body, with a wider range of individual differences, needs, interests, and capacities, and the resulting expansion of a limited curriculum and modification of inflexible methods of teaching have introduced perplexing problems.

A large amount of educational literature concerned with such problems has been accumulating. The United States Office of Education at one time considered publication of a bibliography of some 13,000 titles in the field of higher education. National educational and learned associations and foundations have been active in the promotion of investigations at the college level. In 1935, 92 books, monographs, and bulletins appeared in this field, exclusive of publications in adult education. Numerous surveys of higher institutions have been conducted. To name only a few major studies, there are the Minnesota experiments with class size and science teaching, the Land Grant College Survey, the Modern Foreign Language Study, the Commonwealth Teacher-Training Study, and the National

[1] See Chapter II for an introductory statement concerning needed investigations.

Survey of Teacher Education. National foundations and societies, denominational groups, regional organizations, state governments, teachers associations in subject-matter fields, and individual colleges and universities have promoted intensive surveys of the higher institutions involved. The educational periodicals dealing with college and university problems now include *Journal of Higher Education, Junior College Journal, School and Society, Educational Administration and Supervision, Liberal Arts College Bulletin,* and *Bulletin of the Association of American Colleges.*

The foregoing facts imply that a wealth of material is available for use in university courses dealing with problems of higher education. During the summer of 1931 twenty-four universities offered courses in this field for administrators, teachers, and graduate students. There is need for study and understanding of problems in higher education on the part of workers at both college and high-school levels. Secondary-school principals and teachers who know the entire educational system are able to provide more adequate opportunity and guidance for high-school pupils who expect to enter college. Such courses are of especial interest to candidates for the Doctor's degree in view of the fact that 75 per cent of this group after graduation go into college or university work. Many of these students work out theses concerned with college problems. From 1918-1929, 244 Doctors' theses dealing with problems of higher education were completed. In 1930-1931 181 Doctors' theses in higher education were under way.

Does this rather formidable statement of investigational activity at the college level mean that most of the problems in this field have been solved? Not at all—especially is evidence lacking concerning the merits of certain teaching and curriculum innovations at both graduate and undergraduate levels. At the graduate level, in objective terms, what are the merits of the Iowa plan of individual or independent study, of the Yale seminar organization, or of the relatively new degree programs in education as described in the 1931 Yearbook of

the National Society of College Teachers of Education? At the undergraduate level, on the basis of experimental evaluation, what is the evidence concerning Rollins' workshop or laboratory plan, Cincinnati and Antioch's coöperative or part-time program, Harvard and Princeton's general reading and tutorial plans, Stanford's independent study scheme, Swarthmore's honors courses, Wisconsin's Experimental College, and Chicago's divisional reorganization?

Granted that administrative difficulties may seem almost insurmountable and variable factors apparently uncontrollable, the challenge to evaluate these plans on an experimental or factual basis remains for the student of objective measurement. Minnesota's work with class size and science teaching is a good beginning in this experimental program. It must be kept in mind that scientific evaluation does not consist of opinions collected from parents, students, or teachers with respect to the merits of a given plan; neither is it journalistic description of the methods in use; it is not even analysis and criticism based on observation and painstaking rationalization. Just what scientific evaluation does include is a long story that has been reasonably well told in current volumes which deal with techniques of measurement, experimentation, statistics, and educational research, and in other sections of this book.[2]

A. S. Barr, "Research and the Professional Education of Teachers," *Journal of Educational Research*, XXVII (January, 1934), 364-366.

1. How many new teachers per year, subject, and grade can the profession absorb?
2. What is the present status of the unemployment of teachers?
3. How many of the present unemployed teachers are bona fide teachers legally certified to teach and previously employed in the profession?
4. How many of the present unemployed teachers are physically, socially, and emotionally qualified to teach?
5. What are the physical, intellectual, social, and emotional qualities prerequisite to teaching success?

2 The preceding paragraphs on higher education are adapted from Carter V. Good, "Research in Higher Education," *Journal of Educational Research*, XXIV (October, 1931), 231-232.

6. What subject combinations are teachers most frequently called upon to teach?

7. How much training should a teacher have?

8. Recognizing that teachers are expected to exercise a certain amount of social and civic leadership, how well qualified is the average teacher, employed and unemployed, for this responsibility?

9. What are the objectives of teacher-training, that is, what are the characteristics (knowledges, skills, habits, attitudes, and interests) of the ideal teachers?

10. How can these qualities be most efficiently inculcated in the teaching profession?

11. What kinds of curricula produce the most efficient teachers at the different age, grade, and subject levels?

12. How do teachers trained in different sorts of teacher-training institutions succeed as teachers? What are their characteristic weaknesses? Their positional history?

13. Assuming that the institutional training of teachers will need to be continued in service, how can the in-service training of teachers be made more effective? How may the specific training needs of in-service teachers be most effectively determined? How may the instruction of teachers in service be made more effective?

14. How can teaching ability be more effectively measured?

H. A. Brown, "Some Unsolved Problems of Teacher Preparation," *Educational Administration and Supervision*, XVII (November, 1931), 590-602.

Suggests that a genuinely scientific approach to the problems of teacher preparation needs to be made:

1. A national survey of the whole field of teacher training to define clearly the functions of teacher-training institutions
   - (*a*) What place have county normal schools and high-school teacher-training classes in a national plan of teacher training?
   - (*b*) What is the total task of a four-year degree-granting state teachers college?
   - (*c*) By what means shall selective admission be accomplished?
   - (*d*) How shall the functions of guidance, counseling, and placement be organized and conducted?
   - (*e*) Is the teachers college undertaking work that does not come within its scope?
   - (*f*) Are teachers college curricula adequate for the large task which confronts these institutions?
   - (*g*) To what extent is the present organization of the teachers college adapted to the functions of that institution?
2. The question of supply and demand of persons legally qualified

to teach, indicating ways in which it may be regulated, to stress the advancement of requirements for graduation and certification, and to emphasize the importance of selective admission to teacher-training institutions

3. Facilities necessary for the best arrangement of practice teaching, for its effective conduct under any given condition.
   (*a*) To what extent do students profit from instruction in methods and technique previous to entering on student teaching?
   (*b*) At what time during training should student teaching be done?
   (*c*) What changes actually take place in a student during the experience of student teaching?

4. Standards, for teachers college, of a more qualitative nature which will promote the effective preparation of teachers

5. Analysis in the field of curriculum-making in public education would throw some light upon the question of how teacher training might be reconstructed and fundamentally improved

B. R. Buckingham, "Research in Teacher Supply and Demand," *Educational Administration and Supervision*, XV (April, 1929), 259-268.

1. A better program of educational guidance for those entering teacher-training work

2. More effective distribution of supply in relation to demand for teachers

3. Analysis of the processes of teacher training into their essential elements

4. Development of an effective instrumentality for placing and following up graduates

W. W. Carpenter, "Problems in Junior College Education," *Junior College Journal*, V (October, 1934), 13-15.

Fifty problems in junior college education relating to:

1. Articulation with senior college
2. Finance
3. Organization
4. Records and reports
5. Location
6. Teaching load
7. Student failures
8. Individual differences
9. Recruiting students
10. Class size

11. Curriculum
12. Extracurriculum
13. Graduation requirements
14. Guidance
15. Supervision and improvement of instruction
16. Extension
17. Teaching methods
18. Junior-college functions
19. Post-graduate students
20. Tests and measurements
21. Publicity
22. Library service

Jessie A. Charters, "Problems in Adult Education," *Educational Research Bulletin*, VIII (May 15, 1929), 207-211.

1. Can adults learn?
2. Will adults learn?
3. What shall be taught?
4. How shall adults be taught?
5. Who shall teach adults?

W. W. Charters, "Next Steps: A Program of Research in Adult Education," *Journal of Adult Education*, II (October, 1930), 370-375.

1. Studies of vocabulary
2. Selection and training of teachers
3. Tastes and interests of adults
4. Administrative problems in adult education

W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*, pp. 207-219. Chicago: University of Chicago Press, 1929.

Suggestions for research growing out of the Commonwealth Study (all specific references in the following list are to the Study):

1. Objectives of teaching training

2. How adequately are the objectives covered by the traits and activities contained in the report?

3. To determine to what extent teachers need to be trained in the activities as stated on the master list

4. To check by experimental procedures the validity of the ratings obtained from the various professional groups

5. To define determinants of curricular value other than the four criteria utilized in the present study

6. To interpret relationships between the ratings of different professional groups as shown in the Summary Tables

7. To analyze with reference to the activity list the materials found in existing training courses

8. The most useful means of incorporating traits with other curriculum materials

9. Refine the techniques of collecting trait actions, translating, telescoping, and evaluating the traits as described in Chapter II

10. To determine the traits of most importance to public school teachers of all types, those common to all types and those peculiar to certain types

11. Evaluation of trait actions with reference to the four criteria of the study and others

12. To check the completeness of the data used in constructing the master list of activities

13. To check the depth of analysis to which certain divisions, subdivisions, and sections should be carried for teachers of different types

14. To check the adequacy of the classification

15. To check the selection of group teachers

16. To define the objectives of a given training institution

17. To investigate the assumption that the activities which teachers should perform are more readily identified when the activities that teachers do perform are known

18. To determine the relationship between the amount of experience in teaching and nature of the teaching position held as determining the difficulty of the type activities for the typical teacher

19. To improve the techniques of Chapter IV, Section 3 and Chapter V, Section 3, whereby the fundamental principles, laws, or generalizations of a course may be helpfully related to the teaching activities governed by such principles

20. To determine the relative values of typical elements in the training curriculum as contributing to the efficiency of teachers in service

21. To determine the nature and sequence of training courses most useful to prospective teachers of a given type

W. S. Deffenbaugh and W. H. Zeigel, *Selection and Appointment of Teachers*, p. 115. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 12. Washington: Office of Education, 1933.

1. What constitutes teaching success?

2. How may future success of inexperienced teachers be predicted?

3. How may the success of teachers in service be measured?

E. S. Evenden, *Summary and Interpretation*, pp. 247-253. National Survey of the Education of Teachers, Vol. VI. Office of Education Bulletin No. 10, 1933. Washington: Office of Education, 1935.

1. To define good teaching in various types of positions, and to develop more accurate means of measuring it

2. To make educational leaders aware of the State's responsibility for developing a long-term plan for the education of its teachers and for promoting systematic publicity campaigns to acquaint patrons and teachers with its provisions

3. To obtain greater uniformity in permanent records about the education and the employment of teachers

4. To remove at once the professionally demoralizing lack of adjustment in many States between supply and demand among teachers

5. To persuade each state to establish dates by which all teachers in service whose preparation is below the accepted standard for the State would be expected to meet the current standards

6. To regulate the supply of prospective teachers by raising standards through selective admission of students to curricula for teachers

7. To provide large numbers of teachers better and more specifically prepared for rural schools

8. To provide for more and better-prepared teachers for the Negro schools in those States in which separate schools are maintained for Negroes

9. To develop greater interest in the distinctly professional elements in the education of teachers

10. To make sure that all prospective teachers possess at least the "safety minimum" amount of teaching skill before being certified

11. To adjust curricula for teachers to the work of the junior colleges especially in those States in which the minimum standard of preparation for elementary teachers does not exceed the junior college level

12. To promote the realization that the schools will be required to take a heavier responsibility for the enjoyable and constructive use of increased amounts of leisure

13. To persuade states which have not already done so to adopt systems of restricted certification which will indicate very specifically the kinds of positions for which the teacher is prepared and which will restrict the teacher's employment to those positions

14. To develop and maintain in each state lists of institutions "approved" for the preparation of teachers for each type of position for which the state issues certificates

15. To adopt standards and regulations which will make sure that the courses in all curricula for teachers are taught by staff members

who are adequately prepared—scholastically and professionally—and who are genuinely interested in education and in the education of teachers

16. To raise standards for the preparation of all teachers and to control the supply of new teachers by obtaining from all institutions on the approved list—public and private—coöperation in developing the program and in carrying out its provisions

17. To improve the community status—prestige—of the teacher

18. To develop upon a nation-wide basis such an understanding of the significance of education that ways and means will be found and approved for restoring recent educational losses and for adding new educational services

19. To procure in a majority of the States the legislation or the constitutional amendments essential to the reorganization of the state departments of education

20. Each state must maintain a continuing survey of its teaching personnel in order to meet its teacher-training obligations wisely. In addition to these surveys some agency, national in its scope, such as the Office of Education or the National Education Association, should conduct periodic studies of phases of teacher-education so that the more important aspects of this large problem may be presented on a nation-wide basis at least as often as every five years. [At this writing, 1936, five years have elapsed since parts of the Survey were made.]

E. M. Freeman, "Suggested Program of Investigation Having in Mind the Improvement of Instruction in Science at the University of Minnesota," *Problems in College Education*, Chapter XXXIV. Edited by Earl Hudelson. Minneapolis, Minn.: University of Minnesota Press, 1928.

Suggests investigation of the effect of:

1. Amount of laboratory work on achievement
2. Amount of recitation work on achievement
3. Amount of lecture work on achievement
4. Amount of demonstration work on achievement
5. Supervised study on achievement
6. Size of class on achievement
7. Mentality on achievement.
8. Reading ability on achievement
9. Previous scholarship on achievement
10. Previous training on achievement
11. Sex on achievement
12. Instructor on achievement—(*a*) experience, (*b*) training
13. Total time spent in class meetings on achievement
14. Required readings on achievement (amount)

15. Number of tests on achievement
16. Types of secondary-school work on achievement, (*e.g.*, small high school, large high school, city or country, etc.)
17. Type of lecture on achievement—(*a*) forcefulness, (*b*) dramatic appeal, or (*c*) other qualitative effects
18. Tempo of lecture on results; concreteness and use of illustration
19. Discussion on results
20. Projects on results
21. Time of tests on retention, (*e.g.*, "terminal" quizzes)
22. Review on retention
23. Note-taking on learning or retention
24. Amount of reading on learning (little and much)
25. Homogeneity of group
26. After-correction of tests on further tests
27. Length of class or lecture period
28. Definiteness of aim on results (specific)
29. Distractions on individuals and class (sensitivity)
30. Maturity on results
31. Library work on results; types of library work
32. Group assignment
33. Individual instruction
34. Field trips on instruction

W. S. Gray and Others, *Current Educational Readjustments in Higher Education,* pp. 149-150. Yearbook Number XVII of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1929.

Unfortunately many important problems in higher education have not been subjected to critical analysis or experimentation, such as the fundamental differences in the learning activities of students at various levels of advancement or the length of time required for curricula of various types. With respect to the latter problem, the practice prevails of making all curricula conform to artificial standards, such as the four-year requirement for the baccalaureate degree. Although much has been done to determine student characteristics and the value of ability grouping, few studies have been made to determine methods by which students may be relieved from additional requirements as soon as essential qualitative standards have been attained. Furthermore, very little has been done to define such standards in either academic or professional institutions.

The curriculum studies which have been made thus far are largely summaries of current practice. There is urgent need of critical studies which seek to determine basic principles of curriculum construction and valid materials of instruction designed to serve specific cultural

or vocational needs. Although several studies have been made of the merits of different teaching procedures, only an entering wedge has been made into this important field. With few expections, experimental studies have not been made of the results of the newer methods or techniques of teaching, such as the tutorial plan, and reading for honors. Too frequently, old methods are discarded and new ones adopted without critical studies of the weaknesses of the old or experiments to determine the merits of the new. The same criticism applies to many of the administrative changes which have been made during recent years. For example, personnel work has been hailed with great enthusiasm by many colleges. Numerous reports have been made of personnel activities. Very few studies have been made, however, to determine objectively the advantages and limitations which attach to them. The examples which have been given emphasize the fact that there is urgent need of the wider application of scientific methods in the critical study of practically every problem which higher institutions face to-day.

M. E. Haggerty, "Experimenting with the College Teacher's Problem," *Association of American Colleges Bulletin*, XV (March, 1929), 99-110.

Believes that ten years of experimental attack upon certain problems, as a basis for courses in the teaching of college subjects, are needed, especially on:

1. The problem of college teaching
2. Techniques of making curricula
3. Methods of student marking, examinations, and evaluation

V. A. C. Henmon, "The Function, Value, and Future of Educational Research in Colleges and Universities," *Journal of Educational Research*, XXVII (March, 1934), 493-502.

Contributions experimentally tested, using techniques and measuring devices that educational science has slowly been developing, are needed in the following fields:

1. What aims or objectives can be realized?
2. What should be contained in the curriculum?
3. What methods should be used for the most economical and effective learning?

F. J. Kelly, "Needed Research in Higher Education," *Studies in Education*, pp. 74-84. Yearbook Number XV of the National Society of College Teachers of Education. Chicago: University of Chicago Press, 1926.

F. J. Kelly, *The American Arts College.* New York: The Macmillan Co., 1926. Pp. xiv + 198.

1. Cost studies
2. Student registration or enrolment
3. Teaching load
4. Miscellaneous statistical studies
5. Experimental colleges
6. Aims of higher education
7. Learning problems
8. Adaptation to different intelligence levels
9. Measurement of the results of teaching

L. V. Koos, "Research Problems in Collegiate Education," *School and Society,* XVII (February 17, 1923), 169-174.

1. Functions appropriate to the last two years of the four-year college course
2. Occupational destination of college graduates
3. Differentiation of work to meet the needs of students of varying mental capacities
4. Economic and social composition of the students of our colleges
5. Extent of overlapping in high-school and college courses
6. Development and use of achievement tests at the college level
7. Methods of instruction at the college level

E. A. Lee, "Research Problems in Training Vocational Teachers," *School and Society,* XXIV (July 10, 1926), 31-37.

1. Selection of candidates for teaching
2. Measurement of trade ability and trade testing
3. Curriculum construction
4. Evaluation of the performance of students
5. Analysis of the trade teacher's job

A. R. Mead, "List of Possible Studies and Researches in Supervised Student-Teaching," *Educational Administration and Supervision,* XI (May, 1925), 355-358.

1. What is the psychology of learning involved in acquiring ability to teach?
2. What are the objectives of the various types of laboratory work in teacher-preparation?
3. What are the curricula, facilities, and procedures needed to attain these objectives?

4. How to diagnose and evaluate the laboratory work of teacher-preparation

5. Value of different plans for student-teaching, *e.g.*, the Wisconsin and Cincinnati plans

6. Proportion of teachers-in-service who have had student-teaching

7. Relative efficiency of teachers-in-service who have had student-teaching as compared with teachers similarly situated who have not had student-teaching

8. Establishment of norms for student-teaching done in one-room rural schools

9. Standards for student-teaching of all types of teaching and supervision

10. Student-teaching in foreign countries

11. Historical antecedents and analogies for student-teaching

12. Objectives, procedures, and evaluation of results in the observation of teaching

13. Survey of student-teaching in the various states

> A. R. Mead and Others, "Research in Supervised Student-Teaching and Allied Problems: Report of Research Committee, 1926," *Educational Administration and Supervision,* XII (May, 1926), 346-351.

Investigations dealing with fundamental principles:

1. Dealing with objectives of teacher preparation and attempting to answer the following questions:
   (*a*) What are the kinds of changes to be made in the teacher by his or her preparation?
   (*b*) To what degree should these be sought in pre-service preparation, under existing conditions?

2. Dealing with the assumption that teachers learn to teach by the same laws of learning as they learn other things, *i.e.*, dealing with the implications and applications of the psychology of learning to learning to teach

3. Dealing with the establishment of standards for institutions and teacher-training activities, in order to apply principles of learning and attain desired objectives

Continued series of investigations of existing theories, practices, material facilities, finance, staff, etc.:

1. Collection of data about such work in Canada, Mexico, Central America, and South America

2. Collection of such data in countries of Europe, India, China, Japan, Philippines, Asia, and Africa

3. Experimentation to develop techniques adapted to research in this field

T. W. Merriam, "Needed Studies in Education in Religion at the College Level," *Religious Education,* XXVI (January, 1931), 32-37.

Forty problems relating to:

1. Courses in religion
2. Religious values in other courses
3. General problems of higher education to which religious education teachers may contribute
4. Administrative relationships
5. Professional college religious leadership
6. Extracurricular provisions for religion
7. Extracurricular activities in general

Alonzo F. Myers, "An Evaluation of Research on Teacher Preparation," *Journal of Educational Research,* XXVI (November, 1932), 161-174.

1. What makes teachers effective?
2. Further evaluation of the job-analysis technique
3. How much and what kind of laboratory school experiences are essential in the professional preparation of teachers?
   (*a*) What activities should be included in the laboratory-school experiences of the student?
   (*b*) What are the respective contributions of observation and practice in the practical training of the teacher, and to what extent can the former safely be employed as a substitute for the latter?
   (*c*) Which is to be preferred, concentrated or extended periods of practice?
   (*d*) How much time should be devoted to observation and practice in curricula of two years, three years, four years, and five years in length for the preparation of elementary teachers and of secondary teachers?
4. What is the best type of board of control for teacher-training institutions?
5. Selective admissions to training programs
6. Supply and demand in teaching

Ruth Strang, "The Relation of the Dean of Women to Research," *Teachers College Record,* XXXI (October 1929), 44-49.

