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R E P O R T
O N T H E B A S I S O F T H E .
S T U D Y T O U R T O T H E S O V I E T U N I O N

(Incorporating the radio talks from
Moscow to Indian listeners on
the Soviet system of
education)

(First March to thirty first May, 1965)

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A REPORT PREPARED BY DR. K.N. SAXENA
ON THE BASIS OF HIS STUDY TOUR TO U.S.S.R.

(1st March to 31st May, 1965)

On the basis of the study tour to U.S.S.R., the following are some of the suggestions which may be taken into consideration for the improvement of education in India, specially the science education:

(1) OPENING OF A FACTORY IN THE PUBLIC SECTOR
FOR THE MANUFACTURE OF SCIENCE EQUIPMENT
FOR PRIMARY AND SECONDARY SCHOOLS OF INDIA.

An attempt should be made to manufacture scientific equipments on a mass scale so that the institutions in the country could be provided with bare minimum laboratory equipments of good quality without any further delay and at a low cost. Instead of grants being released for the purchase of equipment from various private sources, it may be found to be convenient to procure good quality materials from the public sector. To start with, a factory may be attached to one of the Regional Colleges of Education under the guidance of a professor of science and a professor of technology. This factory attached to a Regional College may, in the initial stages, supply laboratory equipments to the schools in the neighbouring States and with the insight and experience gained in this enterprise, it may be extended to various other establishments like State Institutes of Science and other Regional Colleges of Education. The quality control of equipments may however be, periodically, examined by the Central Science Workshop of the National Council of Educational Research and Training.

(2) CORRESPONDENCE AND EVENING COURSES

One of the salient features of the Soviet

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* The priorities of the items discussed in this report are based on the immediate needs of the country.

Education today is the existence of a net-work of evening and correspondence courses and an appreciable number of youths and adults join these courses even when they have entered into a profession. This gives a new life to a person who, by virtue of stressed circumstances, has gone into a vocation early but has a craving for improving his educational qualifications. The evening and correspondence courses are so well organized in U.S.S.R. that now the educationists think that the academic standards of the students who qualify from such institutes are comparable to those who pass out from the whole-time day institutes. Evening classes and correspondence courses are run in schools, universities and professional institutes for working people. Evening and correspondence courses are also provided by a number of Pedagogical Institutes. These two types of courses are controlled by the Ministry of Education and by the Ministry of Higher and Special Technical Education.

It is suggested that since a vast majority of students in our schools drop out at various stages of secondary education, correspondence courses and evening courses should be provided even at the school level so that those persons who could not, due to some unavoidable circumstances, complete their secondary education may get an opportunity to work hard and make use of these two major media of education to obtain a secondary education certificate. Further, it is suggested that evening and correspondence courses should be provided in Pedagogical Institutes also to meet the shortage of teachers. This will also apply to the evening and correspondence courses for the graduate and post-graduate levels. This may be uniformly followed all over the country at an early date to avoid future stagnation and frustration.

(3) SPECIAL SCHOOLS

As a result of a close study of some special schools in USSR, it is realized that it will be worthwhile to open some special schools alongside ordinary higher secondary schools where mathematics, physics, chemistry and biology could be taught, as a special subject which will be useful for acquiring knowledge according to the specific aptitudes of children. For example, if a child joins a special school of mathematics, he will be taught various branches of sciences but greater emphasis will be laid on the teaching of higher mathematics. There will be suitable emphasis on the general, moral and physical education also. The same pattern will be followed in other special schools e.g. those of physics, chemistry and biology.

Teachers with wide range of experience and good academic qualifications should be sent to such schools. They may be allowed some additional increments also. These teachers should be given opportunities to join refresher courses organized by State Institutes of Science or by the Department of Science Education, National Council of Educational Research and Training or by the University Grants Commission and in no case should any teacher be allowed to continue in such a school without at least one refresher course in five years. Regarding the provision for library in such schools it should be stated that a close watch should be kept by the Directorate of Education of various States that these schools get the latest literature as quickly as possible cutting the routine type of delays to the bare minimum. Again the equipments of the various

laboratories should be such as to provide challenging opportunities to the students to enable them to take-up projects of an investigatory type.

(4) SPECIAL SCHOOLS FOR TALENTED CHILDREN

Considering the psychology of individual differences and that there are some gifted children who need special care and need not be sacrificed at the altar of the slow learners and of the mediocres, it is very necessary that we should open some special secondary schools with scientific and mathematical bias (to start with) and these schools may be attached to the various universities in India. There are four special schools (attached to Universities) in U.S.S.R. as an experimental measure and the experience of the Ministry of Education, Institute of Psychological Research, University professors and the staff of the schools has been that these institutions are doing a great service to the nation. Building up our concept on this successful attempt, it is very necessary that some such special schools should be opened at an early date in our country. There may be only three classes IX, X and XI and the public examination may be conducted after class XI, by the respective Boards of Secondary Education. Some lectures and allied activities in these schools may be shared by the college and university teachers (considering the paucity of time with the college and university teachers to look after the complete education of gifted children), but it is necessary that there should be whole-time staff available at these schools to follow-up the lectures of the teachers of the colleges and the universities and also to plan regular teaching work

according to the prescribed syllabus of the Board. Thus at these schools there will be a provision for teaching according to the existing curriculum and at the same time to cater to the higher mental powers of the children.

(5) POLYTECHNICAL SCHOOLS

A net-work of polytechnical schools should be laid in the country, where students after class VIII can take up extensive engineering and technological courses with a suitable emphasis on general education. At these polytechnical schools, care should be taken to frame the curriculum in such a way that those who pass out should be competent enough to enter directly in various jobs at the factories and other allied institutions after a suitable period of apprenticeship for such jobs. The course may extend to five years with extensive practical training of a utilitarian type with less load of the theoretical academics.

(6) ORGANIZATION OF OLYMPIADS

It is suggested that a competitive examination in physics, chemistry, mathematics and biology should be held for the students in classes IX and X and the winners at these competitions should be honoured in the form of the presentation of a good set of books and a certificate of merit. The whole process may be organized as under:

1. School level selection in various States may be done by the science teachers in consultation with the principal;
2. A regional competition may be organized at the Regional Educational Headquarters under the guidance of the Deputy Director of Education or a parallel authority;
3. A State level competition to be held at the Capital of the State where the winners of (1) and (2) will be called to appear at the third round;

4. Final round to be held at Delhi under the guidance of the Department of Science Education, National Council of Educational Research and Training where the winners of the first, second and third rounds will compete for the final award.

Since the number of contestants for the fourth round will be small due to the three previous siftings, it is hoped that the expenditure involved in the fourth round will not be too much. The long experience of the educationists of U.S.S.R. has been that such olympiads at the school stage promote scientific thinking, critical observation and above all it provides a suitable motivation and encouragement to the talented students to make use of their now-known potentials. Although it is better to start these olympiads from class VI but considering the present state of science teaching in our country and a number of drop-outs, it will be economical and feasible to take a start from class IX onwards. As an initial step, a pilot project may be launched in Delhi Territory during 1965-66 and if the results are found to be encouraging this Scheme may be extended to the other States and Territories of India, either in steps or all at once. It is suggested that the cooperation of the Directorate of Education of the various States and teachers of the colleges and universities may be elicited to set the question papers and organize the examination at the various stages. In case the Scheme comes into operation on a National level, guidance should be provided to the States by the Department of Science Education, National Council of Educational Research and Training regarding the type of questions to be set for the second and third rounds, to be conducted at a Regional and at the State Headquarters. It will be worthwhile

if the first round of selection is done by the school teachers on the basis of the examination marks, internal assessment and the opinion of science teachers about the quality of work of the students. It may also be pointed out that a parallel competition is being held at the end of class XI by the Department of Science Education, National Council of Educational Research and Training at a National level. This Scheme is intended to provide the colleges and the universities with the vast scientific potentials of the country for creating a future band of scientists.

In case the original Scheme of olympiads is extended to various States of the country, it will be necessary to get the cooperation of the State Institutes of sciences for the formulation of a small science committee which will be responsible for the conduct of such olympiads in their respective States. This committee will consist of educational administrators from the Directorate of Education, college and university teachers and one representative of the Department of Science Education, National Council of Educational Research & Training.

(7) OPENING OF YOUNG HOUSES AND YOUNG FOLK PALACES

On the basis of a close observation of the development of creative potentialities and of the fruitful utilization of the leisure time of children in the Pioneer Houses and Palaces of U.S.S.R., it is suggested that Young Folk Houses and Palaces (as parallel to the Pioneer Houses and Palaces of U.S.S.R.) may be opened in India also, where there will be many circles e.g., fine-art, physics, chemistry, biology, social-services, mathematics, debating, agriculture,

dramatics, mountaineering, navigation, technology, cinematography, electronics etc. At these Young Folk Houses and Palaces there may be a limited number of circles to start with but later on they may be multiplied according to the finances available. These Houses and Palaces should be kept open during the summer vacations and other long vacations and every child of a primary or a secondary school should be allowed to come here at least twice a week to join one, two or more circles. To start with one House may be opened at each District Headquarter and one Palace at the Headquarter city of each State. It will be worthwhile to initiate circles of science, technology, fine-arts, dancing, mountaineering, navigation, aeronautics and electronics. The literature from U.S.S.R. regarding the organization of Pioneer Houses and Palaces is available and some resource persons can also be invited from that country to set the ball rolling.