1. Study "best-all-around, average, and problem" girls for four years and post-graduate life
2. Trends in the number, causes, and kinds of disciplinary cases,

illnesses, and failures in academic work; and in personal problems, social activities, twenty-four hour schedules, and other phases of student life

W. E. Uphaus, "Some Problem Areas in Higher Education," *Religious Education,* XXVI (November, 1931), 735-741.

1. Spiritual inadequacy of compulsory chapel services
2. What are the essential elements of a religious program?
3. How to capture the latent energies of college youth for high spiritual endeavor
4. What character assets do students bring with them to the campus?
5. Point of departure of the religious education of a student
6. What transformations in attitudes and ideals take place month by month and year by year?
7. How do students invest their time, energy, and money?
8. What curricular courses in religion are needed?
9. What are the religious possibilities and effects of secular courses?
10. How may they be brought out skilfully?
11. What are the objectives of religious education?
12. What are the best means of attaining them?
13. Analysis of campus situations characterized by generous reconciliations and friendly coöperation to reveal social and psychological factors involved
14. Given certain campus conditions, what are the necessary adjustments to shape a mutually helpful and creative student community?
15. Community control
16. What techniques do local groups use in resolving their difficulties?
17. What is the student's estimate of the relative value of the things he does?
18. Does he experience contentment and satisfaction, or discouragement?
19. Student-faculty relations
20. Inter-racial relations
21. Student government
22. Honor system

F. L. Whitney, *The Junior College in America,* p. 216. Colorado Teachers College Education Series, No. 5. Greeley, Colorado: Colorado State Teachers College, 1928.

1. To determine the place of this new educational unit (the junior college) in a state system of education
2. To establish any possible contributions which the junior college, both public and private, may make in a local system of democratic education

J. W. Withers, "Important Problems for Research in the Education of Teachers," *School and Society*, XXXIII (May 9, 1931), 613-617.

1. Are we making the most intelligent and effective use of research results of the last twenty-five years in the preparation of teachers and the actual education of children?
2. To what extent are these results wisely incorporated in the curricula and courses of study of present programs and practices in the education of teachers?
3. What effect are they really having on supervision and instruction?
4. Proper recognition and rating of bachelor's degrees of teachers colleges and normal schools by state departments of education and graduate schools
5. Choice of the best source of high-school teachers: colleges of arts and sciences, teachers colleges, or fusions of the two
6. The integration and articulation of teacher-training agencies and the cultural and professional aspects of the education of teachers

The Articulation of the Units of American Education, Chapter XXVI. Seventh Yearbook of the Department of Superintendence. Washington: Department of Superintendence, 1929.

A. Problems of Articulation of Teacher-Training Institutions with Public School Units
   1. The selection of students
   2. Placement and follow-up
   3. Relation between pre-service and in-service training for teaching, administration, and supervision
   4. Certification for professional school service
   5. Curriculum studies in teacher training
   6. Training school facilities
   7. Articulation of high schools and teacher-training institutions
   8. Research service in state school systems
   9. Determination of faculty qualifications
   10. The arts college and teacher training
   11. Legislation affecting administrative control of teacher training
   12. Locating teacher-training agencies within the state

13. Relation of probable tenure to the pre-service education of teachers
14. State versus city teacher-training agencies

B. Problems of Articulation within and among Teacher-Training Units
1. Allocation of functions among the teacher-training agencies
2. Optimum size of the teacher-training institution
3. Methods of financing teacher training
4. Methods of disbursement and accounting
5. Determination of a usable unit cost in teacher training
6. Social education
7. Health service and health education
8. Library service
9. Physical plant and material equipment
10. Faculty organization
11. Transfer of credits
12. Publications

B. SECONDARY EDUCATION

E. J. Ashbaugh, "Research Needed to Adjust High School Curricula to Educational Needs of the Individual," *Journal of Educational Research*, XX (September, 1929), 132-133.

1. What constitutes a need?
2. Determination of specific needs of individuals
3. Differentiation between individual needs and general school aims
4. Aims of the secondary school

L. C. Bain, "Measures of Secondary-School Organization," *Educational Research Bulletin*, XIV (November 13, 1935), 201-207.

Predicts that more consideration, as secondary education improves, will be given to a large number of variables in terms of pupils, parents, teachers, principals, buildings, curriculum, and economic, industrial, and social conditions, such as:

1. Cultural background of pupils
2. Attitude of parents toward secondary education
3. Intelligence of pupils
4. Economic level of the group served
5. Probable kind of employment of schooling after secondary-school attendance terminates
6. Social needs of the group served
7. Attitude of group served toward society

8. Attitude of society toward group served
9. Location, type, arrangement, and facilities of building
10. Attitude of the teachers toward recent trends in education
11. Educational philosophy of the principal
12. Curricula

T. H. Briggs, "Problems in Secondary Education That Need Solution," *School Life,* XI (February, 1926), 116-118.

The primary need is an acceptable philosophy which is comprehensive, complete, consistent, convincing, and generally accepted. The history of secondary education has been neglected. Research, although it is in a formative stage, will provide the foundation by furnishing the facts. Scientific workers should choose subjects wisely, employ sound technique, report studies clearly, and popularize results. Based on reaction of forty-five writers, the number of problems proposed in the more popular fields are:

1. Curriculum (48)
2. Methods (21)
3. Organization (19)
4. Teachers (19)
5. Psychology (17)
6. Tests (16)
7. Finance (9)
8. Prognosis (7)
9. The Principal (6)
10. Supervision (6)

T. H. Briggs, "If There Were Millions," *Teachers College Record,* XXXV (May, 1934), 633-666.

Indicates a program for education, proposing the following steps:

1. Defining the good life
2. Planning comprehensively for secondary education
3. Determining the special functions of secondary education
4. Learning from foreign schools
5. Knowing the pupil population
6. Defining education
7. Determining types of organization
8. Listing desirable activities
9. Preparing teaching units
10. Directing and coördinating research
11. Developing teaching units under ideal conditions, and under normal conditions
12. Preparing curricula
13. Measuring results
14. Popularizing the program
15. Training teachers of unusual promise, involving teacher-training institutions
16. Devising a record system

17. Planning for guidance
18. Providing for articulation
19. Planning for buildings and equipment

T. H. Briggs, "Research in Secondary Education," *Junior-Senior High School Clearing House*, IX (December, 1934), 198-205.

1. What becomes of high school "drop-outs" and graduates?
2. Social and physical effects of acceleration
3. The results of programs varying in the number of subjects
4. The results of outside work and study on achievement in a normal-school program
5. The effect of personal associations on academic school achievement
6. The persistence of high school learning after graduation
7. Comparison of programs and achievement of students' high-school and college careers
8. Learning outside the school
9. Plan of library classification of educational literature
10. Extent to which principals have utilized "scientifically proved" results
11. To what extent do principals earn their salaries?
12. What do the department heads do?
13. Distribution of administrative duties in many schools and in several types of organization
14. The work of the state high-school inspector
15. The use of learning in other subjects in conventional curricula
16. The effects of midyear graduation
17. The later careers of "creative youth"
18. Adapting adolescent education for the dull
19. Delinquent youths in schools and courts
20. What becomes of Protestant youth in New York?
21. Reading on adolescent levels
22. Education of the emotions
23. The causes, degrees, and effects of emotionalized attitudes
24. Extracurricular field
25. The effects of extensive reading in foreign-language fields
26. The effects of collateral reading in English, history, science, etc.
27. Is literature ordinarily taught with regard to the principle of unity?
28. The results of teaching by different methods in various subjects and on the several intellectual-maturity levels
29. How is the ability to systematize acquired knowledge related to different degrees of native intelligence?

30. To what extent does the systematization contribute to the retention, extension, and use of knowledge?
31. Extent of retention after formal examinations
32. What provisions have been made for integration of the individual with larger social groups in the curricula?
33. What provisions have been made in recent curricula for the integration of personality?
34. How do intellectual interests begin and develop?
35. To what extent has a guidance program been effective and useful?

B. L. Johnson, *The Secondary School Library*, pp. 108-110. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 17. Washington: Office of Education, 1933.

1. Determination of adequate qualitative as well as quantitative standards for school library service
2. Effect of newer methods of classroom teaching on use of the library
3. Effect of library devices and activities on use of library materials and on the reading habits of pupils
4. Relation of the library to the study hall
5. Relation of the school library to the public library
6. Selection of books
7. Instruction in the use of books
8. Relation of teachers to the library
9. Training of librarians
10. Discovery of additional library procedures used successfully

J. M. Lee, "Needed Developments in Measurement for Secondary Schools," *Education*, LIII (March, 1933), 424-427.

1. Better tests
2. Training teachers in making and using tests
3. Constructing new-type tests based on the local course of study [This point has had great emphasis in current literature.]
4. More prognosis or aptitude tests
5. Tests which will measure outcomes other than factual elements
6. More tests
7. Better tests for vocational guidance
8. More reliable norms
9. Tests based on desired outcomes of instruction
10. Comprehensive batteries with comparable scores
11. Diagnostic reading tests

C. W. Odell, "Educational Measurement in the Secondary School," *Journal of Educational Research,* XXVI (October, 1932), 81-89.

1. Effect upon pupils' achievements and attitudes of the various types of measuring instruments employed and of the various conditions under which they are used
2. Effect of measurement procedures upon pupils, not only when the tests are employed and immediately thereafter, but at the end of the secondary school, through and at the end of the college program and thereafter
3. Better prediction of success
4. Critical study of present and future tests
5. Construction of new measures—prognostic test, unit test

W. C. Reavis, "Secondary Education as a Field for Research," *Phi Delta Kappan,* XII (June, 1929), 21-24.

1. The secondary-school curriculum, involving basic reorganization and improvement
2. Individual or type activities in the extracurricular field
3. Personnel administration, involving the school's responsibility for adjustment, attacked by the case method and through studies of marks, ratings, records, and measurements, to appraise conditions as a basis for determining changes in policy
4. School costs relating to unit costs of different subjects of instruction, subject failures, extracurricular activities, service organizations, and proportional distribution of costs among the different school functions
5. Controlled classroom experimentation to solve such questions as the size of class most economical in pupil learning, relative merits of different methods of conducting laboratory work in science, efficiency of different classroom techniques, and the relative worth of visual aids and reading materials as supplements to assignments in textbooks

P. M. Symonds, "Needed Research in the Field of Measurement in Secondary Education," *Journal of Educational Research,* XVI (September, 1927), 119-126.

A list of 80 problems under seven headings:

1. Characteristics of tests
2. New tests
3. Characteristics of mental growth of children of high-school age
4. Use of tests in teaching
5. Problems relating to marks, pupil placement, and program
6. Problems relating to the measurement of efficiency
7. Problems relating to prediction

"Looking Forward in American Secondary Education," *School Review*, XLIII (February, 1935), 82-86.

Urges investigation of:

1. The abilities, interests, activities, and opportunities of youth from twelve years of age upward
2. Optimum size of the secondary school
3. Improvement of instructional programs in small high schools
4. Improvement of the curriculum
5. Utilization of community resources on a coöperative basis for educational purposes
6. Determination of how well school officers and teachers can be trained to give guidance to pupils
7. Articulation of the senior high school and junior college
8. A new basis of standards for secondary schools

C. PRESCHOOL AND ELEMENTARY EDUCATION

F. S. Breed, "Special Methods in the Elementary School—Problems and Methods of Research," in "Methods and Techniques of Educational Research," *Review of Educational Research*, IV (February, 1934), 29-35.

1. Selection of the Activities of the Curriculum—Is social utility a valid basis for selecting the content of courses?
2. Gradation of the Activities—What principle or principles should be used in grading the material of the curriculum?
3. Organization of Units—How should curriculum content be organized for instructional purposes?
4. Direction of Learning
   - (*a*) To what extent should individual as opposed to group instruction be employed?
   - (*b*) Should instruction be incidental or systematic?
   - (*c*) What results are obtainable when pupils, courses, and methods—all three—are properly differentiated?
   - (*d*) To what extent should specificity as against generality of learning determine the method of instruction?
   - (*e*) Should instruction proceed through subjects or projects?
   - (*f*) Is the work-book superior to the textbook system of instruction?
   - (*g*) Should instruction be based upon the principle of acceleration or on the principle of enrichment?
5. Diagnosis and Treatment of Disability—What will be the contribution of diagnostic and remedial methods to elementary-school children?

6. Measurement of the Results of Instruction—How can improvement in the reliability and validity of standard tests be most expeditiously brought about? [This problem is discussed briefly in Chapter VII of the present volume.]

B. R. Buckingham, "The Public-School Teacher as a Research Worker," *Journal of Educational Research*, XI (April, 1925), 235-243.

Points out the benefit of research by teachers to the educational world, and to the teacher, with some problems needing investigation in arithmetic:

1. Should addition and subtraction combinations be taught together or separately?
2. To what extent may transfer of learning to higher decade addition and subtraction be relied upon?
3. What methods of teaching the addition combinations will best serve to prevent counting on the part of the pupils in getting the answer?
4. Should the combinations be taught in regular order?
5. If a broken order is used, to what extent is the difficulty of the various combinations a proper criterion for determining the order?
6. To what extent, in determining the order of teaching, should combinations be kept apart which have a common element?
7. What superiority, measured by results, is attained when pupils are given practice material evenly distributed over all the combinations?
8. How should drill be distributed in point of time?
9. How serious is an error made in giving a combination?
10. Myers pleads for imaginative problems set up with many words. Thorndike wants as few words as possible, as long as there is clear meaning. On what type of problem can children do best?

Bess V. Cunningham and Ruth Connor, "Suggested Experiments in the Field of Pre-parental Education," *Teachers College Record*, XXXIV (January, 1933), 285-301.

This analysis of high-school pupils' choice of home and family topics for inclusion in the curriculum suggests the following problems:

1. Organization of certain aspects of pre-parental education with problems of vocational guidance and personal adjustment
2. Further analysis of boys' preferences for home-economics study
3. Relation between child-care skills and child appreciation
4. Experimental teaching unit, for eighth-grade girls, based on suggested interest in personal responsibility in the family

5. Teaching material for ninth-grade girls aimed at acquisition of child-care techniques for immediate use
6. Material for same group aimed at development of appreciation of healthy childhood
7. Relative importance of career or marriage
8. Experimental teaching unit of social-science content concerning "home life in other lands" and "rules governing international trade"

W. S. Gray, "Problems for Scientific Investigation in Elementary Education," *Elementary School Journal*, XXIII (May, 1923), 654-663. Of course, much evidence has accumulated since this analysis was made.

1. How to reorganize the eight-year school into a six-year unit
2. Functional coördination of different administrative units
3. Analysis of elementary-school subjects to determine the most appropriate period in which to emphasize each important phase of subject-matter
4. Criteria for classification of pupils at various levels
5. Determine the advantages and disadvantages of departmental and traditional internal organization of schools
6. Relation of number of pupils per class to the efficiency of instruction
7. Costs of instruction per pupil
8. Pupil experiences which form the core of the elementary-school curriculum
9. Extent to which local conditions should influence the curriculum
10. Courses of study meeting the needs of pupils classified by ability
11. Analyses of the relationships between bodies of subject-matter, and experiments to determine the growth of pupils in knowledge, intellectual power, and skill under different principles of organization and presentation of subject-matter
12. Development and refinement of general and specific tests

W. H. Hughes, "Progressive Education and the Need for Research," *Educational Method*, XI (January, 1932), 197-201.

1. Determine what is really progressive
2. Variety of goals toward which education should strive
3. Ultimate goals and intermediate objectives of education
4. Tenable position on freedom of the learner
5. Lifelikeness of school situations
6. Qualities of personality requisite for vocational success, and educational situations productive of the same in students

7. Techniques for measurement of non-informational accomplishment
8. Discrepancies between the real and supposed in education
9. Post-rationalistic nature of innumerable and ambitious claims concerning new departures in education
10. Incompatibility of educational practices
11. Inarticulation between home and school, school and workaday world, and units in the school system
12. Principles of personnel management
13. Personal qualities of successful teachers
14. Content of the public mind
15. Informing the community concerning its schools

C. H. Judd, "Research in Elementary Education," *Journal of Educational Psychology*, XVII (April, 1926), 217-225.

1. Investigations into the typical characteristics of pupils of different ages
2. A study of the social institutions to which we introduce pupils of the school
3. Problems in arithmetic content and method
4. Reconstruction of the first six grades, following the loss of the seventh and eighth grades
5. The field of school administration
6. A study of the taxing system
7. The fundamental principles of human relations in the institution, involving personnel management, management of teachers, and management of pupils
8. The preparation of textbooks and other mechanical aids to instruction
9. The operations of the classroom

Elizabeth S. Moore, "Can a Teacher of Young Children Carry on Research?" *Childhood Education*, VI (January 1930), 197-200.

1. What do young children gain from playing in a social group?
2. How large may these groups be at progressive age levels?
3. The relation in young children of social adjustment and self-direction
4. Rôle of the teacher in fostering assertion and conformance
5. What play materials have most value for children of advancing age levels?
6. Values of playground apparatus?
7. Rôle of the teacher in introducing the child to various uses of materials

8. In what kind of environment do children express themselves freely in language, music, design, and construction?
9. How may the teacher foster the creative interest?
10. How foster appreciation?
11. Procedures of the adult when the child is eating
12. What adult methods enable a child to relax?
13. How acquire motor control and poise?
14. How may the parent be educated?
15. What data does research offer on the treatment of shyness, temper, fear, over-demonstrativeness, lack of perseverance, and unkindness?

Ruth E. Pearson, "Preschool Personality Research," *American Journal of Sociology*, XXXVII (January, 1931), 584-595.

1. Studies of play of preschool child in neighborhood groups
2. Variations in group behavior among children of the same age and analyses of the processes back of the behavior
3. What a given person does and feels in response to others in all group situations which he habitually meets
4. Results when the social codes and control techniques in two or more of the child's earliest groups are mutually complementary, and when they are conflicting

D. THE CURRICULUM

T. H. Briggs, *Curriculum Problems*. New York: The Macmillan Co., 1926. Pp. xiv + 138.

1. What are the desired ends of education?
2. What is "the good life"?
3. To what extent is it desired that education shall modify the character and actions of future citizens?
4. For which of the approved ends is the public school responsible?
5. What details of subject-matter can contribute to the desired ends of education?
6. What basis should be used for the selection of details of subject-matter?
7. What should be the content of each course of study?
8. What should be the plan of organization of the approved details of subject-matter?
9. What are the responsibilities of each unit of the school organization?
10. What psychology has a bearing on the curriculum?

11. What should be the distribution of the details of a course of study?
12. What is the relative importance of each course of study?
13. What is the best distribution of the time allotted to a course of study?
14. What is required by law or by other outside agencies?
15. How long should education be continued at public expense?
16. What is the optimum length of the school day and year?
17. What is the optimum number of subjects to be carried simultaneously by a pupil?
18. Which units of instruction should be required and which elective?
19. What lesson preparation at home can be secured from pupils?
20. What degree of mastery is demanded?
21. What are the possibilities of curriculum advance in the school community?
22. What are the possibilities of curriculum advance with the teachers of the school?
23. What are the possibilities of curriculum advance with existing buildings and equipment?
24. What are the possibilities with available textbooks?
25. What are the limitations imposed by administrative procedure?
26. What are the characteristics and the most probable future needs of pupils?

Harl R. Douglass, "Scientific Investigation of Instructional Problems," *Journal of Educational* Research, XXIX (October, 1935), 130-138.

Deals with field research involving the curriculum, methods of teaching, and tests

1. The selection and organization of materials of instruction
2. Techniques of assignment, exposition, and supervision of study
3. The measurement of learning and growth
4. Relationship between attendance and scholarship
5. The use of work-books instead of note-books, or in addition to textbooks
6. The effects upon achievement of different lengths of class periods
7. The difference in time of day for recitation periods, of number of class meetings a week, or of different lengths of school term
8. Reliability and validity of classroom tests
9. Item analysis of tests revealing the relative reliability, validity, and descriminative properties of individual test items and types of items

Henry Harap, "Next Steps in Curriculum-making," *Elementary School Journal*, XXXI (September, 1930), 16-24.

1. Assembling the results of studies of objectives into a coherent whole
2. Organization of the unit of work
3. Form of courses of study
4. Use of results of learning studies
5. Adapting instruction to individual differences
6. Grade placement
7. Time allotment
8. Evaluation of courses of study

A. K. Loomis, "Needed Research in the Curriculum," *Journal of Educational Research*, XXIX (October, 1935), 126-130.

Involving the historical method:

1. Well-kept records of actual teaching procedures
2. Case studies of pedagogical growth

Involving controlled experimentation:

3. Does the logical organization of subject-matter provide the most effective sequence of learning experiences?
4. If the activity movement abandons all attempts to organize the sequence of learning experience according to logical demands of subject-matter, what will be the results of this movement?
   (*a*) In the junior high school the wide use of fusion courses presents the issue in a slightly different form.
   (b) In the senior high school the use of problem courses raises the issue.

Shelton Phelps, "Curriculum Construction," *Peabody Journal of Education*, V (January, 1928), 223-229.

1. Principles of curriculum construction
2. Skills and phases of knowledge produced by present curricula
3. Unit tasks of each of the tasks for which public education strives to train
4. Amount of variation produced by different studies of the same problem, using the committee-conference method of curriculum study
5. Test experimentally all principles of curriculum construction
6. Best research method for curriculum study
7. Parts of various research methods best for a synthetic method of curriculum study
8. Checking results

Ethel I. Salisbury, "Needed Research in Course of Study Making," *Journal of Educational Method,* IV (June, 1925), 410-416.

1. Guarantees of efficiency in school subjects other than time allotments
2. Children's speaking vocabulary
3. Moral growth
4. Procedures in education that will produce better results in morals
5. Amount of moral growth accomplished in connection with activities
6. Universal experiences of the ten-year-old child, lending opportunity for honesty or dishonesty
7. Best type of school for moral growth
8. Mental age at which certain skills can be most economically learned
9. Basic experiences prerequisite to reading ability
10. Construction of materials related to basic experience, vocabulary, and the like of the intended age level
11. Necessity of nature study being related to reading
12. To what extent has research affected practice?
13. Test: (*a*) tendency to use large, loosely organized projects to give meaning to skills, (*b*) the tendency to analyze materials and then to arrange these in the order of their difficulty
14. Results of current educational systems and devices
15. Efficiency of the departmental program

A. S. Taylor, "Curricular Research Is Urgently Needed," *Junior College Journal,* III (February, 1933), 246-248.

1. Curricular aims should be obtained and evaluated
2. Do the aims meet community needs and sentiment or demands of remote agencies, *e.g.*, state universities?
3. Are the aims rooted in national or narrowly localistic and superficial educational philosophy?
4. Ascertainment of curricular offerings in public and private schools
5. Are curricular offerings governed by dictates of the community, higher institutions, or tradition?
6. Are enrolments in non-college preparatory or terminal curricula increasing or decreasing?
7. Differentiation in curricula designed for two groups in the leading junior colleges—students training for upper-division schools of arts and sciences and those training for professional schools

8. Analysis of course offerings to determine realization of aims, library facilities, and supplementary material available
9. Classification, indexing, and annotation of curricular experiments

Edward L. Thorndike, "Curriculum Research," *School and Society*, XXVIII (November 10, 1928), 569-576.

1. What is to be learned?
2. Uses of various elements of the curriculum
3. Concerning learners

C. W. Washburne, "Needed Research in Curriculum Building," *Journal of Educational Research*, XXI (March, 1930), 221-223.

1. Method in curriculum-making
2. Provision for individual differences
3. Means of socialization
4. Use of children's natural and specialized interests
5. Learning through development rather than acquisition
6. Integration of social and individual life

H. E. Wheeler, "Suggestions for Research on the Typography of School Textbooks," *Elementary School Journal*, XXIX (September, 1928), 27-31.

1. The point system, involving experiments on type size
2. Study of a few general classes of type-faces, involving styles generally used in books for adults, style in which the lines of the letters are of equal width (similar to the Copperplate Gothic), and the "display" faces
3. The space between lines of type, called leading
4. Line length considered in relation to size of type
5. An adequate measure of the quality of type, in terms of being horizontally condensed or expanded
6. Margins and paragraph indention
7. The effect of "natural" tinted paper on the eyes of pupils, and from the standpoint of hygiene the degree of opacity that is desirable
8. Use of hand-printed materials, when the size and shape of letters have never been specified for any given distance
9. Effect of soiled pages on the child

G. M. Whipple, "Needed Investigations in the Field of the Textbook," *Elementary School Journal*, XXXV (April, 1935), 575-582.

1. Is the textbook an unnecessary pedagogical adjunct?
2. Is it advantageous to replace a single set of one textbook with several sets of different textbooks?
3. What is the extent and the nature of the demand for master copies of material to be reproduced by duplicatory devices?
4. What are the merits—quality of material and cost per word being considered—of the very cheap, ten-cent-store type of books as compared with standard textbooks?
5. Why are school administrators averse to buying elementary-school books that deviate from the format of the typical textbook?
6. What is the validity, if any, of the increasing refusal of the schools to buy textbooks bearing a copyright date more than a few years old?
7. In what specific respects are textbooks too difficult for the learner? If vocabulary and style are primary considerations, how are the difficulties these present best determined and best obviated?
8. Can the tentative conclusions reached in the investigations of certain Boston publishers regarding optimal sizes of type and leading in Grades I and II be confirmed in higher grades?
9. What is the pedagogical value of illustrations, especially of colored illustrations, in school textbooks?
10. What do the schools really want for indexes in textbooks?

E. SCHOOL-SUBJECT FIELDS

R. R. Aurner, "The Status of Research in the Field of Business English," *Balance Sheet*, XV (November, 1933), 111-116, 144.

1. Definition and clarification of problems of prime importance
2. Construction of standardized objective tests for evaluation of teaching methods, effectiveness, performance, and student achievement

W. L. Beauchamp, *Instruction in Science*, Chapter VIII. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 22. Washington: Office of Education, 1933.

1. The size of a learning unit
2. The use of several textbooks
3. The committee method
4. The topical method
5. The use of scrapbooks, posters, and related materials
6. The use of guide sheets
7. The use of the pupil work-book
8. The unit method of instruction
9. Initiation of new work

10. The use of the project method
11. Lecture demonstration versus individual pupil experimentation
12. Methods of demonstration
13. Methods of recording laboratory exercises
14. The use of detailed or general laboratory directions
15. The use of visual aids
16. Training in scientific thinking
17. Testing the results of instruction
18. Types of pupil activities

G. H. Betts, N. L. Tibbetts, Blanche Carrier, and Jessie A. Charters, "Four Areas of Experimentation," *Religious Education*, XXIII (March, 1928), 229-239.

A. Religious Curriculum

1. Loose versus close grading
2. Range and type of information resulting from a specified curriculum
3. The curriculum conceived as types of experience for pupils
4. Proper sources of curriculum content
5. The function of worship in a religious curriculum

B. Local Church

A miscellaneous list of methods of improving a Sunday School

C. Teaching Methods of the Week-day School of Religion

6. Need and method of balance between discussion, worship, and some form of expression in a group of lessons on one theme
7. Balance between idealistic and materialistic or realistic material
8. Methods of questioning and discussion
9. Pupil participation in the learning experience
10. Principles governing inductive and deductive methods of lesson approach
11. Motivation
12. Adaptation of material to varying pupils
13. Function of home work, report cards, and memory work
14. The steps in creating a desire to learn

D. The Family

15. A plan of religious education in the home which will develop the religious experience without sanctioning outworn beliefs

O. W. Caldwell, "Research and Elementary Science Teaching," *Science Education*, XVIII (April, 1934), 65-67.

1. Accurate measurement of results
2. Criteria for selection of curriculum content
3. Grade placement of subject-matter

F. D. Curtis, "Some Contributions of Research to Practices in Science Teaching," *Science Education*, XVI (April, 1932), 266-273.

1. The determination through various analyses of the desirable and practical outcomes of classroom and laboratory work, as the logical and practical basis for investigations into the relative merits of a wide variety of teaching methods as means of securing these specific outcomes

2. Analyses for the purpose of determining a wider variety of profitable classroom, laboratory, and extra-classroom activities, devices, and practices distinct from teaching methods, with objective determination of the relative values of these

3. Construction of standardized group tests for measuring a large number of outcomes of instruction other than a knowledge of subject-matter

4. Synthetic curricular researches aiming to combine and utilize in an objective way the findings of miscellaneous related curricular studies

5. Further analyses of objectives looking toward the determination of the influences which science may exert in molding thought. Especially desirable in this connection are studies for the purpose of further determining and refining the major generalizations of science with their accompanying scientific attitudes and the methods by which these may most effectively and most universally be taught

C. A. Ellwood, "The Fundamental Research in Educational Sociology," *Journal of Educational Sociology*, VIII (September, 1934), 4-11.

1. Can public spirit, democracy, social intelligence, and social attitudes be taught in the schools?

2. Through control of learning situations, can any desired type of society be produced?

3. Can the experience of the past, the wisdom of age, and the lessons of history be imparted to youth and future generations?

Gertrude C. Ford, "Proposed Research by Business Education Associations," *Journal of Business Education*, IX (April, 1934), 21, 34.

1. Year-books in the content subjects of general and vocational business education at the different levels

2. Year-books in the professional areas for general material and higher aspects of business education

3. Ascertain the status of business education within the states for guidance purposes

V. A. C. Henmon, "Recent Developments in the Study of Modern Foreign Language Problems," *Modern Language Journal,* XIX (December, 1934), 187-201.

Seven fundamental questions, the solution of which rests upon adequate experimentation:

1. Who should and who should not study foreign language?
2. At what age should the study of a foreign language begin?
3. How long should it be continued, to yield profitable and worthwhile returns?
4. What should be the specific objectives of a two-year course, since 85 per cent or more of pupils study a language for two years or less?
5. What should the curriculum content of the two-year course be?
6. What methods are most effective in realizing the objectives of the two-year course?
7. What standards of achievement may be expected, and how should they be expressed?

L. T. Hopkins, "The Function of Research in Public School Home Economics," *Journal of Home Economics,* XXII (May, 1930), 358-364.

1. Defining aims
2. Determining content and method
3. Discovering outcomes
4. Training of teachers

G. C. Jensen, "Problems of Commercial Education," *Balance Sheet,* XI (February, 1930), 174, 178.

1. Relation of commercial community needs to commercial school programs
2. Placing of proper persons in jobs by means of high-school recommendations of fit students

C. H. McCloy, "Needed Research in the Field of Program in Physical Education," *Research Quarterly of the American Physical Education Association,* II (October, 1931), 78-84.

1. What objectives of physical education are significant to the pupil?
2. The individual
3. Criteria for instructional material
4. Application of principles of mechanics to progression in physical activities
5. Psychology of fundamental teaching procedure
6. Techniques of measurement, classification, and marking

Research in Unit Activities

7. The objectives of each activity
8. Pupil attitude toward the activity
9. Content of the activity
10. Organization of activity materials
11. Teaching procedure
12. Pupil activity
13. Measurement of results

Research in Organization

14. Studies of programs for varying individual needs
15. Group motivation

C. H. McCloy, "Research in Athletics for Girls and Women," *Research Quarterly of the American Physical Education Association,* III (October, 1932), 101-104.

1. Is any given athletic exercise or competition harmful to the health when conducted in a stated manner?
2. Same for intramural and interschool competition
3. Causes of harm in harmful exercises and competition
4. Determination of optimum strength for girls and women
5. Educational and emotional effects of athletic competition
6. Organization and teaching of activities having leisure-time carry-over values
7. Classification of pupils in terms of physical and emotional qualities
8. What are the fundamental skills of the educationally important activities?
9. How can these skills be best taught?
10. Studies in dynamic body mechanics
11. Scientific basis of scoring systems
12. Measurement of "athletic intelligence"
13. Measurement of present and potential physical status

J. W. Martin, "What Business Research Can I Do This Summer?" *Journal of Business Education,* IV (July, 1930), 17, 24.

Historical

1. Development of some particular commercial or manufacturing enterprise
2. History of a trade area
3. History of a navigation or other transportation enterprise
4. History of a coöperative society

5. History of a local chamber of commerce
6. History of drug-stores

Management

7. An analysis of the accounting system of some company
8. An analysis of the inventory system of some company
9. Family budget studies

E. G. Payne, "Research Problems and Trends in Educational Sociology," *Journal of Educational Research*, XXV (April-May, 1932), 239-252.

1. The relation of education to the problem of community health
2. The relation of standardized curricula, school activities, and methods of instruction to variations in local communities
3. The education of cultural and racial minorities
4. The school use of community resources
5. The use by the community of school resources
6. The control of education by social forces in the community
7. The use of leisure time in relation to the school
8. The relation of the school to crime prevention
9. The sociological significance of various curricular changes in the recent past
10. The sociological determination of curricular requirements by special studies of community needs

Anne E. Pierce and R. S. Hilpert, *Instruction in Music and Art*, p. 65. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 25. Washington: Office of Education, 1933.

1. (*a*) A comprehensive study of the art curriculum as it exists in secondary schools; (*b*) research on the extent to which knowledge and appreciation of art function in adult life; (*c*) the development of a proposed curriculum based on this research (A beginning toward this was made in Minneapolis in 1932)
2. A study of the influence of training on ability in art by comparison of paired groups of those who do not take art with those who take it in the high school (This study would also include a comparison of different methods of instruction.)
3. A study in methods to determine how to conserve self-expression and creativeness typical of the elementary-school child and still gain skill in technical values of which pupils in secondary schools feel need
4. Research in the psychology of self-expression, imagination, and creativeness, including analysis of these experiences, leading toward

the development of tests for their discovery in pupils, and experiments to determine methods to develop these qualities

> Dora V. Smith, "Diagnosis of Difficulties in English," *Educational Diagnosis*, pp. 265-267. Thirty-fourth Yearbook of the National Society for the Study of Education. Bloomington, Ill.: Public School Publishing Co., 1935.

1. There is urgent need of agreement upon the objectives of the teaching of English. Once determined, they must be stated with unmistakable clarity and broken into specific elements capable of measurement or evaluation. What, for instance, are the skills involved in the "ability to marshal evidence or facts concerning a problem under consideration"? What is implied in the term, *adequate vocabulary*, or *interesting style*, so far as speaking and writing are concerned? [There has been a gap between broad aims and specific learning activities.]

2. Studies of the relationship between such factors as health or social adjustment and success or failure in English are all but nonexistent.

3. Investigation is needed of the relationship between enriched classroom environment and the development of such powers of expression as adequate vocabulary and wealth of ideas. The sources of stimulation of creative writing are, for instance, practically unknown

4. Experimental evidence is as yet lacking to prove the superiority of concrete, purposeful situations for teaching writing and speaking over artificial exercises and drills.

5. With one or two possible exceptions, there are no diagnostic tests in English to-day that actually diagnose pupil difficulties. Studies are needed of (*a*) variation in performance due to the nature of the test used, (*b*) adequate mapping of the whole area of difficulty, (*c*) frequency of appearance necessary to adequate testing of an element, and (*d*) approximation in the test of actual language situations in speaking and writing.

6. Process analysis akin to that in arithmetic must be developed in the field of English if pupil difficulties are to be obviated by preventive teaching. What factors, for instance, are involved in the single process of learning to use the apostrophe to show possession or to indicate connection or relationship?

7. Instruments for analyzing power in composition are yet to be devised. What, for example, do we mean by *forceful style*, by *concrete diction*, by *a wealth of ideas*, and how can they be measured? What are the components of *ability to organize ideas*, and how can proficiency in it be tested?

8. Measures for oral composition approaching in objectivity those for written composition are necessary to the evaluation of methods of teaching in that field. Standards for articulation, rate of speaking,

variety of tone, and other elements of oral technique are unknown to the average teacher.

9. Scales or other instruments are awaited for the evaluation of results in certain functional centers of expression, such as the making of announcements, conversations, and creative writing. Determination of pupil progress in the writing of verse is impossible without standards of judgment more objective than those available at the present time.

10. Studies in the relative learning difficulty of items in English are almost non-existent.

11. Records must be made in the near future of the amount of practice in the actual expression of ideas the average pupil has in the classroom.

12. Best methods of eliminating errors in the mechanics of English have been the subject of a few investigations. The importance of oral emphasis in drill and the value of grammatical analysis as an aid in the correction of errors are problems demanding immediate attention.

13. Best methods of improving pupil control of sentence structure are urgently in need of investigation, in view of the difficulty inherent in mastery of the sentence.

14. The Iowa technique for recording oral speech in the classroom reopens for investigation the whole field of pupil errors in English. It likewise makes possible a new and constructive attack upon old problems—a study, for instance, of the gradual development of pupil control over sentence structure—and provides limitless possibilities for the study of pupil powers of organization and the coherent development of ideas. [This technique and the appropriate equipment were mentioned briefly in Chapter VIII.]

15. The problem of what is correct English usage has been little more than opened up by Leonard's studies in that field. Analysis of the actual writing and speaking of adults is still ahead. So also is the determination of the relative cruciality of errors.

16. Investigation of methods and content suited to the needs of pupils of varying levels of ability is of major importance in English, as it is in other subjects of study.

17. Grade placement of materials on the basis of relative difficulty of items and pupil use and progress in mastery of them at various levels of instruction are matters for earnest inquiry at the moment.

18. Problems of remedial instruction needing investigation include such factors as the relative value of motivated versus unmotivated remedial teaching, the relative effectiveness of individualized versus group instruction, and the extent to which pupils may be taught to assume responsibility for the diagnosis and remediation of their own errors.

19. Objective recording of the study techniques of pupils who are

successful and unsuccessful in various phases of English would do much to facilitate the program of remedial instruction.

20. Finally, check-lists and other devices for the objective recording of pupil attitudes and appreciations as revealed in concrete classroom situations are fundamentally important to the evaluation of certain of the most vital outcomes of the teaching of English.

> Dora V. Smith, *Instruction in English*, p. 88. Office of Education Bulletin No. 17, 1932. National Survey of Secondary Education Monograph No. 20. Washington: Office of Education, 1933.

1. What should be the relationship of high-school English to the general objectives of secondary education?

2. How far does the present program in composition and in literature meet the present or the future needs of adolescent boys or girls?

3. To what objectives other than mere correctness should the composition course contribute?

4. To what extent does the present program in English grammar influence speech and writing? What is its relative importance in an overcrowded program of instruction?

5. Granted that a pupil is of low intelligence and has but a year or two to remain in school, what program of English instruction will contribute most to his future welfare and efficiency?

6. What is preparation for college; that is, what are the actual demands of higher institutions? To what extent should they dominate secondary-school practice?

7. Is there a common body of literary material with which all pupils should be familiar?

8. What are minimum essentials and on what bases should they be selected?

9. Granted that the major objectives of the teaching of literature are breadth of experience and interests and a habit of lifelong association with good books, what literature content and what methods of classroom instruction are best calculated to achieve these ends?

> DeForest Stull, "Needed Studies in the Field of Educational Geography," *Teachers College Record*, XXXIII (February, 1932), 416-421.

1. What content for elementary schools is necessary for the realization of the citizenship aim?

2. What are the fundamental principles of geography?

3. What should be the grade placement of curriculum materials in geography?

4. What are the learning difficulties involved in the study of geography in the various grades?

P. M. Symonds, "Needed Research in the Teaching of English," *English Journal, College Edition,* XXII (June, 1933), 447-456.

1. List of the most frequent usages and errors
2. Identify and teach those important cues and guides used in learning, writing, and speaking habits
3. How are illustrations and models most effectively used?
4. Can we teach the application of grammatical and rhetorical rules without having the child learn them as such?
5. Improvement of reading habits of high-school pupils
6. Methods of instilling appreciation of literature
7. What factors are related to interest in literature?
8. Means of, and factors in, changing interest

Ruth Strang, "Health and Physical Education," "Special Methods and Psychology of the Elementary-School Subjects" number, *Review of Educational Research,* V (February, 1935), 53.

1. Continuous critical descriptive records of the development of programs of health and physical education in selected schools
2. Continuous study of pupils as suggested above
3. Intensive studies of relationships among factors such as health and scholarship, health and conduct, health habits and health knowledge, etc.
4. Experimental situations in which the outcomes of certain changes in procedures are recorded
5. Controlled classroom experiments in which the results of different methods and materials are compared
6. Controlled analytical laboratory experiments which furnish accurate facts on specific questions and suggest leads for classroom procedures

J. F. Williams and C. H. McCloy, "Problems for Further Study," *Research Quarterly of the American Physical Education Association,* II (March, 1931), 181-189.

1. What is the aim of physical education in college?
2. Objectives
3. Realization of these objectives
4. How important is exercise in the promotion of health?
5. Does exercise stimulate the growing child to increased growth and development?
6. Posture
7. What price athletics?

8. In the professional training curriculum, what are the real needs as opposed to the merely traditional ones?
9. Curriculum
10. State certification as related to the professional curriculum
11. Objectives of the teacher
12. Interests and attitudes of the pupils
13. Criteria for teaching material
14. Best content of teaching material for attaining the aims
15. Unit activity objectives
16. Pupil attitude toward given activities
17. Teaching procedure
18. What do we expect the student to do in a given educational situation?
19. Measurement of results
20. Effects of injuries to varsity and non-varsity athletes
21. Educational benefits of controlled athletics

The Development of the High-School Curriculum, Part II. Sixth Yearbook of the Department of Superintendence. Washington: Department of Superintendence, 1928. The following analysis is adapted from F. L. Whitney, *Methods in Educational Research,* pp. 47-50. New York: D. Appleton and Co., 1931.