(8) . OPENING OF YOUNG TECHNICIANS STATIONS

This organization will be slightly different from young folk houses and palaces in the respect that here only those students will be admitted who have a definite aptitude for technological tasks. These children can work, out-of-school hours and in vacations, in such technical stations where improved type of technological devices may be made use of to fire the pragmatic imagination of children and promote scientific and technological thinking and combine it with the creative mental powers and manual skills. To start with, five central young technicians stations may be opened, one each at Delhi, Ajmer, Bhubaneswar, Mysore and Bhopal; one at the Department of Science Education, National Council of Educational Research and Training and one at each of the four

Regional Colleges of Education. At these technical stations children will have ample opportunities to work at machines and fabricate new types of kits, models etc.

(9) ESTABLISHMENT OF AN ACADEMY OF SCIENCES, ACADEMY OF HUMANITIES, ACADEMY OF TECHNOLOGY AND ACADEMY OF PEDAGOGICAL SCIENCES

At Delhi, under the leadership of a team of prominent scientists, educationists and technologists respectively, the four Academies may be established to coordinate and plan the research at the college and university levels so that duplication in research and the resulting wastage could be avoided and research plans could be improved by collective thinking. These Academies will plan the future functioning of the various institutions in the country catering to the higher education. Academy of Pedagogical sciences will mainly be concerned with the coordination and improvement in the curriculum, methodology of teaching and research at the post-graduate and Doctoral levels. This Academy may also consider the possibility of suggesting an unified programme of education for the teacher training institutes (B.Ed., B.T. or equivalent) and post-graduate institutes (M.Ed.). It may also coordinate the research in the field of education at the doctorate level all over the country. The other Academies will plan in a similar way as stated above in their own areas. This will give a new life to the entire programme of educational research in India and will bring about the desired effect whereby duplication and stagnation will be avoided and there will be improvement in quality of education, which will accelerate national reconstruction and national unity.

(10) A NETWORK OF PEDAGOGICAL INSTITUTES

Under the guidance of the Academy of Pedagogical Sciences, the programme of planning a network of institutes of Pedagogical Sciences (on lines parallel to the four Regional Colleges of Education of the National Council of Educational Research and Training) may be considered because only such types of professional institutes can meet the immediate shortage of teachers by providing an intensive course of educational theory and practice for 4 years after the secondary education. In such pedagogical institutes - a broad based education will be imparted to the future teachers which will not only make them better teachers but will also give them a vision of the national problems of education together with possible solutions. One of the main reasons for the absence of teacher shortage in U.S.S.R. is that there is a network of pedagogical institutes (including evening and correspondence courses) all over the country where youths are diverted into these institutes at an early stage and they are given an extensive course of teacher training. In U.S.S.R. it is a four or five year course but considering our own national economy, educational content matter and present shortage of teachers, a four-year course should be enough as is at present available in the Regional Colleges of Education.

(11) POLYTECHNICAL MUSEUM

A Central Museum may be opened at Delhi which may consist of working models and machines in a completely demonstrable form, indicating scientific and technological advancement of the country. Every equipment in

this museum will be of a demonstrable type so that batches of children may come to this museum and get the necessary inspiration to utilize their leisure time hours at young folk houses, young folk palaces and young technician stations. A lot of material is available from the Polytechnical Museum, Moscow on this subject and it can be made use of without any difficulty. The private and public enterprises, specializing in the manufacture of scientific and technological equipments, could be approached by the Government of India to donate some tools and machines to this Museum, which will be a handsome contribution towards the building up of Central Polytechnical, Museum of a big size.

(12) CENTRAL PLANETARIUM

A planetarium of a suitable size may be constructed at Delhi, where visits of schools and college students may be organized from various types of institutions of the country. Alongside the conducted tours, the planetarium may also take the initiative of organizing some special programmes on pre-designed themes for advanced students of astronomy and teachers of science. Those students who are interested in astronomy, may be given special opportunities to make use of the resource persons and of the laboratory facilities available there. This Central Planetarium will provide guidance for opening more planetaria in the country. Guidance can be obtained from the Planetarium at Moscow for setting up the Central Planetarium. Necessary help may also be obtained from the resource persons available at the National Physical Laboratory Planetarium at New Delhi or at the Birla Planetarium, Calcutta.

(13) SETTING UP A SPECIAL TRANSLATION UNIT AT THE RUSSIAN INSTITUTE

It was felt at U.S.S.R. that there is some outstanding literature available in sciences, technology, and humanities which need immediate translation into English and later on into Hindi and other regional languages. For this purpose, it is suggested that a special section may be set up at the Institute for Russian languages where such work could be taken up with speed and precision. Recently three books on Psychology were given by one Professor of the Moscow University to one of the UNESCO fellows with the consent that (these books contain work of an international repute) these could be translated into English and made use of in India. Many such outstanding works are available in U.S.S.R. in various branches of knowledge which can easily be procured and translated into English for use in India.

(14) ORGANIZATION OF SPECIAL SUMMER CAMPS

In order to utilize the leisure time of school children, who possess a special aptitude for applied disciplines like oceanography, aeronautics, marine-engineering and navigation, mountaineering, meteorology, agriculture, mining and metallurgy, automobile-engineering etc., summer camps should be organized in these branches. At these camps children with special aptitude should be admitted and should be imparted a detailed practical course in the respective area with the specific purpose of catering to the special aptitude of children, keeping in view the national demands. At such special summer

camps, it is obvious that only a limited number of children with special aptitude can be called and selection to such summer camps may be made centrally by a Board of competent persons on the basis of the recommendations from the various State Governments. In order to organize such summer camps it is very necessary that a special central committee may be set up which will establish contacts with the different Ministries (both Central and States) and will also conduct the selections. Such summer camps will not only encourage youths of the country for academic and social work but will also help to create a suitable atmosphere for the overall development of the personality of the youths, which is very vital for the speedy national reconstruction.

S H A R M A

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OLYMPIADS OF U.S.S.R. IN PHYSICAL AND
MATHEMATICAL SCIENCES

By

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All physical and mathematical olympiads are conducted in USSR by the Ministry of Russian Federation with the active collaboration of the Ministries of Higher and Secondary Special Education of the USSR.

(1) OBJECTIVES OF THE OLYMPIADS

The objectives of the olympiads are:

- (a) To stimulate scientific interest in children, of general and special secondary schools, and in the working youths.
- (b) To bring about improvement in the knowledge of pupils with regard to physics, chemistry and mathematics.
- (c) To raise the quality of teaching mathematics, physics and chemistry at the secondary level.
- (d) To support the activities of circles and allied agencies.
- (e) To spot brilliant children, adolescents and youths so as to foster their scientific talents.
- (f) To help the children to choose the right type of academic speciality in senior classes on the basis of achievement and aptitude.

(2) THE ORGANIZATIONAL PATTERN

The academic and administrative guidance for the conduct of the All-Russian physical and mathematical olympiads is provided by the Central Organization Bureau which consists of members who are representatives of the Ministry of Education, The Ministries of Higher and Secondary Special Education of the USSR and the

Russian Federation, the Academy of Sciences of the USSR, the Central Youth Organization and leading Institutes and Universities of the country.

The Central Organization Bureau plans and executes the entire functioning of the All-Russian Physical and Mathematical Olympiads.

The membership of the Central Organization Bureau is approved by the Ministers for Education and that for the Higher and Secondary Special Education.

(3) THE CONDUCT OF OLYMPIADS

The Olympiads are conducted in four rounds:

The First Round: The inter-school competitions of pupils are organized in January by school teachers and representatives of the Youth Organizations. The

teachers of basic sciences themselves compose problems and check pupil's papers. All the pupils who want to appear are admitted to the examination conducted in the first round (mathematical olympiads are held for pupils of classes V to XI; physics VI to XI; and chemistry VII to IX).

The Second Round: Local, rural and town olympiads are held in February. The second round is conducted by local, rural and town organizational Bureaux, consisting of the representatives of well qualified teachers; local, rural or town educational authorities of Higher and Secondary Schools and the Youth Organizations. The District Organization is represented in a local, rural and town organization bureau by the presence of one person. The pupils of classes V to XI, who are winners of the first round and the winners of correspondence competitions, (who do not take part in the first round) are admitted to the second round.

The Third Round: This round consists of the Republican and District Olympiads which are held during school spring vacations. These olympiads are organized and carried out by the Republican Ministries of Education; district education authorities together with mathematical and physical-Organizations. The direct guidance of the olympiads is provided by a Republican or District Organization Bureau, composed of the representatives of education authorities; teachers and professors; post-graduates students of universities and institutes, best school teachers etc. . .

The Central Organization Bureau has a representation in the Republican and District Bureaux for the sake of uniformity of standards. The guidance for the Moscow and Leningrad Olympiads is provided direct by the Moscow and Leningrad Universities. The District and Republican Organization Bureaux are set up at the beginning of school year, so that they may help the local, the rural and the town organization Bureaux and schools in planning their academic work for the pupils, who exhibit keen interest in mathematical and physical sciences.

The participants of the third round are the winners of the second round and they belong to classes of VII to XI. Besides, an Organizational Bureau may permit some other category of students e.g. belonging to various correspondence competitions (pils of various general or special secondary schools, working youth, servicemen etc.) to the third round.

Education authorities bear no expenses in connection with the participation in olympiads of the winners of correspondence competitions.

With a view to share experience and evolve an effective pattern of olympiads, the Central Organization Bureau maintains uninterrupted relations with the local Organization Bureaux. For the sake of facility and raising the effectiveness of such links, the Russian Federation is divided into three zones with Moscow, Leningrad and Novosibirsk Universities as academic nuclei for guiding the work in their respective zones. Members of the Central Organization Bureau - representatives of the leading institutes of the zone and the Institutes of the Academy of Sciences of the USSR are sent out to help the authorities in conducting the Republican and District Olympiads.

In the first, second and third rounds, competitions in mathematical and physical sciences are carried out separately and the winners are sieved out separately for the two. Olympiads in mathematical and physical sciences are organized in such a way that all the participants wishing to take part in mathematical and physical competitions are able to participate in these without overlap and difficulty.

Exhibits constituting research projects of a physical or technical nature are a vital component of an olympiad. Their quality is taken into consideration while preparing the final list of awardees. Besides theoretical knowledge, practical skills are also tested very enthusiastically by a Board of Experts. The District Organization Bureaux work out model tasks for the local, rural and town olympiads. The Central Organization Bureau supplies such materials to the Republican and District Organization Bureaux which help them to formulate worthwhile problems for the third round.

The Fourth Round: The final or the fourth round of the olympiads is carried out at Moscow in the second half of April. It includes a peculiar type of competition for solving mathematical problems. Its participants are the pupils of classes VIII to XI, who are the winners of the Republic, district, Moscow and Leningrad Olympiads. Each Republic, district as well as Moscow and Leningrad send to the final round a team of four participants. Each team is headed by a member of an Organization Bureau of the third round of olympiad, appointed by the local educational authorities. Applications for participating in the fourth round of the All-Russian Olympiad are sent to the Syllabus and Methods Department of the Ministry of Education of the Russian Federation well in time.

On arrival at Moscow each head of a team must deliver at the Organization Bureau a brief written account of the content of the competition and the number of participants of a Republican/District Olympiad. The winners' papers in mathematics and physics should be attached to the account. Without such an account, a team cannot be admitted for participating in the fourth round. The winners of the third^{round}/in physics and mathematics are awarded diplomas and prizes while the pupils of class XI are invited to enter the leading Universities and Institutes. This is a rare recognition of talents. Besides, the most able winners are sent to the Summer Physical-Mathematical Schools. The personal achievements of the participants in the third round are taken into account when they apply for entrance to the physical-mathematical boarding-schools or to the mathematical and physical-mathematical faculties of Universities and Institutes. District Education

authorities and Organization Bureaux recognize the talents and efforts of the teachers who work well with their pupils and try to give them the best knowledge of physics and mathematics. The four Inter-nat (boarding) schools for talented children also consider the results of olympiads while admitting students to such schools.

The judges of the final-round (prominent Soviet Scientists, teachers and professors of the leading Universities and Institutes of the country) prepare the problems, supervise the final round and sum up the results. This unique blending of the efforts of the school authorities with the university Academicians is an example of developing sound educational practices.

Each participant of the final (mathematical) round is given a badge and a certificate. The winners of the fourth round are awarded diplomas and valuable prizes by the Ministry of Education, the Ministries of Higher Education of the Russian Federation and the USSR. Twelve best teams, which achieve best team results, are awarded diplomas. Universities and Institutes may have their own prizes which are handed over to the winners of the olympiads by the judges. It is noteworthy that through olympiads not only students are honoured but the teachers and institutions are also given due recognition.

(4) expenses

The Ministry of Education bears all the expenses in connection with the conduct of the fourth round and the maintenance of its participants at Moscow. The Institutions bear the travelling expenses of their representatives, who are sent to Moscow.

All the expenses in connection with the conduct of the second and third rounds are borne by corresponding education authorities.

It will be interesting to quote some problems that are included in the various rounds of the Olympiads. The difficulty-values, matching a grade, are indicated in the brackets against the questions.

SOME PROBLEMS IN MATHEMATICS

- Q. 1. Find the smallest possible number which at the same time is:
 - (a) a square of a whole number,
 - (b) a sum of two squares which are not equal to zero,
 - (c) a product of two squares which are not equal to 1. (6 - 7 classes).

- Q. 2. Find the number if:

$$\begin{array}{r}
 \quad a \ b \ c \ d \\
 + \quad \quad k \ l \ m \ b \\
 \hline
 k \quad \quad l \ c \ b \ e \\
 \hline
 \end{array}$$

The same digits are denoted by the same letter, different digits are denoted by different letters. (6 - 7 classes)

- Q.3. Two players took turns to put some coins on the table so that none of the coins should even partially cover the other. That player will lose who does not find the place for a coin when his turn comes. Also none of the coins are to be displaced. How should the beginner play so as to win? (6 - 7 classes)

- Q. 4. The numbers 1 to 36 are arranged in a table as following:

1	2	3	4	5	6
7	8	9	10	11	12
31	32	33	34	35	36

One chooses any number and makes a circle around it, after that the corresponding row and column are crossed out. Continue to choose a number and cross out corresponding rows and columns till none of the numbers is left uncrossed. What is the sum of all the encircled numbers ? (6 - 8 classes)

- Q. 5. Given the whole number n , which is more than 1, the following product is worked out:

$$(1 + 1/3) (1 + 1/8) (1 + 1/15) \dots (1 + \frac{1}{2n-1})$$

Prove that the product is less than 2. (7-8 class)

- Q. 6. In a country, between any two towns the direct railway communication is provided in only one direction. A town is said to be easily accessible if it can be reached directly or after passing through only one town. Prove that there exist at least three such easily accessible town. (8-11 classes)

- Q. 7. Prove that a circle cannot be divided by 3 lines into 7 parts equal in area. (VIII class)

- Q. 8. Given a regular triangle ABC inscribed in a circle and the point M inside this circle. Prove that $AM + BM$ is greater than CM . (9-10 classes)

- Q. 9. (a) prove that there is a number divisible by 5 among any five successive numbers of this sequence. (b) Can a term of this sequence be a cube of a whole number? (9-11 classes)

- Q. 10. Given 'n' different points belonging to a plane. Let us examine all the possible distance between any two of these points. Suppose, that the greatest of these distances is D and the smallest = d , prove that

$$\frac{D}{d} > \sqrt{\frac{n-1}{2}}$$

(9 - 11 classes)

- Q. 11. A man wrote 10 letters to 6 persons and put these letters into ten envelopes. In how many ways is it possible to put the letters into envelopes so that each letter is put in the wrong envelope? Examine all the possible cases. (10-11 classes)

- Q. 12. Prove that all the altitudes of a tetrahedron intersect in one point when and only when the sums of squares of opposite edges are equal to each other (10-11 classes)

BELOW ARE SOME OF THE PROBLEMS IN PHYSICS

- Q. 1. Two snakes of the same length start simultaneously and at the same speed swallowing each other from tail until there remains only two heads unswallowed. Show on a schematic drawing in colour the longitudinal section of the two snakes. (classes 6-7)

Q. 2. Think of a device with three buttons and a screen so that when all the three buttons are pressed simultaneously the screen should become red; when any two buttons are simultaneously pressed - green, and when any button is pressed - blue. It is desirable to make the device as simple as possible. In how many ways can this be done? (classes 6-8)

Q. 3. There are three identical barrels: the first barrel is filled with small shots; the second with big shots, and the third one with big and small shots. Which of the barrel weighs more? (6-11 classes)

Q. 4. Explain how a sewing machine stitches. What is the main difference in the stitches made by hand and by a sewing machine? (Classes 6-11)

Q. 5. A thick walled iron cylinder is floating in a vessel with water. How will the level of the water change in case we sink this cylinder?

(class 8)

Q. 6. A well known toy "diver" is in a vessel with water covered by a rubber film. When we press the film, the diver, which is in the water, sinks, and, when we weaken pressing - it comes to the surface. Explain the phenomenon. (classes 7-8)

Q. 7. Define the shape of the shadow cast by a sheet of cardboard with a square hole, if the source of light has the shape of a luminous disc. The same for a round hole and a luminous square. The luminous surface, sheet of cardboard and screen are parallel between themselves. (classes 8-9)

Q. 8. The sides of a square made of wire have electric resistance equal to 1 Ohm, and its diagonals - 2 Ohms. Find out the resistance between one of the vertices of the square and its centre. The diagonals of the square are made of homogeneous wire and soldered at the centre. (classes 8-11)

SOME PROBLEMS IN CHEMISTRY

Q. 1. 1.31 mg. of radium bromide emits 3.72×10^7 alpha particles per sec. What quantity of radium for the same period of time can emit 0.01 ml. of helium? (classes 8-9)

Q. 2. 23.3 mg. of chlorosulphonic acid is mixed with water. What volume of 0.1 M. solution of caustic soda is needed to neutralize the obtained solution? (classes 8-9)

Q. 3. What minimum quantity of aluminum is needed to solder with the help of thermite the space of 7.2 cm^3 between two rails? (classes 8-9)

Q. 4. Up-to-date chemical industry and metallurgy widely use extraction. The method of extracting the necessary components from water solution with the help of insoluble (in water) organic solvent.