Commercial Studies

1. The office and store occupations most frequently filled in the community by drop-outs and graduates from the school in which the course is to be used

2. The opportunities for employment in offices and stores open to beginners from the school with such amounts of general and special training as can be given in the high school

3. The positions to which beginners are promoted within a reasonable time after entering upon employment

4. The duties, traits, and responsibilities required in each of the beginning and promotional positions most frequently filled by drop-outs and graduates, with special reference to the details required by local employers and determined by the particular nature of the business and commercial life of the community

5. The sequence of subjects that will best prepare both drop-outs and graduates for the positions open to them at the time they leave school

6. The subject content and most effective classroom procedures in terms of learning activities and related traits that will function most effectively in giving abilities and appreciations needed in the characteristic beginning and promotional positions in the community

English

1. Nearly all previous "errors" studies should be repeated
2. The problem of how pupils organize what they have to say should be investigated
3. Grade placement should be examined
4. The measurement of achievement in composition should be attacked
5. How far school instruction carries over into writing and speech should be determined
6. Material and practice tests for work reading should be experimentally constructed

Home Economics

1. What to teach—what skills, information, appreciations, and attitudes should be developed in girls who are living in parent homes but soon will be wage earners and later home-makers?
2. How to select—values in curriculum materials, for case groups?
3. How to arrange the materials—means and methods for unifying home economics?
4. How to measure—means of measuring the functioning of home economics?
5. How to relate—an understanding of the part of home economics in the education of both boys and girls?

Mathematics

1. Do we need curricula differentiated on the basis of intelligence levels? Precisely what things mathematical can pupils having low intelligence do with a reasonable degree of success? [Ability grouping was discussed in 1936 by the National Society for the Study of Education.]
2. What is commercial arithmetic? Who needs it? Who can pursue it successfully?
3. What do pupils taking the industrial-arts curriculum need that is to be found in the newer courses for the junior high school?
4. What is the relative effectiveness of the different types of practice materials used to establish skills in the junior high schools?
5. What are satisfactory degrees of mastery for the fundamentals of arithmetic?
6. If the present low level of mastery of the fundamentals of arithmetic manifested in the senior high school is not sufficient, how shall the courses of the senior high school be reorganized to build up the skills?
7. Do pupils who study the newer courses in the junior high-

school succeed better in a course of demonstrative geometry of the senior high school than do pupils trained in conventional courses?

8. What are the criteria for a desirable test of algebra?

9. How effective are the various classroom techniques for teaching the skill of problem solving in algebra?

10. How does the individualized plan for teaching the skills compare in effectiveness with the older group method?

11. To what extent can teachers with the usual heavy load do remedial work?

12. How large must a school be before it can afford a "hospital" room in mathematics throughout the school day?

Science

1. Determination through various analyses of the desirable and practical outcomes of classroom and laboratory work, as the logical and practical basis for investigations into the relative merits of a wide variety of methods, including the individual laboratory and the demonstration, as means of securing these specific outcomes

2. Analyses for the purpose of determining a wider variety of profitable classroom, laboratory, and extra-classroom activities, devices, and practices distinct from teaching methods, with objective determinations of the relative values of these

3. Construction of standardized group tests for measuring a large number of outcomes of instruction other than a knowledge of subject-matter

4. Investigations to discover other perhaps more satisfactory and effective bases for grouping and sectioning pupils for class work and for experimentation in the teaching of science than intelligence or rate and comprehension of silent reading

5. "Synthetic" curriculum researches aiming to combine and utilize in an objective way the findings of miscellaneous related curriculum studies

6. Further analyses of objectives looking toward the determination of the influences that science may exert in molding thought

Social Studies

1. What peculiar purpose or objective should characterize the program of social studies in the secondary school?

2. How can the program of social studies in the senior high school be articulated with similar programs in the elementary and junior high school?

3. What end does the school contemplate, child needs or adult needs? Or both?

4. Should the merits and deficiencies of contemporary life be studied by senior high-school pupils, or should the courses be merely informative—descriptive sociology? Or should they be interpretative?

5. How should the materials of the social studies be organized to insure the development of critical informed students of societal needs?

6. To what extent can the particularized items—knowledges, skills, meanings, generalizations, appreciations, attitudes, and ideals—be determined objectively?

F. Educational Psychology and Measurement

H. H. Anderson, "Research in Mental Hygiene," *Childhood Education*, VII (April, 1931), 423-427.

1. What is the relation between childhood and adolescence with regard to personality development of school children?

2. Does departmental teaching render unnecessary and impossible the consideration of personality development of school children?

3. What is the cost to the mental health of the children of the school's failure to develop personality?

4. Are there more infractions (gum-chewing, unpermitted talking, shooting paper wads, writing notes) of this nature among junior high-school pupils than in lower grades?

5. Are these problems more serious for adolescents?

6. Reaction of the child to departmental organization

7. Are whispering, unpermitted talking, and writing notes evidences of thwarting of integrative processes by teachers or by the system?

8. Effects of "up-to-date" teaching methods on the mental hygiene of the child

9. Pupil reactions, inferiority feelings and the like, to "special classes"

Hugh Hartshorne, "Present Status of Research in Character Education," *Religious Education*, XXV (June, 1930), 551-554.

1. Utilization of words as tools of character education
2. Permanence of results of character education
3. Transfer of character-education values

B. R. Buckingham, "Fundamentalism in Research," *Journal of Educational Research*, IX (April, 1924), 331-334.

Believes there has been a tendency toward shallowness among research workers, who should apply sustained effort until fundamental results are secured. Mentions some problems for careful investigation:

1. Transfer of training as a condition of learning

2. The learning types of children
3. Forgetting and the distribution of recall
4. Whole and part methods of learning
5. The curve of work during a particular period
6. The learning curve over successive periods
7. Fatigue
8. Motivation
9. The meaning of the law of age of associations
10. The rôle of the teacher in controlling these processes

R. G. Foster, "Objective Methods of Sociological Research Generally Applicable to Child Development Studies," *Journal of Educational Sociology*, IX (October, 1935), 79-87.

Covers needed research in the sociology of childhood:

1. Sociological techniques and methods of child study
2. Historical and comparative studies of the child in society
3. Studies of the social attitudes and personality of children
4. Social problems, pathology, and adjustments of childhood
5. The social organization and institutions of childhood
6. Population, ecological, and demographic studies of childhood
7. Conflict and accommodation groups of childhood

V. A. C. Henmon, "Needed Research in the Field of Learning," *Journal of Educational Research*, XI (May, 1925), 313-321.

1. Preschool learning
   (*a*) Conditioned reflex
   (*b*) Instructive and emotional responses
   (*c*) Innate and acquired tendencies
2. Psychology of learning in general
   (*a*) Learning curves of school activities
   (*b*) Continuity studies of learning
   (*c*) Distributed repetitions
   (*d*) Overlearning
   (*e*) Forgetting
3. Psychology of learning school subjects under school conditions

L. T. Hopkins, "Exploring New Areas of Measurement," *Curriculum Journal*, VI (May 22, 1935), 22-25.

Assumptions in a new type of measurement are:

1. An intellectual heritage variable with the environment and maturity of the individual with emphasis upon experimental selection of meanings, generalizations, and techniques

2. An increasing control over learning by the learners

3. A fragment of experience can be adequately measured only in relation to other fragments which form the emerging whole experience [This involves certain concepts of Gestalt psychology.]

(*a*) The purpose of the individual
(*b*) The interests of the individual
(*c*) Control over experience
(*d*) Criticized values

New forms of measurement which must be given greater weight are:

1. Teacher's observations of the general behavior of pupils
2. Diary accounts of the development of complete experiences
3. Records of work proposed and accomplished by individuals
4. Teacher's records of instances of emotional instability or stability of individuals
5. Teacher's records of lack of coöperation
6. Teacher's records of instances of lack of social stability or control of social adjustments
7. Performance of children in coöperative group activities involving the utilization in modified form in a new setting of the learnings acquired in some previous experience

F. H. Lund, "Educational Research in the Field of Emotion," *Educational Record,* XII (April, 1931), 138-143.

1. Analyses of conditions surrounding those students whose achievement falls below the norm for their intelligence level
2. Is interest, or drive, or incentive an acquired or native trait?
3. Determination of the relative effectiveness of different forms of motivation in use in the school-room
4. Understanding of the autonomic nervous system
5. To what extent is education motivation and connection forming?

Mapheus Smith, "Suggestions for Sociological Research in Child Development," *Journal of Educational Sociology,* IX (October, 1935), 105-110.

Preschool Period

1. A study of the conditioning factors in home life
2. Amount and quality of differences in development of preschool children reared in orphanages and at home
3. Differences in development of preschool children of different social classes
4. A study of the requests of preschool children in middle-class families—what they ask for or ask to be allowed to do; correlation of the requests with the cultural exposure of the child, to determine to

what extent requests of young children are contingent on cultural influences, and to what extent on purely original and individual factors [This area is shared by sociology and psychology.]

5. A study of disobedience of young children, in order to determine at what points resistance to patterning of behavior appears, and under what conditions

6. Relation of nursery-school experience to development of social traits in children

7. Study of social processes by which undefined organic processes of the newborn infant become human nature

Adolescence

1. Differences in sophistication of children of different class and community backgrounds

2. The effect of puberty upon social relationships

3. The effects of institutional changes upon the personalities of children of junior and senior high-school age

4. A systematic study of social problems of adolescence, suggested under the following heads:

   (*a*) The study of the new worlds to which the adolescent must adjust

   (*b*) A study of the definitions and interpretations which are made of these worlds

   (*c*) A study of the manner in which adjustments are made

   (*d*) A study of specific adjustments to objects and situations, *i.e.*, institutional obligations, sex behavior, courtship, etc.

   (*e*) A study of the life pattern and personality traits built up as a result of these serial efforts at adjustment

Entire Age Range of Child Development

1. Comparisons of orphanage and non-orphanage children

2. The effect of the order of birth upon personality

3. The impact of the pecuniary resources and organization of the family and neighboring families on the maturing personality of the child (This may be broken up into more specific problems, such as the child's maturing needs for money and the sources of these needs, family "sets" towards money, the process of organizing his outlook on his world in terms of his spending resources, and social stereotypes as to kinds of orthodox expenditure.)

4. Effects of shifting of economic class lines in depression periods on personality of the children involved

5. The effect upon the child of shifting relationships growing out of the father's inability to support the family

6. Experiences with the fact and idea of death, and their subjective and objective effects on children

7. The extent to which the expectancy of others, both children and adults, influences the interests and actions of children

8. A series of investigations in different centers covering such points on the employment of youth as (*a*) the age at which, and characteristics of the position in which the child's adjustment is greatest; and (*b*) the alternatives to employment which are most and least closely related to satisfactory adjustment

9. Relation of social and emotional problems of children to the number and variety of social contacts they make with social agencies and institutions, with social groups, and with industrial and street life, both within and outside of their own communities

10. Origin, nature, and development of social concepts in children

11. Attitudes of children towards certain selected laws

12. Further studies of children's imaginary companions

13. Further comparative studies of the development of identical twins separated before the age of six months and placed in foster family homes

14. Further study of the effects of foster home placement on personality

15. A comparative study of the rearing and development of children of deaf-mute parentage and of children of normal hearing parents of the same social class and local community

16. The comparative speed of development in social learning and sophistication of white and Negro children in order to learn more about race differentials in development

17. Further studies of conditions under which delinquent and criminal tendencies, moral ideas, moral habits, and strength of character develop

18. A study of antisocial traits of juvenile delinquents in relation to family and neighborhood backgrounds

19. Studies of the development of tendencies to lead, to follow, to originate, and to imitate

20. Development of in-group consciousness in children

21. Observational and experimental studies of the effect of face-to-face, sympathetic interaction upon the development of personality

22. Development of tendencies to play group rôles

23. Further studies of sex differences at various ages, especially through adolescence, with a view of determining the effect of the rôle of each sex in determining sex differences

24. Studies of race differences in the production of persons with ability and personality for outstanding leadership, including studies of Negro children of superior intelligence, after the manner of the Stanford studies of gifted children

25. Methods of obtaining coöperation and socialization
26. Methods of obtaining morale, rapport, and *esprit de corps*, and the methods of inculcating traditions
27. Means of transmission of customs and mores to the younger generation
28. The extent to which psychopathic tendencies are the result of experience and environmental factors

P. M. Symonds, "Needed Research in Diagnosing Personality and Conduct," *Journal of Educational Research*, XXIV (October, 1931), 175-187. A list of 205 problems under 14 main headings.

1. How reliable is a test, questionnaire, or other device for securing information regarding personality and conduct?
2. What conditions affect reliability?
3. How valid is a test, questionnaire, or other device for securing information regarding personality and conduct?
4. What is the effect of changing some elements of the situation in any one of the diagnostic techniques considered? What is the influence of various factors on test results?
5. What is the relation between various measures and estimates of personality, conduct, emotion, etc.?
6. What are the possibilities for improving the various diagnostic techniques?
7. What qualities are necessary for success in the investigation?
8. The development of new tests, questionnaires, and other devices
9. What is the distribution within a group of amounts of a trait, interest, attitude, adjustment, etc.?
10. The problem of framing items, questions, etc.
11. The problem of selecting items
12. The problem of weighting items
13. The problem of scoring
14. Differences between groups—sex, age, race, grade, environment, etc.

W. L. Uhl, "Some Neglected Aspects of Educational Measurement," *Journal of Educational Research*, XXVII (December, 1933), 241-246.

1. Problem solving
2. Social competence
3. Creative ability
4. Esthetic experiencing

G. B. Watson, "Needed Investigations in the Psychology of Character," *Religious Education*, XXIII (January, 1928), 66-72.

1. Elimination of useless educational research
2. Investigation of methods of research
3. What are the values and limitations of field and laboratory data?
4. Shall research consist primarily of intensive work in certain fields or of comprehensive forms in broad fields?
5. What are the defects and values of the psychoanalytic method using free reverie, formal interview, and questionnaire?
6. How trustworthy are personal, subjective data?
7. Use of data
8. How shall differences between methods, experimental factors, and the like be stated?
9. Repetition of important experiments
10. What childhood factors most likely lead to shyness?
11. Consequences of sparing the rod, of stern fathers, fondling by mothers, good marks in school, of membership in a despised minority group
12. General factor of character comparable with Spearman's factor of general intelligence [Factor analysis, including references, was discussed briefly in Chapter X.]
13. Relation of reactions to musical forms to innate ability and training
14. Is martial music organically or conditionally stirring?
15. Analytical comparison of the explanations of anger offered by John B. Watson and by McDougall
16. The causal factors behind concomitant learning
17. Causes of prejudice
18. Factors leading to unusually brave, cruel, self-indulgent, socialized, or sensitive national groups
19. Analysis of factors associated with self-denying groups and with groups given to immediate gratification of impulses
20. Methods of training against playing in the street
21. Shall scolding, spanking, explanation, visits to hospitals, electric shocks, honor systems, mild accidents, or a combination of such be recommended?
22. Immunization against propaganda
23. Validation of techniques in group thinking
24. Relationship between type of task and size of group
25. Conditions prerequisite for group intelligence
26. Reintegration of the forces of divisions of the community and congregation

"The Outlook in the Measurement of Interests," *Personnel Journal*, IX (August, 1930), 176-183.

Fifty-one problems listed under:

1. The development of interests and their foundations in training and inheritance
2. Interests and achievement
3. Improving the interest inventory and its scoring
4. Developing norms for the interest inventory
5. Objective methods of measurement
6. The rating scale
7. Interests of abnormals
8. Social, racial, and geographic differences in interests
9. Special guidance problems

G. SUPERVISION

A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, Chapter VIII. New York: D. Appleton and Co., 1931.

1. Objectives of education
2. Data-gathering devices of supervision
3. Factors conditioning the progress of school pupils
4. Development of standards of practice
5. Principles of learning, teaching, and supervising
6. Translation of the principles of learning, teaching, and supervision into learning, teaching, and supervising practices
7. Improvability of teachers
8. Relative effectiveness of various supervisory devices
9. Evaluation of the products of supervision
10. Relative effectiveness of different methods of organizing practice
11. Relative effectiveness of different modes of integrating theory and practice
12. Psychology of skill in teaching
13. Applicability of the laws of pupil learning to learning to teach
14. Trait differences between teachers and other groups of professional workers
15. Factors influencing the attitude of teachers toward supervision
16. Motivation of supervision
17. Spread of training in supervision
18. Factors conditioning the achievement of school pupils
19. Characteristic differences in the teaching performance of good and poor teachers

20. Characteristic differences in the supervisory performance of good and poor supervisors
21. Individual differences in teaching ability
22. Errors, shortcomings, and difficulties of experienced and inexperienced teachers
23. Methods of educational diagnosis as applied to classroom supervision

A. S. Barr, "Planning the Year's Program," *Journal of Educational Research,* XXII (September, 1930), 140-141.

1. The objectives of education
2. Selection and organization of subject-matter
3. Nature of learning
4. Provision for individual differences
5. Learner's attitude
6. General welfare of school children
7. Social, emotional, and character factors
8. Measurement

A. S. Barr, "The Scientific Study of Classroom Supervision," *Journal of Educational Research,* XXII (October, 1930), 219-222.

1. Scientific conception of the program of supervision as a whole
2. Validation of data-gathering devices
3. Mental processes involved in the different types of learning to teach
4. Relative effectiveness of different training programs in supervision
5. Objective means of measuring the results of supervision

A. S. Barr, "Needed Research in Classroom Supervision," *Peabody Journal of Education,* V (January, 1928), 209-215.

1. Specific information about the thing to be improved
2. More information about the validity, objectivity, and reliability of the items of teaching observed by supervisors
3. More information about the probable effectiveness of different training programs
4. Experimentally determined principles of teaching
5. More information about the improvability of teachers
6. More information about the relative effectiveness of various improvement (supervisory) devices
7. More exact measures of teaching ability

T. H. Briggs, "Supervisory Experimentation," *School Review,* XLI (December, 1933), 737-746.

Certain of the problems listed are of value for practical supervisory purposes rather than to contribute new facts or generalizations.

1. Extent to which explanations of assignments are understood by pupils
2. A traditional form of assignment versus one in which the values of the expected work are stressed
3. Value of topic assignments to small groups organized with a pupil chairman to prepare extended reports
4. Effect of a written list of key questions which can be answered by study of the textbook and supplementary materials
5. Value of problems and issues selected from current developments in business, industry, government, etc.
6. Merits of a pupil-discussion versus a textbook-recitation procedure
7. Evaluation of directed study
8. Effect of hearing a radio while studying
9. Comparison of written work prepared at home with that done at school
10. Case study of pupils in academic difficulties and effect of special coaching on them
11. Value of work-book tests over units of instruction as directions for study and as self-administered measures of achievement
12. Effectiveness of diagnostic tests followed by remedial teaching
13. Effect of knowledge of progress on accomplishment
14. Value of additional readings in science as compared with using the same amount of time for writing up experiments
15. Comparison of textbook-demonstration, and textbook-experimentation (by pupils) methods in science
16. Value of voluntary laboratory work
17. Effect of frequent short drills on work covered
18. Comparison of drill involving the reaction of one pupil at a time with drill requiring responses from the entire group
19. Comparison of rigid examinations each six weeks with daily oral drills in French classes

S. A. Courtis, "Problems in the Appraisal of Supervision," *Educational Administration and Supervision,* XV (April, 1929), 269-278.

1. Measurement of the amount of supervision teachers receive
2. Measurement of the changes produced in teachers by the supervision received

3. Measurement of the effect upon the children by the changes in the teachers produced by the supervision

> Bessie L. Gambrill, "A Critical Review of Researches in Supervision," *Educational Administration and Supervision*, XV (April, 1929), 279-289.

1. Studies of specific supervisory activities other than measurements
2. Psychological factors having to do with supervisor-teacher and teacher-pupil relationships
3. Home and community participation as a means of realizing supervisory objectives
4. Status of supervisors and of programs for their adequate professional training
5. Variations in supervisory activities to provide for individual differences in teachers

> Bess Goodykoontz, "The Scientific Method and Creative Supervision," *Educational Method*, XIII (May-June, 1934), 385-390.

1. Improvement of teachers in service
2. Curriculum construction
3. Reference materials for use with the problem-solving technique
4. Increased enrolment and its attendant problems
5. Teaching load and teaching assignments

> M. C. S. Noble, "A Research Program for Rural School Supervisors," *Certain Phases of Rural School Supervision*, pp. 12-15. Bureau of Education Bulletin No. 28, 1929. Washington: Bureau of Education.

1. Relative status of educational opportunities in the county as compared with those of the nation and state at large
2. Research to determine a solution of local problems
3. Research for purposes of self-analysis and self-improvement

> *Current Problems of Supervisors.* Third Yearbook of the Department of Supervisors and Directors of Instruction of the National Education Association. New York: Teachers College, Columbia University, 1930. Pp. viii + 252.

The 1682 problems fall in major groups as follows:

A. Aims and methods of teaching
   1. Interpretation of objectives
   2. Developing social traits through pupil participation
   3. Helping pupils evaluate their own work
   4. Desirable methods

5. Developing integrated units of subject-matter
6. Criticism of teaching observed
7. Observation upon request
8. Classroom demonstrations for teachers
9. Diagnosis of teaching difficulties
10. Evaluation of outcomes of instruction
11. Use of standard objective measurements
12. Use of informal objective measurements
13. Individual needs and difficulties
14. Adaptation to pupil needs

B. Instructional materials, supplies, and equipment
15. Selection
16. Preparation
17. Interpretation
18. Provision
19. Suggestions concerning use

C. Classroom organization
20. The economical use of time and effort
21. The economical use of materials
22. The organization of pupil groups
23. Teacher and pupil responsibility

D. Professional growth in service
24. Constructive teachers' meetings
25. Capitalizing best methods of teachers
26. Coöperative curriculum revision
27. Professional growth, advancement
28. Experimentation
29. Improvement of limitations, professional and personal
30. Articulation of coördinating agencies
31. Administrative features of supervision

The Superintendent Surveys Supervision, Chapter VII. Eighth Yearbook of the Department of Superintendence. Washington: Department of Superintendence, 1930.