This process is characterised by the coefficient of distribution $K = C_o/C_w$ with C_o and C_w - concentrations of extracting combination inorganic solvent and water. The quantity K is often constant and not large (from one to ten), hence for complete extraction of the needed compounds it is necessary to consecutively process one and the same portion of the water solution with the help of several fresh portions of organic solvent. How many times is it necessary to extract uranium nitrate with the help of ether, if $K = 2$ so that in the water there should remain 0.1 of its original quantity (the volumes of the water and organic solvents are similar)

(classes 8-9)

Q. 5. Methane and hydrogen are completely burnt in oxygen. The common volume of the mixture of the three gases before burning is 40 ml. The volume of the gases after burning is 30 ml. including 3 ml. of CO_2 . Determine the composition of all the components of the original and final mixtures. (classes 10-11)

Q. 6. It is known that natural water contains admixture of heavy water D_2O . How is D_2O extracted in industry? How do we distinguish D_2O from H_2O ? How do they obtain the combination CH_3OD from methyl alcohol using heavy water?

(classes 10-11)

Q. 7. A mixture of nitrogen, hydrogen and carbon dioxide was originally held in a vessel with the volume of 0.55 at the pressure of 4 atm. and the temperature of $323^\circ C$. The vessel is connected with the help of a palladium diaphragm with another empty vessel of the same volume and at the same temperature. After attaining equilibrium the pressure in the second vessel was equal to 0.4 atm. After that some moles of gases from the first vessel were passed through the water solution of caustic soda. As a result, its volume decreased by 25%. How many moles of nitrogen, hydrogen and CO_2 were there originally in the vessel? (classes 10-11)

Q. 8. Separate with the help of chemical means a mixture of aniline, phenol, benzoic acid and benzil alcohol.

(Classes 10-11)

Q. 9. How is it possible to obtain synthetic fibre of lavalan from paraxylone and benzil alcohol? (classes 10-11)

Thus the olympiads in USSR play a vital role in stimulating scientific talents in the country from lower forms onwards in general, special and Internat Schools. The four special schools for talented children at Moscow, Leningrad, Novosibirsk and Kiev admit above average students

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on the basis of the results of olympiads and the special interview committee appointed for the purpose. These schools are attached to the universities and a higher educational standard is maintained at the secondary level. University teachers, research fellows and members of the Academy of Sciences keep a close touch with the students of these four special schools. They motivate and educate these students in such a way that their intellectual and personality growth is definitely superior to the children in parallel, general or multipurpose schools. The curriculum, too, is more broad-based and has a wider spectrum of knowledge accompanied by more depth, content matter, specially in physical and mathematical sciences.

SHARMA

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"SOVIET SYSTEM OF EDUCATION - A VIEW POINT"
A BROADCAST FROM THE MOSCOW RADIO FOR
INDIAN AND SOVIET LISTENERS

BY

DR. K.N. SAXENA, FIELD ADVISER,
NATIONAL COUNCIL OF EDUCATIONAL
RESEARCH & TRAINING, N.T.E. BLDGS,
MITHRAULI ROAD, NEW DELHI-16

The urge for education in U.S.S.R. is one of the motivating forces with the people to develop a keen sense of scientific advancement combined with a aesthetic-cum-humanistic approach towards life. After the October Revolution, illiteracy was liquidated with a peculiar enthusiasm and within ten years it was possible to teach millions to read and write. A number of schools were opened to educate adults. It will be nearer to truth to state that in Soviet Union, education is one of the principal instruments of planning for economic advancement and social cohesion. In spite of racial and linguistic differences, the role of education in bringing about social and cultural prosperity is evident anywhere one goes in U.S.S.R.

On one hand, Soviet educationists believe that science and technology should occupy a place of pride in the school curriculum and on the other hand they lay stress on the moral, aesthetic and physical education. This balance between the scientific education and aesthetic-cum-humanistic approach makes the Soviet system of education a realistic one. The creative and aesthetic powers of children get a fair play in shaping his/her future personality.

On visiting schools, institutes, universities and factories, one finds an approach of equality and friendship between the scientific workers, teachers, machinemen and allied professional human beings. There are no distinct economic disparities and so far as social equality is concerned, it can be said without any hesitation that there is no world of high and low, privileged and non-privileged existing in this country. This has been possible because of the enriched system of education and imparting of civic sense in children, which flows in the veins of each one of them. At the pioneer houses, parks of culture, pioneer palaces, sports grounds, gymnasias, cultural circles and allied places, children and youths are introduced to a peculiar type of esprit-de-corps, which motivates them to grow into strong individuals with deep roots of socialism. Even from early childhood, a pupil learns to respect elders, to protect public property and to help the needy persons.

The educational system is one of the strong foundations of the Soviet society. The complete equality of sexes, right from infancy, through childhood to adulthood, is a matter of legitimate pride for the Soviet people. This credit goes to the sound postulates of the Soviet system of education

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because the Soviet educators believe that the physiological and psychological differences between the two sexes are not enough bases to warrant a different type of educational system or vocational avenues.

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On one hand, in this progressive country, one finds rapid expansion of education, both at the secondary and higher levels and on the other hand a maintenance of quality at various stages. This is possible because the Soviet educators believe that these two processes are the two faces of the same coin and hence are inseparable. When one talks to the children in a school or at home, one finds that they possess a wide range of interests and the academic curiosities/keep up the excessive mental energy of children directed into socially fruitful channels. Whether a child joins a circle at a school, a pioneer house, a technical station or a pioneer palace, he or she keeps oneself so busy in leisure hours that there is no scope for the play of his or her phantastic imagination. Groups of children are taken round polytechnical museums, exhibitions of economic and social development, art galleries, other museums and allied places of science, art and culture. This kindles in them a light of imagination and consequently lays the foundation of a well defined aptitude.

Pedagogical education in the USSR needs a special mention because it is through a network of the pedagogical institutes that it has been possible for the Soviet planners and educators to provide well qualified teachers of various subjects to the growing number of institutions. There is no shortage of teachers in schools and hence educational guidance is guaranteed to every child. Laboratories are well equipped even at the incomplete secondary schools. Even schools in the remote villages have adequately furnished science laboratories.

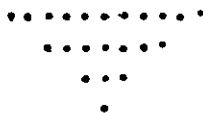
The higher education is provided by the universities and institutes but admission is only by a special procedure of testing. Those having aptitude for higher academic learning are admitted to such centres of fundamental subjects and professional training. This sifting process keeps the quality controlled through the Academy of Sciences and the Academy of Pedagogical Sciences. The coordination between various research institutes, universities and parallel institutes is uniquely maintained in the Soviet Union.

The evening schools and correspondence courses occupy a place of pride in the Soviet Education. For workers and farmers who have not completed secondary education and for those who want to enhance their qualifications, these net work of evening schools and correspondence courses provide an opportunity, which is unparalleled elsewhere. Every University and Institute has its own evening department and correspondence courses.

There is one more important feature of the Soviet educational system and it is, the faith that educators have in the concept of "polytechnical education". Approximately, polytechnical education aims at providing instruction in the fundamental processes of modern production,

industrial as well as agricultural, as an integral part of general education. It is a well defined technique and one of the vital aims of education. Through this very concept, the Soviet educators can claim to have produced creative pupils rather than moving dictionaries.

It can easily be concluded that the scientific, technological, artistic, aesthetic, moral and economic advancement of this country can easily be attributed to its sound system of education, coordination and social translation of research, disciplined citizenship and above all to the deep roots of esprit-de-corps, which are laid from early infancy. Wherever one goes, one finds a thirst for knowledge, discipline in overt behaviour, dignity of human mankind, love for labour and social cohesion. This makes the nation strong and youthful.



BEDROCKS OF SOVIET SECONDARY EDUCATION -
A BROADCAST FROM THE MOSCOW RADIO
FOR INDIAN LISTENERS.

BY

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In the Soviet Union, education is the important link between the economic advancement and social cohesion. It is one of the bed rocks of the social structure of this mighty country. On the one hand, the Soviet educationists try to bring about expansion and on the other hand they jealously guard the qualitative improvement in the overall system of education. It will be correct to say that educators regard efficiency and quality as well as expansion of education as two faces of the same coin. The most important postulates of the well knit system of secondary education are the: school curriculum and the cocurricular activities. Co-education is another pivot over which the socialistic structure revolves with ease. The complete equality of sexes has been achieved in the economic, social and cultural life only by having a complete faith in basing education on a scientific development of an individual rather than depending upon superstitions, lopsided notions and preconceived ideas. The place of Science in the school curriculum is praiseworthy. This is because of the fact that the field of science and technology undoubtedly receives a powerful support from the state, Academicians, administrators, educationists and even from humanitarians. It will be interesting to note that science is taught in schools not as a subject for the acquisition of knowledge only but also for developing a scientific attitude towards life and as a process of developing the entire personality of children. It will also be necessary to note that, although, science occupies a very important place in the school curriculum, the languages occupy the most predominant place right from early childhood education upto the end of the secondary stage. There is a large variety of language groups in the USSR. Approximately three quarters of the population belongs to the eastern group of the Slavonic branch of the Indo-European family of languages. The Turkic group comprises of 18 literary languages and includes Azerbaijani, Uzbek and Tartar with a literary tradition of the medieval period. Another language group includes Armenian, Moldavian, Lattish and Lithunian. The Iranian branch has Tazik, Ossetic, Kurdish and Tat. The Caucasian group includes Georgian, Abkhasian, Asetian, Abaza etc. There are some dialects belonging to the various parts of the country. One wonders how cultural awakening and social cohesion has been brought about in the Union. The answer is quite simple, and it is that, there is one Union language, namely the Russian, which coordinates the thoughts originating through dialectical or regional languages. Books in Russian are available for translation in the local languages and outstanding works in the local languages are translated into Russian.