1. Consideration of the supervisor's philosophy of the job and of his skill
2. Use of teacher-rating blanks to measure improvement in teaching
3. Measuring changes in teaching method and skill
4. Measuring changes in levels of teaching
5. Elimination of errors in teaching procedures
6. Elimination of teachers' difficulties

7. Evaluation of supervision through semi-objective rating devices
8. Improvement in the character of the materials of instruction
9. Objective analysis of activities in the classroom
10. Objective analysis of characteristics of pupil behavior as indices of the quality of instruction
11. Miscellaneous techniques

H. SCHOOL ADMINISTRATION

Carter Alexander, "Opportunities for Research in Educational Finance," *Educational Administration and Supervision,* IX (April, 1923), 209-222.

1. What are the available materials in a given unit, as a state or the city school systems of a state, and to what important uses may such materials be put?
2. Just what practical and reasonably attainable changes are needed in records, reports, methods of reporting, time of making the budget, and the like, of a given unit as a state or the city systems of a state, to make the fiscal data thoroughly useful and why?
3. What are the needed new techniques for securing valuable results from data already available?
4. What prediction techniques are needed?
5. How do certain educational fiscal policies really work?
6. What can a given fiscal area afford to spend for schools, considering its resources and its other civic needs?
7. What are the possible and practical economies?
8. How can adequate funds for education be raised?

Carter Alexander, "Research in Educational Publicity," *Teachers College Record,* XXIX (March, 1928), 479-487.

Agents

1. Comparative results of various publicity organizations

Media

2. Relation of desired responses from the public to the issuance of measured quantities of school publicity of determined standards

Administration

3. Relative values of campaign and continuous publicity
4. Sources of financial support for school publicity
5. Legality of tax receipts for publicity

6. Costs, actual and estimated, of publicity programs
7. Proper use of pupils in publicity

W. G. Carr, "New Angle of Attack Needed in Class Size Research," *Nation's Schools*, X (November, 1932), 27-30.

1. Effect of large classes on pupil health
2. Effects of more classes or longer periods on the teacher, pupils, and instruction
3. Effect of large classes on mental hygiene of pupils
4. Do teachers in small classes know their pupils better than teachers in larger classes, and, if so, how do they utilize this knowledge?
5. Parents' preferences for large or small classes and reasons for them
6. Effect of large classes on failure, retardation, and acceleration
7. Views of practising physicians, psychologists, and psychiatrists on the class-size problem

M. M. Chambers, "Needed Studies in Educational Administration," *Educational Administration and Supervision*, XIX (April, 1933), 268-274.

1. Statutes and judicial decisions in every state governing the employment policies of the public-school corporation, including such topics as:
   (*a*) Religious prejudice
   (*b*) Partisan prejudice
   (*c*) Nepotism
   (*d*) Exclusion of married women
   (*e*) Teachers' tenure acts
   (*f*) Teachers' retirement systems

Further Problems

2. Relation of education to unworthy interests in business and politics
3. Limitations upon the application of principles of business and industrial management to the problems of educational administration [Can a school be operated like an office or a factory?]
4. Should education be one of the major coördinate departments of government, along with the executive, judicial, and legislative branches?

O. L. Chapman, "Six Problems in Education," *Nation's Schools*, XIV (December, 1934), 17-18.

1. Restatement of objectives
2. Revamping of tax systems
3. District reorganization
4. Teacher training
5. Public relations and education of the public to the program of the school
6. Planning for the school plant

T. C. Holy, "Needed Research in the Field of School Buildings and Equipment," in "The School Plant," *Review of Educational Research,* V (October, 1935), 406-411.

There has been little research in the field of school buildings and physical equipment. The broadened curriculum, the more active methods of learning, and emphasis upon doing and working with things rather than merely studying books—all have focused attention upon the importance of physical environment and the supply of materials necessary for this changed type of work. In general, the problems in the school-plant field fall into two major divisions:

1. Those problems concerned with the functional planning of school buildings and equipment to serve better the actual instructional and recreational activities of the school
   (*a*) Space provisions necessary for various school activities
   (*b*) A definite basis for determining the amount of space which should be allowed for non-instructional parts of the building, such as corridors, toilets, offices, storage, and similar areas
2. Financial problems concerned with the efficient and economical construction, maintenance, and operation of the school plant—the effect which the size of the building and type of construction have upon operation and maintenance costs
   (*a*) Is the money spent for a modern school building justified or would a cheaper and less elaborate building do just as well?
   (*b*) How important is the school plant to the school program, and in what features and to what extent do a building and equipment affect the efficiency of teaching?

More detailed problems relating to buildings and equipment are:

1. Reliable methods of determining the room requirements for a given program (New York state has made considerable headway in meeting this problem for its own program.)
2. Size of school sites (These need to be determined on the basis of the recreational program.)
3. Flexibility in the design and construction of school buildings (This problem is increasing in importance due to developments in curriculum and teaching methods. A school building has a life of fifty

to seventy-five years and unless it is of a flexible type, it either thwarts educational development or has an early obsolescence.)

4. Expansibility so planned that additions can be most easily and economically made without destroying the unity of the building
5. Factors which contribute to obsolescence
6. Lighting, both natural and artificial
7. Toilet requirements
8. Studies of building utilization
9. Location and plans of different types of rooms
10. Best building materials, when cost and utility are considered
11. Multiple use of rooms and equipment
12. Acoustics of classrooms, libraries, and auditorium
13. Arrangement and types of equipment
14. Effect of good school buildings and equipment on educational achievements
15. Methods of calculating unit costs of school buildings
16. Effect of expenditures for capital outlay upon the school budget and upon the curriculum (This question is particularly pertinent in small communities. New buildings may furnish a stimulus to the support of an enlarged educational program or there may be a tendency to pay for the new building by savings made at the expense of teachers' salaries, supplies, or other current expenditures.)
17. State and city organizations responsible for the planning, erection, maintenance, and operation of school buildings
18. School plant insurance, ratio between premiums and losses according to types of building construction, self-insurance plans, effect upon insurance rates of elimination of fire hazards
19. Continued studies of school ventilation

G. N. Kefauver, "Proposals for a Program of Evaluation of Guidance," *School Review,* XLII (September, 1934), 519-526.

1. Measurement of the need for guidance
2. Analysis and description of practices with relation to objectives of guidance
3. Comparison of practices in a school with a "standard" program
4. Comparison of characteristics of pupils before and after experience in guidance
5. Measurement of characteristics of pupils after having had the advantage of guidance service
6. Comparison of characteristics of pupils under various types of guidance service
7. Comprehensive investigation which follows a group of pupils through a well-planned program of guidance and makes careful measurement at each grade level

G. N. Kefauver and H. C. Hand, "Needed Research in Guidance," *Junior-Senior High School Clearing House*, VIII (September, 1933), 40-42.

1. To what extent are the interests and behavior of students of different types affected by experiences in the various courses?
2. Systematic analyses of the need for guidance
3. Definition of problems of guidance
4. Discovery and invention of new methods in guidance
5. Effect of existing guidance procedures

U. L. Light, "Muddling Through from Guess to Science," *Educational Review*, LXVIII (June, 1924), 5-9.

1. Kindergarten administrative problems
2. Departmental teaching
3. Annual or semi-annual promotion
4. Class size

S. S. Majo, "Neglected Phases of Ability Grouping in High School," *American School Board Journal*, LXXXI (July, 1930), 48.

The author suggests that in future experiments on homogeneous versus heterogeneous grouping the following two phases, heretofore neglected, be considered:

1. Differentiation of subject-matter
2. Adaptation of teaching methods

J. C. Morrison, "Problems for Investigation in State School Systems," *Nation's Schools*, XIII (April, 1934), 37-40.

A summary of problems needing investigation, from the annual reports of state education departments. The first fifteen appeared three or more times, and the last twelve one or two times.

1. Investigations to secure a more uniform accounting as a basis for the general improvement of specific administrative practices
2. Studies to secure a more adequate local administrative organization or for the general improvement of specific administrative practices
3. Local studies of school-building needs as a guide for responsible local school authorities
4. Investigations to show the inequalities in educational opportunity or to discover a more equitable basis of educational support
5. Diagnostic and remedial testing programs to improve the instructional program in elementary schools
6. Studies of the junior high school and of the small high school looking toward more effective organization

7. Standardization and surveys of the one-room school as the basis for its improvement or as a step toward its elimination

8. Studies of the educational needs of handicapped children—mentally retarded, crippled, blind, with limited vision, deaf, with limited hearing, with defective speech—as a basis for providing or improving an educational program

9. Personnel studies—salaries, qualifications, experience, tenure, certification—as a basis for the improvement of the personnel service

10. Studies of teacher supply and demand

11. Studies looking toward a more adequate control or administration of state textbooks

12. Surveys of local schools or school systems as a basis for the improvement of the educational program

13. Studies of transportation

14. Guidance studies

15. Surveys of state educational or quasi-educational institutions

16. A critical study of the economic and social conditions underlying the high-school program in Georgia

17. An investigation of the junior-college movement throughout the country with special reference to the junior-college needs of Utah

18. A survey of the agricultural problems in agricultural high-school communities in Oklahoma

19. The time lost by teachers on account of illness in Florida

20. The holding power of elementary schools in Oklahoma

21. Overlapping in courses of study in Ohio

22. The cost and administration of county traveling libraries in Florida

23. The work of high-school parent-teacher associations in Florida

24. Effects of educational practice upon pupil learning in Virginia

25. A study of the value of supervision in the rural schools of Missouri

26. A study of the ways in which school art could serve industry in Massachusetts

27. A survey of health conditions of 2,000 crippled children in Wisconsin

P. R. Mort, "A Forecast of Future Research in Financing of Education," in "Finance and Business Administration," *Review of Educational Research*, V (April, 1935), 165-170.

1. Efficient and economical operation of schools, involving studies of salary schedules, class size, unit costs for categories of service, efficient local tax districts, budgeting, and auditing

2. Local taxing power versus centralization, involving studies of local initiative and dangerous by-products of necessary centralization

3. Productiveness of education, involving studies of returns for money spent, economic value of education, and taxes based on benefit received

P. R. Mort, "Needed Research in the Field of State Aid," *Teachers College Record,* XXVII (April, 1926), 707-712.

1. Investigation of the demands on the state fiscal program of the principle that the state shall encourage progress of education in the localities
2. Interpretation of a satisfactory minimum educational offering in terms of the unit cost it involves
3. Development of an index for measuring the burden involved in transporting pupils
4. Investigation of the effect which the cost of living should have on a true measure of educational need
5. Investigation of the part to be played in an equalization program by capital outlay

M. C. S. Noble, "New Problems in Public School Finance," *American School Board Journal,* LXXXIII (November, 1931), 32, 80.

1. Why is there a tendency from local to increased state support?
2. Shall schoolmen advocate as the source for educational expenditures certain taxes or the General Fund?
3. Recommendations on state sources of revenue
4. Characteristics of present taxation system
5. Establishing standards for selecting, collecting, and distributing revenue
6. Characteristics of a scientific taxation system

J. K. Norton, "Ph. D. and Ed. D. Adventures in School Administration," *Teachers College Record,* XXXVI (December, 1934), 207-212.

Outlines criteria for selecting problems and suggests areas for research.

1. The organization and articulation of the administrative units of the American school system
2. Relationship of laymen and lay organizations to professional educators in determining the content and activities of the school curriculum
3. The relation of education to other areas of government, functionally and structurally
4. Determination of state funds for local education
5. Nature, causes, effects, and promoters of demands and pressures on the public schools, and methods of dealing with them

W. D. Parkinson, "Problems for Research," *Journal of Education*, CX (November 4, 11, 18, 25, 1929), 381, 383; 408-409; 438, 441; 460-462.

1. Limits of compulsory attendance
2. Relation between schooling and crime
3. Financial support of public education
4. Effect of women teachers on boys and girls

Roscoe Pulliam, "Wanted: Some Studies of School Buying," *American School Board Journal*, LXXVII (November, 1928), 38.

1. Standard necessities in supplies
2. Standard janitors' supplies
3. Standards of quantity
4. Cost of production
5. Standard list of supplies
6. Lists of equipment

H. P. Smith, "Research in the Business Management of Public Schools—Progress and Problems," *American School Board Journal*, LXXVI (March and April, 1928), 53-54; 45, 129-130.

1. Criteria for business practices in administration
2. Adequate support under fiscal independence
3. Purchasing by the municipality
4. Relative efficiency of contractual and salaried janitorial and engineering service, and their effects on plant-maintenance cost
5. Personnel problems such as employment, training in service, rating, promotion, compensation, and tenure
6. Appraisal of school property for insurance purposes
7. Rate of depreciation on school property
8. Self-insurance versus commercial insurance
9. Allocations of insurance among different agencies
10. A state-wide insurance fund for school buildings

F. T. Spaulding and Others, "A List of Needed Investigations of School Organization," *The Reorganization of Secondary Education*, pp. 421-423. Office of Education Bulletin No. 17, 1932, National Survey of Secondary Education Monograph No. 5. Washington: Office of Education, 1933.

1. The validation of a system of rating the organization of an individual secondary school; in particular, the determination of relationships between:
   (*a*) Practice in detailed aspects of organization and pupil achievement

(*b*) Practice in general aspects of organization and pupil achievement

(*c*) Practice in general aspects of organization and the judgment of competent specialists as to effectiveness of organization

2. Analysis of the extent to which effectiveness in one major phase of organization is dependent upon special effectiveness in one or more other phases of organization

3. More exact analysis of the typical organization of conventionally organized schools, as a means of gaging the effects of reorganization

4. Detailed analysis of the organization of outstanding private schools, as contrasted with the organization of public schools

5. Study of the organization of private secondary schools used as agencies of public instruction, as contrasted with the organization of comparable public schools

6. Analysis of various special types of organization not sufficiently represented in the present study to allow detailed investigation; in particular, analysis of:

(*a*) The four-year junior high-school organization within unit enrolment groups

(*b*) The undivided five-year high-school organization within unit enrolment groups

(*c*) Secondary-school organization forming parts of eleven-grade public-school systems

(*d*) Secondary-school organizations which include junior-college units

7. Detailed investigation of the factors which cause individual secondary schools either notably to exceed or notably to fall below the norms for organization of schools of their type and size (Study of this problem may properly be a phase of the validation of norms. On the assumption that certain norms have been accepted as valid, it is here suggested as a problem in the determination of causal relationships.)

8. Detailed study of methods by which schools necessarily handicapped either in size or in type of organization may improve their organization

9. Further evaluations of various types of organization in schools falling in enrolment groups not adequately represented in the present study; in particular, study of schools separately classified:

(*a*) In subdivisions of average grade enrolments below 30

(*b*) In subdivisions of average grade enrolments above 333

10. More exact analysis of the differences in organization between large and small schools by a segregation of schools in type groups and a determination of the differences between large and small schools common to all the type groups

11. Investigation of the maximum effective size of school under various types of organization

12. Study of the relationship between effectiveness of organization and per-pupil outlay for items immediately associated with organization

13. Recurrent studies of school organization, according to methods similar to those employed in the present investigation, to provide: [Another National Survey would now be in order.]

(*a*) Facts concerning the status of school organization on a nation-wide basis, in the light of which progress in organization may be determined periodically

(*b*) Periodic data on the relationships of the various elements in the national program one to another

14. Study of the relative holding power of schools of various sizes and types over a period of years

15. Investigations of the relationship between differentiation in salary schedules among separate units of the school system, and:

(*a*) Articulation between the units

(*b*) Pupil achievement in the separate units

16. Study of the relationship between the sources of support for extracurriculum activities and the scope of the extracurriculum

17. Study of the relationship between the effectiveness of homogeneous groups, and the use of:

(*a*) Semiannual as contrasted with annual promotions

(*b*) Promotion by subject as contrasted with promotion by grade

18. Investigation of the effects of extreme departmentalization in the junior high-school grades

19. Comparison of both the administrative and the educational effects of various types of curriculum organization

Ruth Strang, "Research Issues in Student Personnel Work," *Personnel Journal,* XIII (August, 1934), 101-105.

Emphasis on the value of an intensive developmental study of many aspects of a considerable number of individuals during the process of learning

1. A cursory survey of a mass of students versus a careful analytical study of individuals

2. A cross section, or snapshot picture, versus a developmental study of individuals over a long period of time

3. A study of end results alone versus observation of the process by which learning takes place

4. Observation of an isolated fragment of the personality versus a consideration of the individual as a whole in his environmental setting

George D. Strayer, "The Scientific Approach to Problems of Educational Administration," *School and Society*, XXIV (December 4, 1926), 685-695.

A brief summary of the development of scientific method in administration and a list of needed studies:

1. Governmental control, and provisions for interpreting the desires of the community in relation to education, involving the organization of public education in relation to national, state, and local government
2. Financing of the educational program
3. Registration of those who are subject to compulsory education, and the securing of their regular attendance in school
4. Organization of schools and classes with reference to the differences among pupils in intelligence, physical condition, and vocational outlook
5. Development of curricula and courses of study which take account of individual differences and of the social objectives which the school is organized to secure
6. Training, assignment, supervision, remuneration, and tenure of the staff employed in the schools
7. Coöperation of the schools with other social agencies
8. Provision of buildings and equipment suitable for the most efficient development of the program of education to be conducted in them
9. Conduct of business affairs
10. Reporting to the public with respect to the service rendered

David E. Weglein, "Educational Problems," *Baltimore Bulletin of Education*, VII (September-October, 1928), 3-5.

1. Size of elementary-school buildings
2. Size of junior high-school and senior high-school buildings
3. Size of classes
4. Length of school day and of school year
5. Curriculum
6. Supervision
7. Methods of teaching

"Investigating the 'Unknowns' of School Finance," *School Review*, XL (February, 1932), 91-92.

A list of twenty problems expected to be studied in the National Survey of School Finance.

The cost of public education

1. Why has expenditure for education increased so markedly?
2. Where will present tendencies lead?

3. How much public expenditure is really needed?
4. What can we afford to spend for education?

Returns for money spent

5. Why do expenditures vary so widely from place to place?
6. What advantages are obtained by communities spending exceptionally large amounts for education?
7. What disadvantages are suffered by communities spending exceptionally small amounts for education?

The tax burden for public education

8. Under present financing systems, how is the tax burden for education distributed?
9. What changes in taxation and in state and federal aid would bring about a more defensible distribution of burden?

The elimination of backward areas in American education

10. Why do they exist?
11. What will it cost to eliminate them?

Efficient expenditure of educational funds

12. How can we secure greater value for what we spend?
13. How can we effect economies?
14. To what degree, if any, are we wasting money through the over-education of some boys and girls?
15. What is the extent of waste suffered through failure to give some individuals sufficient education to develop their real potentialities? [Bright children usually have not worked up to capacity.]

Public education during business depression

16. How should education be dealt with during business depressions?

The use of indebtedness

17. What place is indebtedness now taking in educational finance?
18. What place should it take?

Public enlightenment on educational finance

19. How can the public be continually informed on the pertinent questions of educational finance?

The economic status of the teacher

20. What are the conditions that should determine salaries of teachers?

> *Research Problems in School Finance.* National Survey of School Finance. Washington, D. C.: American Council on Education, 1933. Pp. viii + 164.

1. School finance as a social factor
2. Financial implications of the principles underlying American education
3. Improvement of expenditure measurement in school finance
4. Management of school income
5. Securing adequate returns for school expenditures
6. Improvement of budgeting, accounting, auditing, and reporting procedures
7. Importance of private support in education
8. Responsibilities of the state in the support of public education
9. Responsibilities of the federal government in the support of public education
10. Development of efficient local tax districts
11. Controls and limitations of school taxation and expenditures
12. Stabilization of school support

I. RURAL EDUCATION

William G. Carr, "Some Crucial Problems in Rural Education," *Journal of the National Education Association,* XIX (December, 1930), 282-284.

1. Better teachers
2. Longer terms and better attendance
3. Greater opportunities for secondary education
4. A vitalized curriculum
5. Well-equipped and modern buildings
6. Better understanding between rural citizens and their schools
7. Adequate units of administration and supervision
8. More equitable financing

D. H. Kulp, "Problems of Rural Education Demanding Sociological Research," *Teachers College Record,* XXXI January, 1930), 332-338.