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This is how an equilibrium is maintained in keeping education unified as well as flexible. Next to the languages, mathematics occupies the largest proportion of school time. The disciplinary concept of teaching mathematics is maintained by the educators. Algebra and Geometry are introduced in form VI. Regarding the teaching of Science, it may be added that science is taught not only to prepare future specialists but also as a vital means to develop creative thinking in children. The out-of-school programme, as in circles, Pioneer Houses, Pioneer Palaces and Young Technician Stations is praiseworthy. An elementary course on nature study is introduced in form IV. Biology is introduced in form V, Physics, in form VI and Chemistry in form VII. History is introduced in grade IV and Geography in form V. Economic Geography is taught in higher grades. Foreign languages occupy an important place in the school programme and also in higher education. Learning a foreign language is obligatory for every pupil from class V. There are some special schools where a foreign language is taught from Grade II. Drawing and music occupy an important place from grade I to grade VIII. Physical education is given considerable importance in the Soviet educational system. The standards of gymnastics, sports, games, and drill are very high in schools. Astronomy is taught in grade X and considerable interest is aroused by organized visits of children to the planetaria. The polytechnical education and productive training are the rock foundations of the Soviet system of education. The total programme, includes love of labour; labour training; socially useful work; productive training; and polytechnical education. This new concept can be characterised as the most important development in Soviet education. The Soviet school curriculum, though uniform, is not a static one. Pedagogists, teachers, administrators and psychologists are always busy to conduct new experiments and modify the existing curriculum in the light of the experimental findings.

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SOME PIVOTS AND DETAILS OF SOVIET EDUCATION

DR. K.N. SAXENA

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DEPARTMENT OF SCIENCE EDUCATION
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SOME PIVOTS AND DETAILS OF SOVIET EDUCATION

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At the very outset it will be interesting to understand the Soviet system of education, as it freely revolves on its constitutional pivot. In Article 121 of the Constitution of U.S.S.R. it is clearly stated:

"Citizens of the USSR have the right to education. This right is ensured by universal compulsory eight-year education; by extensive development of secondary polytechnical education, and secondary special and higher education based on close ties between the school, real life and production activities; by the utmost development of evening and extra-mural education; by free education in all schools; by a system of state grants; by instructions in schools in the native language, and by the organization of free vocational, technical and agronomic training for the working people in the factories, state farms and collective farms".

From the above, it will be interesting to note that education in U.S.S.R. is regarded as an important link between social cohesion and national economy. It is purposeful and goal directed. Dignity of labour is one of the fundamental postulates over which the system revolves freely. The education of the talented is not ignored at the altar of the mediocre and the slow learner and in a similar way the physically and mentally handicapped children are admitted to special types of schools.

The evening and correspondence schools deserve a special mention. Millions of people have been educationed through such schools. The Soviet educationists are of the opinion that every individual has infinite mental capacity to learn and profit by education. Hence educational facilities are extended so extensively that every individual can get an opportunity to educate himself or herself without any frustrations.

The system of education in USSR is as follows:-

- (a) Pre-school education (up to 7 years of age) is provided in nurseries and kindergartens, where the children learn the alphabet and numbers, become acquainted with the rudiments of drawing and singing, and learn how to behave in society. Collective singing is very much encouraged in such schools. Parents, who work in offices, factories, farms or elsewhere may send their children to nurseries and kindergartens during their working time. If necessary, the children may spend the whole week there under the supervision of experienced teachers and nurses. During the summer, kindergartens and nurseries usually move to the country. There are many Internat (boarding) pre-schools, where children can stay after school hours because their parents are employed at places where there is odd shift-system of work. If one visits any of these kindergartens or nurseries, he will carry an everlasting impression that apart from academic activities, a great premium is paid to nurture socially acceptable decent behaviour in the children. They are taught collective work and dignity of manual labour in a very natural setting. This lays the sound foundations of future citizenship even in such small children.

- (b) The general education school provides the young (from 7 to 17-18 years of age)* with fairly extensive knowledge. The curriculum includes the native language, the elements of higher mathematics, physics, chemistry, geography, history, literature, a foreign language and other general subjects. There is a uniform curriculum for all but one can opt for a speciality, after class VIII. Physical education occupies a place of pride in the Soviet curriculum. It is universally accepted that "a sound mind can conveniently reside only in a sound body" and hence right from the early childhood to youth, physical work in different forms is an essential feature of the Soviet education. This is one of the reasons why one can find in Soviet schools, a band of future athletes, sportsmen and wrestlers. The teachers also are very active and participate with children at the playgrounds and gymnasias without any hesitation.

There is sufficient stress on laboratory work, machine work, workshop practice, farm-labour, excursions to museums, exhibitions and places of scientific interest and on individual project work. One of the bedrocks of Soviet secondary educational system is the net-work of the Pioneer Palaces and Young Technician Stations. These are exactly the places where children fruitfully utilize their out-of-school leisure hours to shape their personality by individual and team work. At one Pioneer Palace, there can be hundreds of active co-curricular circles e.g. scientific, literary, artistic etc. The children participate freely in such activities and can thus fulfil two major objectives: (i) develop such personality traits as self-confidence, perseverance, esprit-de-corps and initiative; (ii) learn to be of vital use to the existing social structure by developing a balanced and objective attitude towards life and realities.

Another bedrock of the Soviet System of Education is co-education. From early childhood to adulthood, the two sexes are brought up naturally as two inseparable faces of the same coin. This philosophy keeps many silly and petty problems away into the limbo of oblivion and children build up their moral values, without being panicky of the undue sophisticated views of their elders and superiors.

Since 1958, compulsory eight-year schooling has been introduced in place of seven-year. The five-mark system is used in schools and the internal assessment is so well designed that apparently there does not seem any necessity to hold annual examinations for passes and failures. The Soviet educationists have their own views regarding evaluation and in the entire structure of evaluative techniques, oral examination (with the frequent use of black-board) occupies a predominant role from earliest school education up to highest type of education.

In Soviet schools, lessons are given every day (with the exception of Sunday) from morning till mid-day. The time-tables are so drawn up as to ensure a variety of subjects each day and thereby avoiding monotony arising out of fatigue or boredom. Science is taught in classrooms, where adequate arrangements are already available at each table of the students for experimental verification of any theoretical concept developed by the teacher. This makes the study of science lively, fruitful, objective and connected. Visits to places like botanical gardens, zoological parks, planetarium, factory sites, industrial plants, polytechnical museum, industrial and technological exhibitions fall in connected lines with the school teaching work. These visits, again confirm the objective basis of acquiring scientific knowledge.

- (c) There is an important link between secondary and higher education. On finishing eight year schooling, the teenagers either continue their secondary education (11 classes) or begin work to the best of their abilities with a guaranteed wage. Those who desire it, may go to a vocational school to learn a trade. For this purpose there is wide

* Before 1958 reform, there was 10-year schooling but soon after it was raised to eleven years. The educationists are again thinking to bring it back to 10 year schooling after a lot of fundamental research at the Research Institute of Psychology, Moscow.

network of polytechnical and specialized schools whose programmes cover the range of general knowledge provided by the 11-year school, besides giving professional training. In 1962, for instance, there were more than 20,000 general education polytechnical schools with more than 1.5 million pupils.

Other types of 11-year schools include music, choreographical and art schools, where general subjects are taught and professional training is provided. The number of such schools is less compared to the schools mentioned above.

- (d) In the Soviet Union universities and colleges are operating in 226 towns. There is a phenomenal rise in the number of higher institutions in the eastern areas of the country. There were only four higher educational establishments before the revolution and now there are 204 such centers.

Universities in USSR are large study and research centres, training specialists of high qualifications in all the fields of sciences. A university consists of several colleges with faculties of natural sciences and humanities.

The Moscow University was founded in 1755 by the great Russian Scientist Lomonosov. It has 13 faculties, 223 chairs, 250 laboratories, eight scientific training centres, three museums, botanical gardens, and four astronomical observatories. In addition, the University has a preparatory faculty for foreign students, learning the Russian language. The teaching staff includes approximately 3,700 professors and scientific workers, and 33 members of the USSR Academy of Sciences. At present the student body exceeds, 40,000 including more than 10,000 persons who attend evening and correspondence departments without breaking off their work.