Policy Making and Administration

1. Determination of societal worths of rural groups and dominant institutions and agencies
2. Population distribution, migration, trends, and tendencies in group memberships
3. Division of labor between schools and non-school agencies in education
4. Analysis of cultural and community areas as a basis for reorganization of curriculum units and consolidation
5. Sociological aspects of school support

Teaching

6. Child personalities
7. Social worlds of rural children
8. Effects of rural conditions on child personality
9. Relation of maladjustments to types of social experience
10. Qualitative tests of uses children make of school learnings in non-school situations, the value to children's personalities of such uses for social adjustment

Extracurricular Activities

11. Study of spontaneous groupings of pupils and the correlations of such groupings with size of schools, geographical and social distance, and attitudes of teachers and parents
12. Pupils' out-of-school leisure time
13. Comparison of spontaneous school groups with non-school leisure groups of the community
14. Correlation of type learnings with type voluntary participations as a basis for programming extracurricular activities
15. Wishes of pupils satisfied by membership in spontaneous school and non-school groups
16. New ranking methods for evaluating the worth of such participation, as a substitute for the practical point system
17. Correlation of type groups and activities with levels of development of pupils as personalities

School-Community Relations

18. Community use of rural schools
19. Shortages of facilities for group activities
20. Analysis of types of leadership in communities
21. Relation between teachers, school activities, and teacher leadership in various types of communities

Teacher Training

22. What knowledge content in rural sociology should be devised for teacher-training curricula?
23. How do field conditions of professional service determine selection of teacher personalities?
24. What activities do teachers carry on, that imply what sociological techniques are needed to equip them with tools for direct analysis of the societal aspects of their teaching situations? [There is real need for more sociological training on the part of teachers.]

Dwight Sanderson, "Status of and Prospects for Research in Rural Life Under the New Deal," *American Journal of Sociology*, XLI (September, 1935), 180-193.

1. Service research: research on specific problems, local, state, or national, as a basis for immediate programs of action
2. Fact-finding and interpretation: surveys, studies of documentary materials, monographs on particular groups, etc., in an effort to describe the social situation and by induction to arrive at certain generalizations which may find specific application when properly interpreted
3. Social dynamics: a better understanding of what motivates the life of rural groups and the social psychology of their behavior
4. Experimental research: careful description of the inception processes, and results of such social experiments as subsistence homestead communities; defining objectives by study of various types of groups
5. Social evaluation: demonstration of the values of existing or proposed institutions, mores, societal forms, organizations, and processes

J. GENERAL PROBLEMS

W. W. Charters, *Research Problems in Radio Education*. New York: National Advisory Council on Radio in Education, 1931. Pp. 17.

I. *The objectives of radio education*
   1. Setting up the criteria for effective radio education
   2. Determining the relation of recreation to education in radio education programs
   3. Studying the limitations of radio education
   4. Studying the problems of uncensored channels for education by radio
   5. Determining the areas in which radio education will operate most effectively

II. *Administration of the station*
   1. Setting up criteria for judging good administration
   2. Surveying stations to evaluate their efficiency
   3. Studying the publicity methods to secure effectiveness
   4. Investigating educational broadcasting finance
   5. Studying the internal organization of the station—staff, duties, control
   6. Studying the laws and regulations governing broadcasting
   7. Investigating the relations of commercial and educational stations
   8. Studying the relations of college stations to each other

9. Studying the limitations, contributions and inter-relations of national chains and local stations
10. Securing information from audiences
11. Maintaining close contact with audiences to find better methods

III. *Curriculum materials*
1. Determining criteria for effective materials of instruction
2. Surveying materials to determine their effectiveness
3. Diagnosing the weaknesses of materials and providing remedies
4. Determining the tastes, needs, and wishes of audiences
5. Selecting and preparing materials to be broadcast
6. Selecting written materials, diagrams, pictures, and the like to be used in connection with broadcasts
7. Preparing programs for special occasions
8. Selecting extracurricular materials to be presented in school, before and after school, and during vacations
9. Enlisting the coöperation of educators in preparing materials
10. Fitting radio lessons into school programs
11. Determining grade placement of materials and grade distribution of programs

IV. *The broadcaster and his methods of presentation*
1. Setting up criteria for the selection of broadcasters
2. Judging the efficiency of broadcasters
3. Diagnosing the weaknesses of a broadcaster and providing training
4. Eliminating inefficient broadcasters
5. Setting up criteria for good presentations
6. Judging the effectiveness of presentations
7. Diagnosing the weakness of presentations and providing remedies
8. Providing broadcasters at the scheduled time
9. Securing proper teaching conditions in the studio
10. Making vocabulary studies
11. Studying coöperation between the broadcaster and the classroom teacher

V. *The classroom teacher and his methods of teaching*
1. Setting up criteria for the use of radio material by the teacher
2. Surveying teachers' methods to determine their effectiveness
3. Diagnosing teachers' weaknesses and providing remedies
4. Securing the coöperation of teachers
5. Preparing classes in advance

6. Supplementing radio instruction
7. Studying the problems of class management introduced by the radio
8. Investigating the problems of the ungraded school

VI. *The pupil and his learning*
1. Setting up criteria for good learning
2. Surveying classroom activities to evaluate the learning of the pupils
3. Providing for pupil activity and participation
4. Adjusting learning to the radio presentation
5. Setting up proper conditions for learning
6. Determining the radio interests of children
7. Determining the influence of radio upon children's reading [for study, recreation, and other purposes]

VII. *Adult audiences and their learning*
1. Setting up criteria for learning by adults
2. Investigating the tastes of adults
3. Organizing groups interested in education by radio
4. Supplementing radio lessons
5. Investigating the possibilities of group discussions as a supplement to radio lessons

VIII. *Equipment* (Receiving in particular)
1. Setting up criteria for suitable equipment
2. Measuring the effectiveness of equipment
3. Securing equipment (in school particularly)
4. Maintaining equipment in good condition (for schools particularly)
5. Building equipment (by children)
6. Studying proper physical conditions for reception

IX. *Measuring results*
1. Setting up controlled experiments in schools by
   (*a*) enlisting the assistance of teachers
   (*b*) selecting typical schools
   (*c*) establishing exact measure of learning
   (*d*) securing adequate financial support
2. Making adequate surveys
3. Securing audience reactions by radio, correspondence, questionnaire, and interview

X. *Psychology*
1. Applying the laws of learning to radio education
2. Studying the psychology and physiological psychology of hearing in relation to learning over the radio to determine the span of attention, the proper length of lessons, the optimum time of day for lessons, the retention of material learned over the radio and the like

3. Investigating the relative effectiveness of hearing and sight and a combination of the two as channels for learning, to throw light upon the relative values of radio, silent movies, talkies and television for learning

XI. *History of radio education*

1. Investigating the history of the significant phases of radio education

XII. *Comparative radio education*

1. Investigating the objectives, policies and practices of foreign countries in connection with the significant problems of American broadcasting

L. D. Coffman, "The Administration of Research During the Depression," *Journal of Higher Education*, V (January, 1934), 1-6.

Already investigations are being initiated into the effect of the depression on the birth rate, malnutrition among children, family relationships, and special care of unfortunates of every kind. Studies are likewise being conducted on the effect of the depression upon preschool children, upon elementary-school children, secondary-school children, and students of college age. In addition, studies are being made of the effect of the depression upon school financing and its effect in turn upon the length of the school year, school equipment, and the decline of the professional status of the teacher. Medical schools are concerning themselves with new problems relating to health, growth, and disease arising out of the depression.

1. Taxes and taxation
2. Use of land reverting to the state because of delinquent taxes
3. Economic restoration of the region in which the university is located
4. Study of the employment situation

V. E. Dickson, "The Place of Scientific Research in the New Education," *Educational Method*, XIII (April, 1934), 337-348.

Deals with seven fields needing research and with means for carrying on research by four general procedures (A.) measurement, (B.) statistical analysis, (C.) case study, and (D.) experimental control:

1. Mental and physical differences: measure by every means that will help to understand, on the one hand, the nature and extent of variable qualities, and, on the other hand, the nature and extent of the changes which take place during growth and education of the child
2. Differences in achievement: resulting from innate capacity and environmental influences
3. Problems of behavior and social adjustment: to bring about an equilibrium in social behavior

4. Differences in vocational objectives: because the new education stresses self-realization for each individual, there must be a research program in the field of "education for vocational efficiency"

5. Problems of the curriculum: including all those educational activities in which the pupil is engaged

6. Problems of teaching methods: the place of laboratory experimentation, freedom of the child, pupil initiative, drill, memorization, and the socialized recitation

7. Problems of administration: for example, proper size of class and the grouping of children

W. C. Eells, "What Needs to Be Done Now in American Education?" *Nation's Schools*, IX (January, 1932), 21-26.

The following are steps in educational progress suggested by the faculty of the school of education of Stanford University:

1. The provision of a more nearly adequate and suitable means of financing our entire educational program

2. The adoption of a much larger and more efficient unit of educational organization, with professional administration and supervision of the schools therein

3. The selection and training of outstanding school administrators [so as to rank with the leading citizens of the community]

4. The extension and democratization of public junior colleges

5. The adoption of the simplified calendar of thirteen equal months

6. Securing adequate salaries for teachers

7. Reform in selection, training, and certification of teachers to ensure proper preparation and to control the supply

8. Revamping the whole program of teacher training in terms of skills to be attained rather than credits to be earned

9. The classification of fundamental principles and functions of the high school, junior college, and university

10. The revision of the curriculum to eliminate outgrown material and development of a unified curriculum from the kindergarten through the junior college

11. Application to the college curriculum of procedures now being tried in elementary and secondary schools

12. The determination of the relation of school to life, with the resulting effect on vocational guidance

13. A fuller development of the field of adult education

14. An increased emphasis on character education

15. The development of systems of instruction based upon objective studies, with emphasis upon the activity principle, teaching practice, and treatment of children pedagogically

16. The investigation of the principles of complex learning of the school type, rather than of the laboratory type
17. The improvement of college and university teaching methods
18. The extension of library method, personnel, and equipment
19. The adaptation of modern inventions, such as the radio, the movies, the talkies, and the airplane to educational uses
20. The development by state teachers' associations of a forward looking and constructive policy dealing with fundamentals, other than salary increases, retiring allowances, and life tenure

H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, XXIX (October, 1935), 148-153.

1. A study of the transition from private to public education, including the American academy
2. A study of the development of concrete and objective teaching
3. A study of developing curricula, facilities, and methods in the teaching of science, the practical arts, the commercial field, and other subjects
4. A history of child care and education, and the whole attitude toward children in the United States and the world
5. A history of education in Nazi Germany in contrast to Republican Germany
6. A history of educational marking and measurement

Bess Goodykoontz, "Opportunities for the Classroom Teacher as a Research Worker," *School Life*, XV (May, 1930), 161-163.

1. Study of methods of teaching
2. Analysis of steps of learning
3. Which is better—long or short daily assignments?
4. Shall primary teachers use print or script?
5. Shall English teachers have a recommended or a required reading list?
6. Does an open-book discussion in science yield better results than an individual-study period?
7. Shall pupils in algebra be permitted to progress individually or by groups?
8. Study of curriculum materials
9. Case studies of pupils' behavior

H. Y. McClusky, "The Experimental Use of Comparative Cultures," *University of Michigan School of Education Bulletin*, V (April, 1934), 99-101.

1. Comparison of educational practices in the British Empire and America suggests many problems of instruction in grammar, com-

position, and literature, and in the geographical, historical, and social studies.

2. Are British children more vague in their notions of the North American continent than American children are of the British Empire?

3. How does instruction in British schools concerning the American Revolution compare with the instruction in American schools on the same topic?

4. Why is the per-pupil cost of education higher in the United States than it is in Great Britain?

5. How do the careers of youth in Great Britain who do not continue in school beyond the age of fourteen compare with the careers of the corresponding youth of the same age in the United States who attend school until the age of sixteen?

6. How do the attitudes of the younger generation in these two countries compare in certain personal, religious, economic, social, and international problems?

7. What are the consequences of the fact that in the United States the college population is eight times as great a proportion of the total population as it is in England?

8. Selection and preparation of teachers
9. The status of the teaching profession
10. The relationships of the teaching staff
11. The administrator
12. The board of education
13. The financial support of the schools
14. Methods of instruction and examination
15. The whole range of problems from the nursery school to adult education

H. L. Smith, "Looking Ahead in Education," *Journal of the National Education Association*, XXIV (September, 1935), 177-178.

1. The problem of what to do with the products of the schools as they are sent out by the hundreds of thousands year by year
2. The school and the moral welfare of school children
3. The need for coördination of all agencies in education
4. Providing a curriculum broad enough to include the social and vocational studies necessary to meet present-day needs
5. Preparing our youth to meet the onslaught of radical social views that constantly threaten essential social stability
6. To teach our youth it is the part of wisdom to avoid either one of the plans that shifts too far to one side of the central span of safety
7. The successful solution of the foregoing problems will be of assistance in the problem of the proper training of teachers

G. D. Strayer, W. W. Coxe, and Others, *Needed Educational Research in New York State and Research Studies Recently Completed.* Albany, New York: State Education Department, 1935. Pp. 72.

Includes 318 studies under the following headings:

Historical studies
- Educational history of New York State
- Educational finance
- Curriculum development
- Local educational history
- History of educational institutions

Special methods of instruction and organization

Educational psychology and child study
- Personality ratings
- Sex differences in behavior
- Maladjustment problems
- Group differences in various traits
- Problems of learning and thinking

Tests and testing
- Test construction
- Regents examinations
- Prognostic measures of college success
- Critical evaluation of tests

Special subjects of curriculum
- Art, music, and dramatics
- Commercial studies
- English, spelling, and writing
- Foreign language
- Mathematics
- Science
- Social studies

Preschool education

Secondary education
- Administration
- Curricula

Teacher education
- Demand for teacher education
- Curricula
- Practice teaching
- Personnel
- Administrative

Professional status of teachers
- Educational and social status
- Rating and characteristics of teachers
- Tenure

Certification
Teacher organizations
Miscellaneous
Higher education
Selection of students and predictions of success—admission of students
Personnel problems
College marks
School administration
Centralization of control
Secondary-school organization
School buildings
School finance
Supervision
Transportation
School management
Attendance and child accounting
Failure, retardation, and elimination
Classification, grading, and promotion
Curriculum studies
Textbooks
Health and physical education
Social aspects of education
Relation of social trends to education
Parent education
Moral and religious education
Manual and vocational education
Professional education
Educational and vocational guidance
Exceptional children
Delinquency
Physically handicapped children
Mentally retarded and gifted children
Libraries and reading
Reading interests
Miscellaneous

New York State Education Department, *Needed Educational Research in New York State.* Albany: University of the State of New York Press, 1933. Pp. 16.

A list of sixty-three problems under the following headings:

1. Elementary education: the curriculum, administration, and special classes
2. Secondary education: organization and administration
3. Guidance: pupil problems, special school services, health education, and vocational education

4. Rural education
5. Higher education
6. Teacher training and status: normal schools, teachers colleges, and status of teachers
7. Finance
8. General administration: buildings, grounds, and supervision
9. Social aspects of education
10. Extension education

M. M. Willey, "Recent Social Changes and Educational Research," *Journal of Educational Research,* XXVII (January, 1934), 321-322.

1. Significance of population trends for education
2. Part played by mass communication in education
3. Taxation problems
4. Place of the school in producing social values and social thinking

APPENDIX II

PROFESSIONAL PUBLICATIONS AND ORGANIZATIONS IN SUBJECT-MATTER FIELDS[1]

a. Art

American Magazine of Art. American Federation of Arts, Barr Building, Washington, D. C. Monthly.

School-Arts Magazine. The Davis Press (Inc.), 44 Portland Street, Worcester, Mass. 10 numbers.

American Federation of Arts, *American Art Annual.*

Association of Art Museum Directors.

College Art Association of America, *Art Bulletin* (quarterly).

Eastern Arts Association, *Proceedings, Bulletin.*

Federated Council on Art Education, *Reports.*

International Art Congress.

Western Arts Association, *Bulletin* (6 numbers).

b. Business and Commercial Education

American Penman. A. N. Palmer Co., 55 Fifth Avenue, New York City. 10 numbers.

Balance Sheet. South-Western Publishing Co., 201 W. Fourth Street, Cincinnati, Ohio. 9 numbers.

Educator (formerly *Business Educator*). 612 North Park Street, Columbus, Ohio. 10 numbers.

Journal of Business. University of Iowa, Iowa City, Iowa. 6 numbers.

Journal of Business Education. Edited by Paul S. Lomax of New York University, New York City. (Formed by a combination of the *Journal of Commercial Education* and the *Business School Journal.*) 10 numbers.

National Business Education Quarterly. Department of Business Education of the N. E. A., Washington, D. C.

American Association of Collegiate Schools of Business, *Proceedings, Reports.*

American Association of University Instructors in Accounting, *Yearbooks.*

Commerce Guild.

Eastern Commercial Teachers Association, *Yearbooks.*

International Society for Commercial Education.

National Association of Accredited Commercial Schools, *Accredited News.*

[1] See Chapter III for a brief discussion of such publications and organizations.

For helpful references and bibliographies classified according to subject fields, see also J. E. Seyfried, *Principles and Mechanics of Research,* Chapter VI. Albuquerque, N. M.: University of New Mexico, 1935.

National Association of Commercial Teacher Training Institutions.
National Association of Penmanship Teachers and Supervisors.
National Commercial Teachers Federation, *Yearbooks*.
N. E. A., Department of Business Education.
New England High School Commercial Teachers Association.
New England Penmanship Association.
Southern Commercial Teachers Association.
Southwestern Private Commercial Schools Association.

c. English and Speech

American Speech. Columbia University Press, 2960 Broadway, New York City. Quarterly.
Elementary English Review. National Council of Teachers of English, Box 67, North End Station, Detroit, Mich. 10 numbers.
English Journal, College and High School Editions. National Council of Teachers of English, University of Chicago Press, 5750 Ellis Avenue, Chicago, Ill. 10 numbers.
English Leaflet. New England Association of Teachers of English, Cambridge, Mass. 9 numbers.
Philological Quarterly. University of Iowa, Iowa City, Iowa. Quarterly.
Quarterly Journal of Speech. National Association of Teachers of Speech, University of Michigan, Ann Arbor, Mich. Quarterly.
American Association of Schools and Department of Journalism.
American Association of Teachers of Journalism, *Journalism Bulletin* (quarterly).
American Society for the Study of Disorders of Speech.
College Conference on English in the Central Atlantic States.
Council on Education for Journalism.
Inland Empire Education Association, Council of English.
National Association for American Speech.
National Association of Teachers of Speech.
National Council of Teachers of English, *English Monographs*.
National Honorary Society for High School Journalism.
National Society for the Study and Correction of Speech Disorders.
New England Association of Teachers of English.
Western Association of Teachers of Speech.

d. Foreign Languages

Classical Journal. Torch Press, Cedar Rapids, Iowa. 9 numbers.
Classical Weekly. 1737 Sedgwick Avenue, New York City. Weekly during college year.
French Review. American Association of Teachers of French, 1309 Carroll Street, Brooklyn, N. Y. 6 numbers.
Hispania. American Association of Teachers of Spanish, Stanford University, Calif. 4 numbers.
Latin Notes. Service Bureau for Classical Teachers, New York University, New York City. 8 numbers.
Modern Language Journal. National Federation of Modern Language Teachers, 5500 Thirty-third Street, N.W., Washington, D. C. 8 numbers.

Modern Language Forum. Modern Language Association of Southern California, 1537 West Forty-sixth Street, Los Angeles, Calif. Quarterly.
American Association of Teachers of French.
American Association of Teachers of German.
American Association of Teachers of Italian, *Italica*.
American Association of Teachers of Spanish.
American Classical League.
Association of Modern Language Teachers of the Central West and South.
Association of Modern Language Teachers of the Middle States and Maryland.
Classical Association of New England, *Annual Bulletin*.
Classical Association of the Atlantic States.
Classical Association of the Middle West and South.
Classical Association of the Pacific States.
Modern Language Association of America, *Publications of the Modern Language Association*. Quarterly.
National Federation of Modern Language Teachers.
New England Modern Language Association, *Annual Bulletin*.
Société des Professeurs Français en Amérique, *Annual Bulletin*.
Society for the Advancement of Scandinavian Study, *Scandinavian Studies and Notes*. Quarterly.

e. Home Economics

American Cookery. Boston Cooking School Magazine Co., 221 Columbus Avenue, Boston, Mass. 10 numbers.
Journal of Home Economics. American Home Economics Association, 617 Mills Building, Washington, D. C. Monthly.
Parent Education. National Council of Parent Education, 60 East Forty-second Street, New York City. Every six weeks from October through May.
Practical Home Economics. 468 Fourth Avenue, New York City. Monthly.
American Dietetic Association.
American Home Economics Association, 617 Mills Building, Washington, D. C.
N. E. A., Department of Supervisors and Teachers of Home Economics.
New England Home Economics Association, *New England News Letter* 3 numbers.

f. Industrial, Manual, Mechanical, and Agricultural Arts

Industrial Arts and Vocational Education (formerly *Industrial-Arts Magazine*). Bruce Publishing Co., 534-44 North Milwaukee Street, Milwaukee, Wis. Monthly.
Industrial Education Magazine. Manual Arts Press, Peoria, Ill. 5 numbers
Journal of Engineering Education. Society for the Promotion of Engineering Education, Prince and Lemon Streets, Lancaster, Pa. 10 numbers.
Occupations. National Occupational Conference, 522 Fifth Avenue, New York City.
Printing Education. United Typothetae of America, Fourteenth and K Streets, N.W., Washington, D. C. 4 numbers.

Vocationist. State Normal and Training School, Oswego, N. Y. Quarterly.
American Association for the Advancement of Agricultural Teaching, *Annual Reports*.
American Association of Agricultural College Editors.
American Institute of Chemical Engineers.
American Institute of Electrical Engineers.
American Society of Civil Engineers.
American Society of Mechanical Engineers.
American Management Association, Industrial Relations Association, 20 Vesey Street, New York City.
Association of Land-Grant Colleges and Universities, *Proceedings*.
Conference of Negro Land-Grant Colleges.
Engineering Economics Foundation, 3 Joy Street, Boston, Mass.
Society for the Promotion of Engineering Education, *Proceedings*.
Western Industrial Education Association.
Women's Educational and Industrial Union, 264 Boylston Street, Boston, Mass.

g. Mathematics

Mathematics Teacher. National Council of Teachers of Mathematics, 525 West One Hundred and Twentieth Street, New York City. 8 numbers.
School Science and Mathematics. Central Association of Science and Mathematics Teachers, Menasha, Wis. 9 numbers.
American Mathematical Society.
Association of Teachers of Mathematics in New England, *Reports*.
Association of Teachers of Mathematics in the Middle States and Maryland.
Central Association of Science and Mathematics Teachers.
Inland Empire Education Association, Council of Teachers of Mathematics.
International Commission on the Teaching of Mathematics.
Mathematical Association of America.
National Council of Teachers of Mathematics, *Year-books*.

h. Music

Music Clubs Magazine. National Federation of Music Clubs, 320 Wait Avenue, Ithaca, N. Y. 5 numbers.
Music Educators' Journal (formerly *Music Supervisors' Journal*). National Conference of Music Supervisors, 64 East Jackson Boulevard, Chicago, Ill. 6 numbers.
School Music. Finchley Building, Chicago, Illinois. 5 numbers.
Eastern Music Supervisors Conference, *Eastern School Music Herald*.
Juilliard Musical Foundation, Frederick A. Juilliard, 49 East Fifty-second Street, New York City.
Music Teachers National Association, *Proceedings*.
National Association of Schools of Music.
National Bureau for the Advancement of Music, 45 West Forty-fifth Street, New York City.
National Conference of Music Supervisors.
National Federation of Music Clubs.

National School Band Orchestra Association.
Southern Conference for Music Education.

i. Physical and Health Education

American Child. National Child Labor Committee, 419 Fourth Avenue, New York City. 10 numbers.

American Journal of Public Health and the Nation's Health. American Public Health Association, 50 West Fiftieth Street, New York City. Monthly.

Child Health Bulletin. American Child Health Association, 50 West Fiftieth Street, New York City. Bimonthly.

Hygeia. American Medical Association, 535 North Dearborn Street, Chicago, Ill. Monthly.

Journal of Health and Physical Education. American Physical Education Association, Ann Arbor, Mich. (Formed by a merger of the *American Physical Education Review* and the *Pentathlon*.) 10 numbers.

Journal of Outdoor Life. 50 West Fiftieth Street, New York City. Monthly.

Journal of Physical Education. National Council of the Young Men's Christion Association, Physical Education Department, 347 Madison Avenue, New York City. 6 numbers.

Journal of Social Hygiene. American Social Hygiene Association, 50 West Fiftieth Street, New York City. 9 numbers.

Mental Hygiene. 50 West Fiftieth Street, New York City. Quarterly.

Mind and Body. Mind and Body Publishing Co., New Ulm, Minn. 9 numbers.

Public Health Nursing. 50 West Fiftieth Street, New York City. Monthly.

Recreation. National Recreation Association, 315 Fourth Avenue, New York City. Monthly.

Research Quarterly of the American Physical Education Association. Ann Arbor, Mich. Quarterly. Devoted to fact-finding studies in the field of health and physical education.

Safety Education Magazine. Educational Division, National Safety Council, One Park Avenue, New York City. 10 numbers.

American Child Health Association. 450 Seventh Avenue, New York City, *Bulletins, Proceedings*.

American Mouth Health Association.

American Nurses Association, 450 Seventh Avenue, New York City.

American Physical Education Association, Box 362, Ann Arbor, Mich.; Eastern, Middle-west, Northwest, and Southern Sections.

American Public Health Association, 450 Seventh Avenue, New York City, *Reports*.

American Student Health Association, *Proceedings*.

College Physical Education Association, *Proceedings, Bulletins*.

Eastern Society of the Association of Directors of Physical Education for Women in Colleges and Universities.

Mid-West Association of Directors of Physical Education for Women, *Annual Reports*.

National Amateur Athletic Federation of America, Men's Division, 39 Broadway, New York City, *Proceedings*.

National Amateur Athletic Federation of America, Women's Division, 303 West Forty-second Street, New York City, *Proceedings.*
National Collegiate Athletic Association, *Proceedings.*
N. E. A., Department of School Health and Physical Education.
National Federation of State High School Athletic Associations, *Proceedings.*
National Health Council, 450 Seventh Avenue, New York City.
National Organization for Public Health Nursing, 370 Seventh Avenue, New York City.
National Association of Directors of Physical Education for Women in Colleges and Universities.
Society of State Directors of Health and Physical Education.
Western Society of Directors of Physical Education for Women in Colleges and Universities.
Y. M. C. A. Physical Directors Society of North America.

j. Religious, Moral, and Character Education

Catholic Educational Review. Catholic Education Press, 1326 Quincy Street, N.E., Washington, D. C. 10 numbers.
Catholic School Interests. 178 Kenilworth Avenue, Elmhurst, Ill. Monthly.
Catholic School Journal. 524-44 North Milwaukee Street, Milwaukee, Wis. Monthly.
Character (see *Religious Education*).
Character Builder. 1627 Georgia Street, Los Angeles, Calif. 10 numbers.
Character and Personality. Duke University Press, Durham, N. C. Quarterly.
Christian Education. Council of Church Boards of Education in the United States, 111 Fifth Avenue, New York City. 5 numbers.
Christian Education Magazine. Board of Education of the Methodist Episcopal Church South, Nashville, Tenn. Quarterly.
Christian Educator. Board of Education, Department of Educational Institutions for Negroes of the Methodist Episcopal Church, 740 Rush Street, Chicago, Ill. Quarterly.
Christian Student. Board of Education of the Methodist Episcopal Church, 740 Rush Street, Chicago, Ill. Quarterly.
Church School Journal. Methodist Book Concern, Cincinnati, Ohio. Monthly.
Information Service. Department of Research and Education, Federal Council of the Churches of Christ in America, 105 East Twenty-second Street, New York City. 48 numbers.
International Journal of Religious Education. 203 North Wabash Avenue, Chicago, Ill. Monthly except August.
Religious Education. Religious Education Association, 59 East Van Buren St., Chicago, Ill. 2 numbers. *Character.* 5 numbers.
American Catholic Philosophical Association.
Association of Universities and Colleges of the Society of Jesus, *Annual Reports.*
Association of Directors and Ministers of Religious Education.
Association of Teachers of Religion.
Character Education Institution, 3770 McKinley Street, Washington, D. C.
Council of Church Boards of Education in the United States.
Educational Association of the Methodist Episcopal Church.

Franciscan Educational Conference, *Proceedings.*
International Council of Religious Education.
National Benedictine Educational Association, *Proceedings.*
National Catholic Educational Association.
National Catholic Welfare Conference, 1312 Massachusetts Avenue, N. W., Washington, D. C.
National Council on Religion in Higher Education, *Yearbooks, Reports.*
National Lutheran Educational Conference, *Annual Reports.*
Northern Baptist Education Society.
Presbyterian College Union.
Presbyterian Education Association of the South, *Minutes.*
Religious Education Association, 308 North Michigan Avenue, Chicago, Ill.
Seventh Day Baptist Education Society.
Southern Baptist Education Association, *Proceedings.*

k. Science

Current Science. American Education Press (Inc.), 40 South Third Street, Columbus, Ohio. 38 numbers.
Journal of Chemical Education. Easton, Pa. Monthly.
Nature Magazine. American Nature Association, 1214 Sixteenth Street, Northwest, Washington, D. C.
School Science and Mathematics. Central Association of Science and Mathematics Teachers, Mount Morris, Illinois. 9 numbers.
Science. Science Press, Grand Central Terminal, New York City. Weekly.
Science Education. Lime and Green Streets, Lancaster, Penna. (Formerly *General Science Quarterly.*) Quarterly.
Scientific Monthly. Science Press, Grand Central Terminal, New York City. Monthly.
American Association for the Advancement of Science, Washington, D. C., *Proceedings.*
American Chemical Society.
American Chemical Society, Division of Chemical Education.
American Chemical Society, Senate of Chemical Education.
American Institute of Chemical Engineers.
Botanical Society of America.
Central Association of Science and Mathematics Teachers.
Eastern Association of Physics Teachers, *Reports.*
Geological Society of America.
National Academy of Sciences, B and Twenty-first Streets, Washington, D. C., *Proceedings, Annual Reports.*
National Association for Research in Science Teaching.
N. E. A., Department of Science Instruction.
New England Association of Chemistry Teachers, *Reports.*

l. Social Studies

Current Events. American Education Press (Inc.), Columbus, Ohio. 38 numbers.
Economic Geography. Clark University, Worcester, Mass. Quarterly.

Journal of Educational Sociology. New York University, New York City. 9 numbers.

Journal of Geography. National Council of Geography Teachers, Menasha, Wis. 9 numbers.

National Geographic Magazine. National Geographic Society, Washington, D. C. Monthly.

Social Forces. Williams and Wilkins Co., Baltimore, Md. Quarterly.

Social Science. Pi Gamma Mu, National Social Science Honor Society, 1414 East Fourth Avenue, Winfield, Kan. Quarterly.

Social Science Abstracts. Social Science Research Council, Columbia University. Monthly (discontinued in 1932).

Social Studies (formerly *Historical Outlook*). McKinley Publishing Co., Philadelphia, Pa. 8 numbers.

Sociology and Social Research. University of Southern California, Los Angeles, Calif. Bimonthly.

American Academy of Political and Social Science, 3622-24 Locust Street, Philadelphia, Pa., *Annals* (bimonthly).

American Association of Social Workers, 130 East Twenty-second Street, New York City.

American Catholic Historical Association.

American Economic Association.

American Geographical Society, Broadway at One Hundred and Fifty-sixth Street, New York City.

American Historical Association, 40 B Street, S.W., Washington, D. C.

American Political Science Association.

American Social Hygiene Association, 450 Seventh Avenue, New York City.

American Sociological Society, *Proceedings*.

Association of American Geographers.

Association of History Teachers of the Middle States and Maryland, *Proceedings*.

Association of Schools of Professional Social Work.

Bureau of Commercial Economics.

Mississippi Valley Historical Association.

National Conference of Social Work, 277 East Long Street, Columbus, Ohio, *Proceedings, Quarterly Conference Bulletin*.

National Council of Geography Teachers.

N. E. A., Department of Social Studies.

National Geographic Society, Washington, D. C.

National Historical Society, 175 Fifth Avenue, New York City.

National Society for the Study of Educational Sociology, *Yearbooks*.

New England History Teachers Association, *Reports*.

Pan-American Institute of Geography and History.

Pollak Foundation for Economic Research, 109 Sargeant Street, Newton, Mass.

Social Science Research Council.

APPENDIX III

SELECTED SUPPLEMENTARY BIBLIOGRAPHY, 1936-1941

ADAMS, James Truslow, and COLEMAN, R. V., Editors. *Dictionary of American History*. New York: Charles Scribner's Sons, 1940. Five volumes and index.

ALEXANDER, Carter. *How to Locate Educational Information and Data*. Revised Edition. New York: Bureau of Publications, Teachers College, Columbia University, 1941.

ALLEN, E. M. *The Author's Handbook*. Scranton, Pennsylvania: International Textbook Co., 1938. Pp. ix + 150.

ARKIN, Herbert, and COLTON, R. R. *Graphs—How to Make and Use Them*. New York: Harper and Bros., 1936. Pp. 224.

BAKER, R. P., and HOWELL, A. C. *The Preparation of Reports*. New York: Ronald Press Co., 1938. Pp. xvi + 578.

BARNES, H. E. *A History of Historical Writing*. Norman: University of Oklahoma Press, 1937. Pp. xiii + 434.

———, and BECKER, Howard. *Social Thought from Lore to Science*. Volumes I, II. Boston: D. C. Heath and Co., 1938. Pp. xxiv, lxxxiv + 790; viii, lxxxvii + 388.

———; BECKER, Howard; and BECKER, Frances B., Editors. *Contemporary Social Theory*. New York: D. Appleton-Century Co., 1940. Pp. xx + 947.

BARTLETT, F. C., and Others. *The Study of Society:* Methods and Problems. London: Kegan Paul, Trench, Trubner and Co., 1939. Pp. xiv + 498.

BEERS, H. P. *Bibliographies in American History*. New York: H. W. Wilson Co., 1938. Pp. 339.

BENBOW, John. *Manuscript and Proof*. New York: Oxford University Press, 1937. Pp. x + 118.

BENJAMIN, A. C. *An Introduction to the Philosophy of Science*. New York: Macmillan Co., 1937. Pp. xvi + 469.

BERNAL, J. D. *The Social Function of Science*. New York: Macmillan Co., 1939. Pp. xviii + 482.

BINGHAM, Walter V. *Aptitudes and Aptitude Testing*. New York: Harper and Bros., 1937. Pp. ix + 390.

BINKLEY, R. C. *Manual on Methods of Reproducing Research Materials*. Ann Arbor, Michigan: Edwards Bros., 1936. Pp. xiv + 207.

BOGARDUS, E. S. *Introduction to Social Research*. Los Angeles: Suttonhouse, 1936. Pp. xi + 237.

BOWMAN, Isaiah. *The Graduate School in American Democracy*. Office of Education, Bulletin No. 10, 1939. Washington: Government Printing Office, 1939. Pp. 70.

BRINTON, W. C. *Graphic Presentation.* New York: Brinton Associates, 1939. Pp. 512.

BRISTOL, Margaret C. *Handbook on Social Case Recording.* Chicago: University of Chicago Press, 1936. Pp. xii + 219.

BROOM, M. E. *Educational Measurements in the Elementary School.* New York: McGraw-Hill Book Co., 1939. Pp. 345.

———, *Educational Statistics for Beginning Students.* New York: American Book Co., 1936. Pp. 336.

BURGESS, J. B. *Introduction to the History of Philosophy.* New York: McGraw-Hill Book Co., 1939. Pp. 631.

BUROS, Oscar K., Editor. *The Nineteen Forty Mental Measurements Yearbook.* Highland Park, New Jersey: Mental Measurements Yearbook, 1941. Pp. xxvi + 674.

———, Editor. *The 1938 Mental Measurements Yearbook.* New Brunswick, New Jersey: Rutgers University Press, 1938. Pp. xvi + 415.

CAMPBELL, W. G. *A Form Book for Thesis Writing.* Boston: Houghton Mifflin Co., 1939. Pp. iv + 145.

CARR, William G. "Deliberative Committee Reports of 1940," *School and Society,* LIII (February 8, 1941), 164-71. Also see other annual compilations.

CATTELL, J. M., and CATTELL, Jacques. *American Men of Science.* Sixth Edition. Lancaster, Pa.: Science Press, 1938. Pp. viii + 1608.

———; CATTELL, Jacques; and ROSS, E. E., Editors. *Leaders in Education:* A Biographical Directory. Second Edition. Lancaster, Pa.: Science Press, 1941. Pp. 1134.

CATTELL, R. B. *A Guide to Mental Testing:* For Psychological Clinics, Schools, and Industrial Psychologists. London: University of London Press, 1936. Pp. xvi + 312.

CONFREY, Burton. *Initiating Research in Catholic Schools.* Manchester, New Hampshire: Magnificat Press, 1938. Pp. 168.

COOKE, D. H. *Minimum Essentials of Statistics.* New York: Macmillan Co., 1936. Pp. xviii + 272.

COULTER, Edith M., and GERSTENFELD, Melanie. *Historical Bibliographies.* Berkeley: University of California Press, 1935. Pp. 206.

CROWTHER, J. G. *The Social Relations of Science.* New York: Macmillan Co., 1941. Pp. xxxiv + 665.

CROXTON, F. E., and COWDEN, D. J. *Applied General Statistics.* New York: Prentice-Hall, 1939. Pp. xviii + 944.

CULVER, Dorothy C. *Methodology of Social Science Research:* A Bibliography. Berkeley: University of California Press, 1936. Pp. x + 159.

DEWEY, John. *Logic:* The Theory of Inquiry. New York: Henry Holt and Co. 1938. Pp. 546.

DIXON, Elizabeth S., and BROWNING, Grace A., Editors. *Social Case Records:* Family Welfare. Chicago: University of Chicago Press, 1938. Pp. x + 312.

EELLS, W. C., Editor. *American Junior Colleges.* Washington: American Council on Education, 1940. Pp. 585.

———, *Evaluation of Secondary Schools:* General Report. Washington: Coöperative Study of Secondary School Standards, 1939. Pp. 556.

ELLS, W. C. *Surveys of American Higher Education.* New York: Carnegie Foundation for the Advancement of Teaching, 1937. Pp. xii + 538.

ELLWOOD, C. A. *A History of Social Philosophy.* New York: Prentice-Hall, 1938. Pp. xvi + 581.

ELMER, M. C. *Social Research.* New York: Prentice-Hall, 1939. Pp. xvi + 522.

ENLOW, E. R. *Statistics of Education and Psychology.* New York: Prentice-Hall, 1937. Pp. x + 180.

FOSTER, Laurence. *Functions of a Graduate School in a Democratic Society.* New York: Huxley House, 1936. Pp. 166.

FREEMAN, F. N. *Mental Tests:* Their History, Principles, and Applications. Revised Edition. Boston: Houghton Mifflin Co., 1939. Pp. x + 460.

———, and Others. *The Scientific Movement in Education.* Thirty-Seventh Yearbook of the National Society for the Study of Education, Part II. Bloomington, Illinois: Public School Publishing Co., 1938. Pp. xii + 495.

FRITZ, M. F. *Collection and Presentation of Statistical Data in Psychology and Education.* New York: Prentice-Hall, 1939. Pp. vi + 58.

FURNAS, C. C. *The Next Hundred Years:* The Unfinished Business of Science. New York: Reynald and Hitchcock, 1936. Pp. xiv + 434.

GARRETT, Henry E. *Great Experiments in Psychology.* Revised Edition. New York: D. Appleton-Century Co., 1941. Pp. 452.

GEORGE, W. H. *The Scientist in Action:* A Scientific Study of His Methods. London: Williams and Norgate, 1936. Pp. 355.

GESELL, Arnold, and Others. *Biographies of Child Development.* New York: Harper and Bros., 1939. Pp. 345.

———, and Others. *Developmental Diagnosis.* New York: Harper and Bros., 1941.

GOLDMAN, E. F., Editor. *Historiography and Urbanization:* Essays in American History in Honor of W. Stull Holt. Baltimore: Johns Hopkins Press, 1941. Pp. 220.

GOOD, Carter V. "Educational Progress During the Year 1940," *School and Society,* LIII (March 15, 1941), 330-37. Also see other annual numbers in the series.

———, "Selected Bibliography on the Methodology of Educational Research and Related Problems, 1939-1940," *Journal of Educational Research,* XXXIV (September, 1940), 57-80. Also see other annual compilations.

———, and Others. "Methods of Research in Education," *Review of Educational Research,* IX (December, 1939), 449-672.

GOOD, W. R. *An Introduction to Statistics:* Emphasizing Applications to Education. Ann Arbor, Michigan: Ann Arbor Press, 1936. Pp. 48.

———, *An Introduction to Thesis Writing.* Ann Arbor, Michigan: Ann Arbor Press, 1937. Pp. 48.

GOULDEN, C. H. *Methods of Statistical Analysis.* New York: John Wiley and Sons, 1939. Pp. 277.

GRAY, C. T., and VOTAW, D. F. *Statistics Applied to Education and Psychology.* New York: Ronald Press Co., 1939. Pp. xiv + 278.

GRAY, G. W. *The Advancing Front of Science.* New York: McGraw-Hill Book Co., 1937. Pp. 364.

GRAY, Ruth A. *Bibliography of Research Studies in Education, 1938-1939.*

Office of Education Bulletin No. 5, 1940. Washington: Government Printing Office, 1940. Pp. xiv + 411. See other annual numbers.

GREENE, E. B. *Measurements of Human Behavior*. New York: Odyssey Press, 1941. Pp. xxii + 777.

GREENE, H. A., and JORGENSEN, A. N. *The Use and Interpretation of High School Tests*. New York: Longmans, Green and Co., 1936. Pp. xxvi + 614.

GRIZZELL, E. D., and Others. *Educational Studies and Their Use:* An Exploratory Study of the Processes of Implementation in Secondary Education. Series I, Vol. IV, No. 11. Washington: American Council on Education, January, 1940. Pp. viii + 74.