A specific feature of the higher education, in particular university education in the USSR, is its comprehensive general educational nature. The graduate, besides specializing in his chosen field, must have a wide range of knowledge of a number of allied sciences. The period of study in the natural science faculties is five and a half years; in the humanities five years.

The Institutes are divided into polytechnical (with several faculties in different subjects) and specialized (a definite branch of learning e.g. Pedagogy, medicine etc.). There are 206 higher technical educational establishments in the USSR, situated in 60 cities, primarily in industrial areas.

Specialists in agriculture, economics, law, education, medicine, .. arts, literature are trained at specialized institutes. For instance, there are over 50 higher art schools for musicians, actors and sculptors. In the majority of higher educational establishments, theoretical studies are combined with adequate practice. The students get an on-the-spot training in the practical processes at fields, factories and experimental training farms.

The significant feature of higher education is that the students move up a year on passing the regular examinations and carrying out a certain amount of independent work. Term projects and term papers are the first independent research, the first practical steps of the young specialist.

The technical colleges are constantly adding new courses to their programmes in keeping with the present-day standards of science e.g. "fundamentals of industrial electronics", "computing machines and programming" and "Application of atomic energy in the national economy," etc.

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Graduates present a diploma thesis to which 18 to 25 weeks of the time-table are devoted. In the case of a technical college, the student usually receives the assignment of designing some complex unit. The subject of an engineering project may be a unit of a diesel engine, aircraft, industrial shop, pit or power station, according to the given speciality. The project usually consists of 10 to 15 drawings with an explanatory note and calculations attached in about 100-120 pages in all. Diploma theses primarily pursue an educational purpose, but their themes often make it possible to apply the students work practically.

The most interesting feature of the Soviet Education is that more than 1.5 million people (more than one-half of the entire student body) attend evening and correspondence departments of universities or colleges. The second important feature is that all education is free of cost. All expenses connected with studies at universities and colleges are fully borne by the State. The complete training of one student costs the state from 820 to 850 roubles a year (one rouble is equal to Rupees five and twenty nine naye paise). Students who make good progress receive state grants, the amounts of which depend upon the speciality of the institute and the students' material position.

Each graduate is guaranteed work in his chosen speciality, and he has the opportunity to choose his place of work himself.

Thus in Soviet Union, education is regarded as the most important link between national reconstruction, economic planning and social cohesion. It is regarded as the strongest base for the socialistic pattern of Soviet Society.

IMPORTANCE OF THE CO-CURRICULAR ACTIVITIES
IN THE SOVIET SYSTEM OF SECONDARY
EDUCATION - A BROADCAST FROM THE
MOSCOW RADIO FOR INDIAN LISTENERS

BY
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In the Soviet educational system, the programme of co-curricular activities occupies a very predominant role. It is treated at par with the instruction imparted in the classroom. The pivots of such a network of activities are to develop in children initiative, interest, abilities, creative powers and above all to train them for group work and social cohesion. A training in the political ideology and socialistic pattern of society is not ruled out as a part of extra-curricular activities. Thus on one side, one finds a rigid school curriculum imparting elements of knowledge and on the other hand a full scope is provided, out-of-school hours, to develop the child's personality to the maximum extent. The very basis of total school education is, therefore, two-fold: one through the classroom and the other through activities organised, out-of-school hours.

The extra-curricular activities are organized by (i) school itself (ii) special establishments (iii) youth organizations and community. The activities organized at school are in the form of 'circles'. These are meant for specific subjects and to cater varying interests and are open to all the children in the school. Although every child can join a circle, yet it primarily caters to the needs of the talented children. These are really the places where real aptitude germinates. Every school has a number of circles. The work of these circles is supervised by teachers and other specialists. A pupil can join one or more than one circle and attend it twice a week for two hours each day, outside the school hours. To give an example of such circles, the most popular are those of natural sciences, mathematics, physics, chemistry, dramatics, painting, music, dancing, sports, photography, machine work, puppetry etc. The pupils develop their own individual projects and thus are given a fair deal to develop their intellectual capacities and powers of creativity. For each circle, a good library is provided which is made use of very actively by children. To supplement the work of the circles in schools, specially in natural sciences and technology, a network of establishments known as 'stations' are organised all over the country. There are stations for naturalists and again for young technicians. Central stations for young naturalists and young technicians in big cities coordinate the overall programmes of circles and stations. All the stations are well equipped with laboratories and allied facilities. The stations for young naturalists have farms and orchards, green houses, meteorological stations and wild life sections. The 'Young Naturalists' movement is now more than fortythree years old and covers several thousands of pupils. The stations for young technicians are equipped for electrical and radio engineering, aviation and automobile engineering. It will be worthwhile to mention that groups of students are taken round the places of permanent value in art, science and technology e.g., to the Exhibitions of Economic and Scientific Achievements; to art museums; polytechnical museums; and to various factories and plants. These visits are very educative and fruitful in training the imagination of children on pragmatic lines and also to produce in them an intellectual stimulation to work out individual projects.

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There is a network of competitions in USSR, which provide stimulation to pupils' interest and are used as a means to identify talents at an early stage. The process can be illustrated by explaining the term "Olympiads". They are competitions originating from schools with more emphasis on physics, chemistry and mathematics. Each school sends the best children from each class to compete in the regional contest and then there is another seiving at the Republic level. Thus there are three major rounds namely: the first at the school level; the second at the regional level; and the final round at the Republic level. The most talented students are honoured at a public function. In 1965 the final round of the olympiads for RSFSR and for the Union was held at Moscow University in the third week of April and it was noteworthy that the topmost Academicians and Professors took keen interest in organizing these contests. Finally, prizes were distributed by the Minister for Education, RSFSR. The most outstanding feature of the whole programme was that a student of class V from a village school of North-east Siberia succeeded in solving problems of chemistry of class VII, while no chemistry is taught as a school subject at that stage. This small child had read a lot of chemistry by borrowing books from his elder friends and his teachers also promoted his talents. This is how the "Olympiads" stimulate the minds of children and also identify the future potentials.

The third category of activities involve the functioning of youth organizations. These exert a powerful influence on the education of the young people. They work in close collaboration with schools and organize activities for masses. The central theme is to develop in young men and women general level of discipline; social behaviour; political consciousness; and adevotion for civic duties. The movement comprises of the "Octoberists", the Pioneers and the Komsomols. The rough age group of the first is below 10 years; of the second 10 to 15 years; and of the last category 15 to 26 years. The whole programme of these organizations is guided and controlled by a Central Committee at the Headquarters of the Soviet Union.

All children of primary grades and below 10 years of age are "Octoberists". Every school has a Pioneer organization and a whole time person to organize and supervise the programme. The Pioneers in a school form a brigade and each class has a Pioneer's platoon. The Pioneers form themselves into small team which undertake collective projects.

Each district has a Pioneer house, where Pioneers go in the evening and participate in a variety of programmes provided by the circles in the 'House'.

The cities have Pioneer Palaces which are very adequately equipped with all the modern amenities and also with a large staff of whole time workers. Most of them are housed in the palaces of previous nobles and lords. Thus, in the most beautiful and extensive buildings Pioneer Palaces are lodged. There are more than 1500 Pioneer Houses and Palaces in USSR. These are the real places where strong foundations of personality structure are laid in children, adolescents and youths. There are 700 circles at the Pioneer Palace at Moscow and about 250 in Leningrad, where thousands of children take part every day. Each Palace has a good library. Camping during vacations is a regular part of the Pioneer programme in which millions of children take part every year.

At the age of 15, the pupil is ripe enough intellectually and emotionally to seek admission to the Komsomol organization. The admission is a controlled one. The age group covered is from 15 to 26 years. Its units are established at factories, schools, farms, universities, institutions and offices. The Komsomol has the same organizational structure as that of the Pioneers except that the participants of the former have much to do with public affairs. The tasks before Komsomols are the intensive studies of his or her fields of speciality and improvement in the knowledge of technology, care of public property and development of the body and mind to the fullest extent.

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The Komsomols undertake work-projects on a big scale. The Cultural Committee of Komsomols supervises the programmes and also publishes a large amount of literature dealing with various academic and organizational matters.

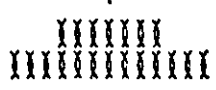
Most of the cities have Komsomol parks where young persons participate in various out-door activities on holidays.

This is how the educational system in the USSR interknits the school and out-of-school activities to produce balanced personality in the youths.

A PAPER READ AT THE CONFERENCE OF AFRICAN-ASIAN
SCIENTISTS HELD AT NEW DELHI FROM 25TH APRIL
TO 2ND MAY, 1966

A NATIONAL EFFORT TO IDENTIFY AND
NURTURE SCIENTIFIC TALENTS

DR. K.N. SAXENA



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With the progressive democratization of educational opportunities with the industrial and technological advancements in the sphere of national reconstruction, it has become imperative that the scientific potential of a mighty country like India should be geared up by suitably fielding up a band of future research workers in basic sciences. This problem needs careful scrutiny because it is applicable to majority of the developing countries of the world.