GUILFORD, J. P. *Psychometric Methods*. New York: McGraw-Hill Book Co., 1936. Pp. xvi + 566.

HAMILTON, Gordon. *Social Case Recording*. New York: Columbia University Press, 1936. Pp. vii + 190.

———, *Theory and Practice of Social Case Work*. New York: Columbia University Press, 1940. Pp. viii + 388.

HARPER, C. A. *A Century of Public Teacher Education*. Washington, D. C.: American Association of Teachers Colleges, N. E. A., 1939. Pp. 175.

HASLETT, A. W. *Unsolved Problems of Science*. New York: Macmillan Co., 1935. Pp. xi + 317.

HAWES, Marion E., and ELLISON, Martha L. "Sixty Educational Books of 1940," *Journal of the National Educational Association*, XXX (April, 1941), 117-20. Also see other annual numbers.

HAWKES, H. E., and Others. *The Construction and Use of Achievement Examinations:* A Manual for Secondary School Teachers. Boston: Houghton Mifflin Co., 1936. Pp. vii + 497.

HAYNES, B. R., and HUMPHREY, C. W. *Research Applied to Business Education*. New York: Gregg Publishing Co., 1939. Pp. 218.

HILDRETH, Gertrude H. *Bibliography of Mental Tests and Rating Scales*. Revised Edition. New York: Psychological Corp., 1939. Pp. 295.

HOLLIS, E. V. *Philanthropic Foundations and Higher Education*. New York: Columbia University Press, 1938. Pp. x + 366.

HOLLIS, Florence. *Social Case Work in Practice: Six Case Studies*. New York: Family Welfare Association of America, 1939. Pp. v + 313.

HOLMES, Henry W., and Others. *Educational Research:* Its Nature, Essential Conditions, and Controlling Concepts. Council Studies, No. 10, Series I. Washington: American Council on Education, 1939. Pp. viii + 186.

HORTON, B. J. *The Graduate School:* Its Origin and Administrative Development. New York: New York University Bookstore, 1940. Pp. 182.

HUNT, Thelma. *Measurement in Psychology*. New York: Prentice-Hall, 1936. Pp. xx + 471.

HUTCHINSON, W. T., and Others. *Marcus W. Jernegan Essays in American Historiography*. Chicago: University of Chicago Press, 1937. Pp. x + 417.

JARVIE, L. L., and ELLINGSON, M. *A Handbook on the Anecdotal Behavior Journal*. Chicago: University of Chicago Press, 1940. Pp. xii + 71.

JASTROW, Joseph, and Others. *The Story of Human Error*. New York: D. Appleton-Century Co., 1936. Pp. xvii + 445.

JESSEN, C. A. *Needed Research in Secondary Education.* Office of Education Bulletin No. 28, 1937. Washington: Government Printing Office, 1938. Pp. 69.

JOHNSON, Allen, and MALONE, Dumas, Editors. *Dictionary of American Biography.* New York: Charles Scribner's Sons, 1928-1937. Twenty volumes and index.

JOHNSON, Edgar. *One Mighty Torrent:* The Drama of Biography. New York: Stackpole Sons, 1937. Pp. 595.

JONES, G. P., and POOL, A. G. *A Hundred Years of Economic Development.* New York: Macmillan Co., 1940. Pp. 420.

JOUGHIN, G. L. *Basic Reference Forms:* A Guide to Established Practice in Bibliography, Quotations, Footnotes, and Thesis Format. New York: F. S. Crofts and Co., 1941. Pp. xi + 94.

JUDD, Charles H., and Others. *A Century of Social Thought.* Durham, North Carolina: Duke University Press, 1939. Pp. vii + 172.

———, *Research in the United States Office of Education.* Staff Study, No. 19, Advisory Committee on Education. Washington: Government Printing Office, 1939. Pp. viii + 133.

KAEMPFFERT, W. *Science Today and Tomorrow.* New York: Viking Press, 1939. Pp. 275.

KANDEL, I. L. *Examinations and Their Substitutes in the United States.* Bulletin No. 28. New York: Carnegie Foundation for the Advancement of Teaching, 1936. Pp. xii + 184.

KAPLAN, Louis. *Research Materials in the Social Sciences.* Madison: University of Wisconsin Press, 1939. Pp. 36.

KELLETT, E. E. *Aspects of History.* New York: Thomas Nelson and Sons, 1938. Pp. 160.

KURTZ, A. K., and EDGERTON, H. A. *Dictionary of Statistical Terms and Symbols.* New York: John Wiley and Sons, 1939. Pp. xiv + 191.

LEARNED, W. S. *The Graduate Record Examination:* A Memorandum on the General Character and Purpose of the Examination Including a Summary of Initial Studies of Its Validity. New York: Carnegie Foundation for the Advancement of Teaching, 1941. Pp. 39.

LEVY, Hyman. *Modern Science.* New York: Alfred A. Knopf, 1939. Pp. x + 736.

LINDQUIST, E. F. *A First Course in Statistics:* Their Use and Interpretation in Education and Psychology. Boston: Houghton Mifflin Co., 1938. Pp. xiv + 226.

———, *Statistical Analysis in Educational Research.* Boston: Houghton Mifflin Co., 1940. Pp. xiv + 266. Stresses the application of the techniques devised by Fisher.

LINGELBACH, W. E. *Approaches to American Social History.* New York: D. Appleton-Century Co., 1937. Pp. viii + 101.

LOUTTIT, C. M. *Clinical Psychology:* A Handbook of Children's Behavior Problems. New York: Harper and Bros., 1936. Pp. xx + 695.

LOWRY, Fern, Editor. *Readings in Social Case Work,* 1920-1938. New York: Columbia University Press, 1939. Pp. 810.

LYND, Robert S. *Knowledge for What?* The Place of Social Science in American Culture. Princeton: Princeton University Press, 1939. Pp. 268.

MACMURRAY, John. *Clue to History*. New York: Harper and Bros., 1939. Pp. xii + 243.

MCCALL, W. A. *Measurement*. New York: Macmillan Co., 1939. Pp. xvi + 535.

MCCLOY, C. H. *Tests and Measurements in Health and Physical Education*. New York: F. S. Crofts and Co., 1939. Pp. 412.

MCCUISTION, Fred. *Graduate Instruction for Negroes in the United States*. Nashville, Tennessee: George Peabody College for Teachers, 1939. Pp. 172.

MARSH, C. S., Editor. *American Universities and Colleges*. Fourth Edition. Washington: American Council on Educatior, 1940. Pp. 1120.

MARZOLF, S. S. *Studying the Individual:* A Manual on the Case Study for Guidance Workers and Psycho-Clinicians. Minneapolis: Burgess, 1940. Pp. vii + 181.

MAYER, Joseph. *Social Science Principles in the Light of Scientific Method*. Durham, North Carolina: Duke University Press, 1941. Pp. xxii + 573.

MILLER, Hugh. *History and Science*. Berkeley: University of California Press, 1939. Pp. x + 201.

MODLEY, Rudolf, and HESS, F. C. *How to Use Pictorial Statistics*. New York: Harper and Bros., 1937. Pp. 170.

MONROE, W. S., Editor. *Encyclopedia of Educational Research*. New York: Macmillan Co., 1941. Pp. xxiv + 1344.

———, and ENGELHART, M. D. *The Scientific Study of Educational Problems*. New York: Macmillan Co., 1936. Pp. xvi + 504.

———, and SHORES, Louis. *Bibliographies and Summaries in Education to July, 1935*. New York: H. W. Wilson Co., 1936. Pp. xvi + 470.

MUDGE, I. G. *Guide to Reference Books*. Sixth Edition. Chicago: American Library Association, 1936. Pp. xii + 504. Also see earlier editions and the informal supplements.

———, *Reference Books of 1935-1937*. Chicago: American Library Association, 1939. Pp. 69. Supplement to *Guide to Reference Bookks*. Sixth Edition.

MUNN, N. L. *Psychological Development:* An Introduction to Genetic Psychology. Boston: Houghton Mifflin Co., 1939. Pp. xx + 582.

MURPHY, Gardner, and Others. *Experimental Social Psychology*. Revised Edition. New York: Harper and Bros., 1937. Pp. xi + 1121.

NELSON, J. R. *Writing the Technical Report*. New York: McGraw-Hill Book Co., 1940. Pp. xvi + 373.

NELSON, M. J. *Tests and Measurements in Elementary Education*. New York: Cordon Co., 1939. Pp. 351.

NEVINS, Allan. *Gateway to History*. New York. D. Appleton-Century Co., 1938. Pp. vii + 412.

NOBLE, M. C. S. *Practical Measurements for School Administrators*. Scranton, Pa.: International Textbook, 1939. Pp. xvii + 330.

OMAN, C. W. C. *On the Writing of History*. New York: E. P. Dutton and Co., 1939. Pp. xii + 307.

ORLEANS, J. S. *Measurement in Education*. New York: Thomas Nelson and Sons, 1937. Pp. 480.

ORTEGA Y GASSET, José. *Toward a Philosophy of History*. New York: W. W. Norton and Co., 1941. Pp. 273.

PALFREY, Thomas R., and COLEMAN, Henry E., Jr. *Guide to Bibliographies of Theses—United States and Canada*. Second Edition. Chicago: American Library Association, 1940. Pp. 54.

PANUNZIO, Constantine M. *A Student's Dictionary of Sociological Terms*. Berkeley, California: University of California Press, 1937. Pp. 49.

PENNIMAN, T. R. *A Hundred Years of Anthropology*. New York: Macmillan Co., 1936. Pp. 400.

PETERS, Charles C., and VAN VOORHIS, Walter R. *Statistical Procedures and Their Mathematical Bases*. New York: McGraw-Hill Book Co., 1940. Pp. xiii + 516.

PETTUS, Clyde. *Subject Headings in Education:* A Systematic List for Use in a Dictionary Catalogue. New York: H. W. Wilson Co., 1938. Pp. 188.

PFIFFNER, J. M. *Research Methods in Public Administration*. New York: Ronald Press Co., 1940. Pp. 447.

PORTEUS, Stanley D. *The Practice of Clinical Psychology*. New York: American Book Co., 1941. Pp. 589.

PREU, Paul W. *Outline of Psychiatric Case-Study*. New York: Harper and Bros., 1939. Pp. 154.

RANDALL, J. H. *The Making of the Modern Mind:* A Survey of the Intellectual Background of the Present Age. Revised. Boston: Houghton Mifflin Co., 1940. Pp. xiv + 696.

RATNER, Joseph, and DEWEY, John. *Intelligence in the Modern World:* John Dewey's Philosophy. New York: Modern Library, 1939. Pp. xvi + 1077.

RIDER, Paul R. *An Introduction to Modern Statistical Methods*. New York: John Wiley and Sons, 1939. Pp. 220.

RIDGWAY, J. L. *Scientific Illustration*. Stanford, California: Stanford University Press, 1938. Pp. xiv + 173.

RINSLAND, H. D. *Constructing Tests and Grading in Elementary and High School Subjects*. New York: Prentice-Hall, 1937. Pp. xvi + 323.

ROBINSON, Virginia P. *Supervision in Social Case Work*. Chapel Hill: University of North Carolina, 1936. Pp. 199.

ROGERS, C. R. *The Clinical Treatment of the Problem Child*. Boston: Houghton Mifflin Co., 1939. Pp. xiii + 393.

ROSS, C. C. *Measurement in Today's Schools*. New York: Prentice-Hall, 1941. Pp. xviii + 597.

SALVEMINI, G. *Historian and Scientist:* An Essay on the Nature of History and the Social Sciences. Cambridge, Mass.: Harvard University Press, 1939. Pp. x + 203.

SARTON, George. *The History of Science and the New Humanism*. Revised Edition. Cambridge, Mass.: Harvard University Press, 1937. Pp. xx + 196.

SCATES, Douglas E. "Assumptions Underlying Research Data," *Journal of Educational Research*, XXXIV (December, 1940), 241-54.

———, "Fact-Finding and Research in Industry and Public Education," *Elementary School Journal*, XXXVIII (June, 1938), 735-46.

———, and HOBAN, Charles F., Jr. "Critical Questions for the Evaluation of Research," *Journal of Educational Research*, XXXI (December, 1937), 241-54.

SCHMECKEBIER, L. F. *Government Publications and Their Use.* Washington: Brookings Institution, 1936. Pp. 446.

SCHROEDER, P. L., and Others. *Child Guidance Procedures:* Methods and Techniques Employed at the Institute for Juvenile Research. New York: D. Appleton-Century Co., 1937. Pp. 358.

SELIGMAN, Edwin R. A., and JOHNSON, Alvin, Editors. *Encyclopedia of the Social Sciences.* New York: Macmillan Co., 1930-1934. Fifteen volumes.

SHEFFIELD, Ada E. *Social Insight in Case Situations.* New York: D. Appleton-Century Co., 1937. Pp. xii + 283.

SHEPHERD, W. *Science Marches On.* New York: Harcourt, Brace and Co., 1939. Pp. 420.

SHORES, Louis. *Basic Reference Books:* An Introduction to the Evaluation, Study, and Use of Reference Materials with Special Emphasis on Some 300 Titles. Second Edition. Chicago: American Library Association, 1939. Pp. xiv + 472.

SHOTWELL, J. T. *The History of History,* Vol. I. New York: Columbia University Press, 1939. Pp. xiv + 407.

SMITH, B. O. *Logical Aspects of Educational Measurement.* New York: Columbia University Press, 1938. Pp. x + 182.

SMITH, H. L., and O'DELL, E. A. *Bibliography of School Surveys and References on School Surveys.* Bulletin of the School of Education, Indiana University, Vol. XIV, No. 3. Bloomington, Indiana: Indiana University, 1938. Pp. 144.

SORENSON, Herbert. *Statistics for Students of Psychology and Education.* New York: McGraw-Hill Book Co., 1936. Pp. 375.

SOUTH, Earl B. *A Dictionary of Terms in Measurement and Guidance.* New York: Psychological Corp., 1939, Pp. 88.

———, *An Index of Periodical Literature on Testing.* New York: Psychological Corp., 1937. Pp. xii + 286.

SPEARMAN, C. *Psychology Down the Ages.* Volumes I, II. New York: Macmillan Co., 1938. Pp. xviii + 809.

STRODE, Josephine. *Introduction to Social Case Work.* New York: Harper and Bros., 1940. Pp. xvi + 219.

TAFT, Jessie, Editor. *Social Case Work with Children.* Philadelphia: Pennsylvania School of Social Work, University of Pennsylvania, 1940. Pp. 237.

TAYLOR, F. S. *The March of Mind:* A Short History of Science. New York: Macmillan Co., 1939. Pp. xiv + 320.

TAYLOR, H. O. *Historian's Creed.* Cambridge, Mass.: Harvard University Press, 1939. Pp. 137.

TIEGS, E. W. *Tests and Measurements in the Improvement of Learning.* Boston: Houghton Mifflin Co., 1939. Pp. xxi + 490.

TRAXLER, Arthur E. *The Use of Test Results in Diagnosis and Instruction in the Tool Subjects.* Educational Records Bulletin, No. 18. New York: Educational Records Bureau, 1936. Pp. vi + 74.

TRELOAR, A. E. *Elements of Statistical Reasoning.* New York: John Wiley and Sons, 1939. Pp. xi + 261.

TURABIAN, Kate L. *A Manual for Writers of Dissertations.* Chicago: University of Chicago Bookstore, 1937. Pp. vi + 61.

ULICH, Robert. *On the Reform of Educational Research.* Occasional

Pamphlets of the Graduate School of Education, Harvard University, No. 2. Cambridge, Mass.: Harvard University, 1937. Pp. 26.

VAN ORMER, E. B., and WILLIAMS, C. O. *Elementary Statistics for Students of Education and Psychology.* Ann Arbor, Michigan: Edwards Bros., 1940. Pp. viii + 111.

WANG, Charles K. A. *An Annotated Bibliography of Mental Tests and Scales,* Vol. I. Peking, China: Catholic University Press, 1939. Pp. vi + 725.

WAPLES, Douglas; BERELSON, Bernard; and BRADSHAW, Franklyn R. *What Reading Does to People:* A Summary of Evidence on the Social Effects of Reading and a Statement of Problems for Research. Chicago: University of Chicago Press, 1940. Pp. xii + 222.

WARE, Caroline F., Editor. *Cultural Approach to History.* New York: Columbia University Press, 1940. Pp. x + 359.

WATERFIELD, R. L. *A Hundred Years of Astronomy.* New York: Macmillan Co., 1938. Pp. 526.

WATSON, D. L. *Scientists Are Human.* London: Watts and Co., 1938. Pp. xx + 249.

WAUGH, A. E. *Elements of Statistical Method.* New York: McGraw-Hill Book Co., 1938. Pp. xv + 381.

WEBB, L. W., and SHOTWELL, Anna M. *Testing in the Elementary School.* New York: Farrar and Rinehart, 1939. Pp. xx + 408.

WECHSLER, David. *The Measurement of Adult Intelligence.* Baltimore: Williams and Wilkins Co., 1939. Pp. 229.

WENDT, G. R. *Methods of Recording Action.* Columbia University, New York: Archives of Psychology, 1938. Pp. 83.

———, *Science for the World of Tomorrow.* New York: W. W. Norton and Co, 1939. Pp. 316.

WERKMEISTER, W. H. *The Philosophy of Science.* New York: Harper and Bros., 1940. Pp. 551.

WERT, J. E. *Educational Statistics.* New York: McGraw-Hill Book Co., 1938, Pp. xi + 305.

WHEELER, Joseph L., and HAWES, Marion E. "Educational Literature of 1940," *School and Society,* LIII (March 29, 1941), 391-409. See other annual numbers of the series.

WHELPTON, P. K. *Needed Population Research.* Lancaster, Pa.: Science Press Printing Co., 1938. Pp. 196.

WHITNEY, F. L. *The Elements of Research.* New York: Prentice-Hall, 1937. Pp. xviii + 616.

WILLIAMS, C. B., and STEVENSON, A. H. *Research Manual:* With a Bibliographical Guide to College Studies and Interests. New York: Harper and Bros., 1940. Pp. xvi + 264.

WILLIAMS, C. H. *Modern Historian.* New York: Thomas Nelson and Sons, 1938. Pp. 318.

WILSON, R. S. *The Short Contact in Social Case Work,* Vols. I, II. New York: National Association for Travelers Aid and Transient Service, 1937. Pp. 201, 219.

WITMER, Helen L. *Psychiatric Clinics for Children.* New York: Commonwealth Fund, 1940. Pp. xix + 437.

WOLF, A. *A History of Science, Technology, and Philosophy in the Eighteenth Century*. New York: Macmillan Co., 1939. Pp. 814.

———, *A History of Science, Technology, and Philosophy in the Sixteenth and Seventeenth Centuries*. New York: Macmillan Co., 1936. Pp. xxvii + 692.

WOLFLE, Dael. *Factor Analysis to 1940*. Psychometric Monographs, No. 3. Chicago: University of Chicago Press, 1940. Pp. viii + 70. A review of the literature.

WOODRUFF, L. L., Editor. *Development of the Sciences*. New Haven, Conn.: Yale University Press, 1941. Pp. 336.

YOUNG, E. F., and Others. *The Social Workers' Dictionary*. Revised Edition. Los Angeles, California: Social Work Technique, 1939. Pp. 160.

YOUNG, Pauline V. *Scientific Social Surveys and Research*. New York: Prentice-Hall, 1939. Pp. xxx + 619.

ZNANIECKI, Florian. *The Social Role of the Man of Knowledge*. New York: Columbia University Press, 1940. Pp. viii + 212.

"Coöperative Educational Experiments," *Educational Method*, XX (March, 1941), 267-334. Describes the work of major research commissions and large scale educational investigations.

Dartmouth College, Amos Tuck School of Administration and Finance, *Manual on Research and Reports*. New York: McGraw-Hill Book Co., 1937. Pp. x + 140.

Doctoral Dissertations Accepted by American Universities, 1933-34—. Compiled for the National Research Council and the American Council of Learned Societies by the Association of Research Libraries. New York: H. W. Wilson Co., 1934—. Edited by Donald B. Gilchrist, 1934-39; by Edward A. Henry, 1940—.

A Manual of Style. Tenth Edition. Chicago: University of Chicago Press, 1937. Pp. x + 394.

National Committee on Coördination in Secondary Education, *Suggested Studies in Secondary Education:* A List of Problems for Research. Washington: Civic Education Service, 1939. Pp. 101.

National Education Association, *The Implications of Research for the Classroom Teacher*. Joint Yearbook of the American Educational Research Association and the Department of Classroom Teachers. Washington: National Education Association, 1939. Pp. 318.

National Education Association, Educational Policies Commission, *Deliberative Committee Reports, 1939*. Washington: The Commission, N. E. A., January, 1940. Pp. 54. See other annual numbers.

National Resources Committee, *Research:* A National Resource. Washington: Government Printing Office, 1938. Pp. 225.

National Resources Committee, *Technological Trends and National Policy*. House Document No. 360. Washington: Government Printing Office, June, 1937. Pp. x + 388.

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