Experience has shown that in any advanced country it is possible to bridge the gap between the national requirements and the existing resources by careful planning and action in advance. Utility of the scientists in the building up of national economy can never be underestimated. Their specific role in the building up of a healthy and strong social structure has been obviously demonstrated. The country needs a team of scientists. How can this stupendous task of creating a band of efficient scientists be completed with efficiency? The answer is not so simple. For this purpose, we have to nurture scientific talents in a congenial atmosphere. Again, it will be necessary to do a nation wide search in order to spot out children of promise. Because the talented pupil today has every chance of turning into a talented scientist of tomorrow, provided the environmental factors are invigorating. It has been experimentally proved that the scientific aptitude tends to mature by the close of the secondary stage of education. This aptitude begins to germinate by about 12+ to 13+ and tends to be developed in full form by about 16+ to 18+. Consequently, an experiment was conducted in 1963 at Delhi territory to locate the scientific talent at the end of the secondary stage. The tools of selection consisted in the use of a scientific aptitude test, an essay paper and an interview. The empirical and the predictive validity of the tools of selection as well as the predictive validity of the composite scores indicate that it was really possible to locate scientific talent with precision. This experiment was successful and the Scheme was extended all over the country in 1964.

In 1964 another tool of selection was added to it. That was the use of a project report to be written by the participants on the basis of their experimental and observational work. This tool of selection has proved to be of great utility because through this it is possible to test the powers of mental creativity, initiative, and self-confidence of the students. From 1964, 350 scholars were awarded scholarship each year for pursuing higher studies in basic sciences. One of the specific conditions for the award of scholarship is that the student must continue his studies in basic science courses.

Till 1965 this scholarship was awarded for a period of three years only i.e. for pursuing the B.Sc. course for a period of three years. In 1966, the whole Scheme was reconsidered and it has been decided that these students of promise, who are selected each year on the basis of the comprehensive testing Scheme, should be awarded scholarship for a period of at least 9 years i.e. three years in B.Sc., two years in M.Sc. and 4 years in Ph.D. provided their academic success in good. With this new orientation in the Scheme, it has been possible to give a clear-cut picture to an awardee about the entire period of scientific education.

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Alongside, it has also been considered worthwhile to maintain suitable contacts with the employing agencies so that when these students complete their education they may be fruitfully employed in suitable scientific establishments without any frustration. In addition to this it is being considered that these scholars should be registered in the scientists pool, in case it is necessary.

The real edifice of the entire Science Talent Search Scheme is neither the identification part nor the disbursement of scholarship amount but the nurturing of scientific talents so that their intellectual potentialities of these scholars may blossom up without obstruction or stagnation. With a view to nurture these talents several measures have been adopted and they include:

Improved science curricula; award of current science books and periodicals; placement at suitable institutions of higher learning, such as centers of Advanced Studies; organization of summer schools etc. The organization of summer schools for the talented scholars is a very special feature which has recently been introduced as a part of the follow-up programme of the entire Scheme. It includes an inter-personal contact between the scientists of repute and the scholars so that the awardees may develop a genuine motivation to develop a research spirit and mental creativity. At this school every effort is made to inculcate in the scholars a deep sense of responsibility towards executing worthwhile scientific projects and a habit of utilising the leisure hours in pursuing academic activities which will form the real edifice of scientific research.

In addition to the individual oriented programmes, an emphasis is laid on a net work of lectures by eminent scientists on the current developments in basic sciences. In 1965, the summer schools were conducted on a broad base of lectures on various branches of science such as physics, chemistry, botany, zoology, astronomy, geology, meteorology etc. On a closer evaluation of the results, it was found out that the talented students were more interested in a particular branch of science rather than in a broad spectrum of diffused knowledge of interdisciplinary sciences. The Directors of the summer schools of 1965 alongwith other resource persons collected together and analysed the results of previous summer schools and decided that it would be worthwhile to hold summer schools in specific areas of science such as physics, chemistry, mathematics and biology. This experiment is being tried out at 16 summer schools all over the country in the coming vacation.

In addition to the lectures on specific topics and the individual programme of research and experimentation, part of the time of the entire schedule is devoted to the critical observations of some outstanding films in basic sciences. Excursions to places of scientific interests also have proved to be of great use to the students for developing their scientific knowledge.

The keeping of a cumulative record card for each awardee needs a mention at this place. It has been empirically established that a close observation of the academic progress of the students and timely guidance has proved to be of great use in boosting up the morale and output of the students. The follow-up programme regarding the academic career of the awardees can be regarded as the most vital link between the process of identification and the ultimate results of the entire process of nurturing the talents.

Reverting back to the original preposition that the scientific aptitude in a talented group of children begins to manifest itself at a lower age, it is very necessary to identify the talents at an early stage of the school education. Keeping this hypothesis in view, the National Council of Educational Research and Training is also thinking actively to start a mathematical talent search at the end of class VIII. Since it is possible

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to identify children of promise at this stage, it will also be possible to create such environmental circumstances and accelerated programmes of education as may help the talented scholars to grow to perfection with sagacity, accuracy and speed. If this experiment is successful, search for talent in other science subjects at this early stage will also be taken up.

This will mean that it will be possible for the nation to identify the talents in the fields of science and mathematics between age group 12+ to 25+ and if these identified talents are properly nurtured it should be possible for the nation to produce a band of future scientists and mathematicians. A word of caution will be necessary at this place and that is that with all optimistic aspects of the Scheme, one cannot profess with complete confidence that the probability of success is cent per cent under any circumstances. This is because of the fact that there are many constant and random errors which can creep in the experiment and secondly there are some factors which are absolutely beyond the control of the experimenter and the subject.

Building up our postulates on the psychological foundations that under normal conditions it is possible to accelerate the pace of intellectual progress and academic advancement, this national effort of identifying scientific talents should bear adequate fruits which will go a long way to bring about speedy national reconstruction.

It will not be out of place to mention the experiments that have been conducted in this field in two major countries of the world. In the Soviet Union talent is identified in the lower classes of the school stage and it is nurtured through an organized programme of curricular and co-curricular activities. Every year competitions known as 'Olympiads' are held all over the country for this purpose. These are held at the school, district, state and national levels. The winners of the awards are nurtured by the Academicians of the Soviet Union. Such 'Olympiads' have become a regular feature of the progressive educational system and they have provided a very rich foundation for creating a band of future scientists in the country. It is interesting to note that in the organization of such 'Olympiads' university teachers and academic people of international reputation take the most active part, as it is felt to be a part of their duty to develop and conserve the future assets of the nation. The Ministry of Education undertakes all the responsibilities and seeks the active cooperation of all the concerned people. The competitions are open to students of all grades and through these competitive programmes, a revolution has been brought about in the content matter and methods of teaching at the school stage.

Similarly in the United States many students in the Junior High Schools and early years of Senior High Schools look forward to prepare to enter the Science Talent Search competitions which are run by the Westing House Science Talent Search Scheme and several other scientific and industrial organizations. Through these competitions, a discovery is made of the youths of America whose scientific skill, talent and academic abilities indicate potential creativity and originality. The Science Club and the Science Fairs provide excellent preparation and background for success in these scholarship competitions.

The Science Talent Search Scheme is conducted annually by the Science Clubs of America as an activity of the Science Services in cooperation with the Westing House Educational Foundation. It is open to any boy or girl who is in his last year in an accredited higher secondary school in the United States.

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There is no doubt about the fact that such fruitful efforts are being made in some other countries of the world also but in most of the cases this experiment is still in the initial stages. It is high time when the experiences of a handful of countries should be pooled together for the benefit of the other developing countries.

The problem of discovering the scientific potential in any progressive country of the world is self evident and it is a perennial problem which should be resolved with mutual trust and collaboration.

BASIC EDUCATION - A PSYCHOLOGICAL AND
PEDAGOGICAL APPROACH

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PEDAGOGICAL APPROACH

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Defining basic education, Gandhiji wrote in the Harijan dated July 13, 1937 - "By education, I mean an all-round drawing out of the best in the child and man - body, mind and spirit. Literacy is not the end of education nor even the beginning. It is one of the means whereby man and woman can be educated. Literacy in itself is no education". It is evident that the child, and not the mastery of the "3R's", should be the centre of education. Development of personality is not possible in vacuum and requires an interaction of forces from within and without the individual. From this point of view the school is a miniature form of society, notwithstanding the artificial barriers between the traditional schools and community life. It necessarily implies that a child in accordance with his maturity, understanding and personality qualities, will develop an academic atmosphere around himself bringing about a liaison between himself, the school and the community life. The distinction between children, mainly on socio-economic grounds or high parentage (cherished by the special public schools) is rooted out by the new system of basic education. Every child is to do the same manual work, irrespective of his birth and parentage.

Two decades ago, we had the traditional textbook schools, whose main objective was the mastery of the "3R's", whose methods, memorisation and reproduction and whose curriculum was based on a rigid compartmentalisation of the subject-matter, with the consequence of shifting all emphasis to the dry, dreary academic facts, ignoring the child and the community. The second type of schools was slightly democratic in nature whose objective was not to produce clerks or personnel for lower vocations, but to produce individuals who could take up the responsibility of citizenship with sagacity, flexibility and integrity. These schools emerged out of a national consciousness aroused in people as a reaction to the foreign regime and the educational pattern sponsored by it. The main objective of these schools was to make education child-centred. The methods employed were not far from those used in the traditional type of schools. The curriculum was rigid but was slightly modified by the interest of the children for whom it was intended. The third type of schools were an extension of the second, with greater emphasis on child's potentialities, interests and aptitudes and on the community focus. We can identify the third type with basic schools with learning by doing as a dominant feature. These craft-centred schools were based on the fundamental psychological assumption that education is a modification of behaviour which can easily be achieved by actual participation in activities of the immediate environment. Naturally, new knowledge, skills and attitudes can be acquired more easily than by any formal schooling based on methods of memorization and reproduction. To create a psychological environment whereby the higher mental process of analysis-synthesis, reasoning, orientation, etc. can be called forth, it is necessary that the creative aspect of child's personality must be actively developed. Since satisfaction comes more readily in actions and jobs done with one's own hands, it is imperative that some handwork should be the centre of education at the preliminary stages. Basic education helps the child in developing his or her personality through manipulation and activity. Since it is related to the community life a child will naturally adjust himself to the environment through insight, sympathy, imitation and suggestion. The organic, intellectual and economic needs of the child motivate him to learn not only the subject-matter of the text-books but also to adjust to the social environment.

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There is a common notion among some people that basic education can at the best produce suitable artisans and not well balanced scientists, literary persons and future citizens. They are also apt to think that the traditional schools are in many ways superior to the basic schools chiefly because in the former the subject-matter is learnt by heart and reproduced to the satisfaction of examiners in home and public examinations. If this is the criteria of judging knowledge and predicting future success, we have every right to go back to the disciplinary concept in education. But if we think that the main purpose of education is an all-round development of personality, we are to modify our views. In the latter case, we will have to make education child-centred and introduce such manual work as to intercept the monotony of learning of the "3R's". In that case, we will be nearer to the surrounding and may be developing a sense of security, self-confidence and self-reliance in our children and adolescents.

The whole success of basic education lies in the selection of a suitable craft, for which the raw-materials may be available in the immediate surroundings. By absorbing in this craftwork, the children not only learn the technique but also develop a particular attitude towards life, gradually affecting the growth of the total personality. Normally the basic craft is connected with the immediate environment and often breaks the artificial barrier between intellectual and manual work. Through craft teaching many personality qualities may be developed, e.g. self-confidence, initiative, calmness under pressure, self-respect, dignity of labour, sense of responsibility and creative sublimation of emotions, etc. Therefore to regard that craft-centred schools are inferior in nature and are meant for slum areas is baseless, unpsychological and foolish. The major necessity is to correlate the contents of other subjects with central crafts. Better correlation will produce better results.

Flexibility of the child's mind requires that small projects should be planned, related to the central craft and the local needs. Evidently the assignment should be purposeful in nature, eliciting active co-operation from children by providing enough of motivation. Although all the stuff prepared by the child during the early training will not be saleable but gradually the produce will be able to serve some local needs and it will render some economic help to the school.

At the junior and senior basic stages the chief crafts chosen are agriculture and allied arts, spinning and weaving; metal craft, wood craft, etc. Mat-making, moodha making, tat-patti and carpet making (ordinary) and the making of earthenwares, small pieces of wooden furniture etc. are also some of the profitable occupations for the children in basic schools.

It will be necessary to mention that from the psychological standpoint the recreational and the productive side of basic craft should go hand in hand. True basic education prepares the children for harmonious, healthy and good social relationship. It also imparts them skills and outlook for future citizenship and prepares them for a wide variety of vocations. It is an admitted fact that a child taught in basic schools is more alert, self-confident and mentally better adjusted to his social surroundings than one educated in a traditional type of school, where pedagogues' bias or the phobia of examination are the main incentives and motivations. A new movement is being launched to improve Basic education with "make all basic Schools better schools" as the top goal. I would very much wish that simple projects may be started which are to be based on the real needs of community life. I would also wish that some additional crafts may be provided and the curriculum for theoretical subjects may also be broadened. Some such modifications will make Basic Education more adequately suited to all types of children including the gifted.

SOME SPECIAL ASPECTS OF A STANDARDIZED ACHIEVEMENT
TEST IN SCIENCE

DR. K.N. SAXENA

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SOME SPECIAL ASPECTS OF A STANDARDIZED ACHIEVEMENT
TEST IN SCIENCE

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The investigator prepared an achievement test to be used after the 'Delta' class for selecting suitable boys for the scientific group at the Higher Secondary stage. The test consisted of 100 items (selected on the basis of curricular importance, difficulty value, discriminating value, etc.) and was standardised on 2,190 students of 'Delta' class of 30 different institutions selected from 10 different districts of U.P. The reliability of the test was 0.88, the empirical validity was 0.46 and the predictive validity was 0.57 (criterion being school science marks).

The test consisted of 4 types of items, viz., multiple choice, recall, completion and matching, and had three main areas, viz., Physics, Chemistry and Biology. In this article details of an analysis of facts obtained in these three specific areas are discussed because the results are of some significance to the field workers.

Out of the total sample, a representative sample of 365 students was drawn and the scores in the three sub-areas were analysed.

ANALYSIS OF THE DATA FOR THE SUB-TESTS.

The following are the frequency distributions of raw scores as obtained by 365 students on the three sub-tests.

TABLE 1

Frequency distribution of scores in Physics

C.I.	F
50-54	1
45-49	2
40-44	5
35-39	8
30-34	19
25-29	32
20-24	51
15-19	76
10-14	71
5-9	68
0-4	32
	365

TABLE 2

Frequency distribution of scores in Biology

C.I.	F
10-11	4
8-9	10
6-7	77
4-5	144
2-3	86
0-1	44
	365

(Contd.)

TABLE 3

Frequency distribution of scores in Chemistry

C.I.	F
15-17	2
12-14	19
9-11	83
6-8	142
3-5	102
0-2	17
	<u>365</u>

TABLE 4

Mean, Standard deviation and percentage of questions answered correctly on the average

Sub-test	No. of items in the test	Mean of scores	S.D. of scores	Percent of questions answered correctly on the average
Biology ...	14	4.15	1.94	29.60
Chemistry ...	20	6.93	2.88	34.65
Physics ...	66	16.25	9.60	24.60
	100			

INTERPRETATION OF DATA

On the average, students are able to answer correctly 29.6% of the questions in Biology, 34.65% of the questions in Chemistry, and 24.6% in Physics. The questions in Physics are harder in nature in comparison to those of Biology and Chemistry. The items in Physics have been given more weightage because this is considered by science teachers, research workers and experts as the subject of fundamental importance in higher studies and research. In Biology and Chemistry items, the knowledge tested is more of a factual nature and hence it was not considered desirable to give more weightage to these items.

CO-EFFICIENTS OF CORRECTION BETWEEN THE VARIOUS SUB-TESTS SCORES, THE TOTAL SCORES AND THE CRITERION SCORES AS CALCULATED FROM THE REPRESENTATIVE SAMPLE.

Inter-correlations among the three sub-tests, the total and the criterion scores were calculated. The results are summarised below:-

TABLE 5

Showing the Correlation Matrix of the various sub-tests, the total and the criterion

	Biology	Physics	Chemistry	Total	Criterion
Biology	0.61	0.42	0.73	0.28
Physics ...	0.61	...	0.36	0.94	0.46
Chemistry ...	0.42	0.36	...	0.57	0.22
Total ...	0.73	0.94	0.57	...	0.46
Criterion ...	0.28	0.46	0.22	0.46	...

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DISCUSSION OF RESULTS

It is observed from the above data that the correlation between the scores on sub-tests Physics and Biology is greater than that between the scores on sub-tests Biology and Chemistry or Chemistry and Physics. Obviously a student doing well in Physics does well in Biology also but not in Chemistry. This is somewhat contrary to the conventional belief that Physics and Chemistry rather than Physics and Biology are highly correlated. The belief is all the more borne out by the fact that in syllabi for different grades, Physics and Chemistry are coupled together. Further study may bring out some interesting results on this aspect.

The co-efficients of correlation of the various sub-test scores with the total are all sufficiently high, indicating that the students doing well in any of these sub-tests, do well on the whole also. As desired, to give more weightage of Physics, we find that the aim is fulfilled in the occurrence of a very high co-efficient of correlation between Physics and the total. As regards the low correlational figures between the sub-tests and the criterion or the total and the criterion, the reasons are obvious, viz., the criterion scores are school marks based on essay type of examination etc. It is hoped that if the test scores are correlated against the scores of another standardised achievement test in science, better correlational figures shall be obtained.

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* ROLE OF THE EDUCATOR IN THE PSYCHOLOGICAL DEVELOPMENT OF *
* ADOLESCENTS AND YOUTHS OF TODAY *
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* DR. K.N. SAXENA *
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ROLE OF THE EDUCATOR IN THE PSYCHOLOGICAL DEVELOPMENT OF
ADOLESCENTS AND YOUTHS OF TODAY

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No one in this scientific era can deny or underestimate the importance of proper guidance to children, adolescents and adults. The hustle and bustle of the thickly populated areas, competition, rivalry, overwork, worries, anxieties, hurry, nervousness and similar circumstances have made our adolescents and youths bewildered and occasionally a misfit in life.

The individual differences and peculiarities combined with social exactations, faulty education, struggle for existence, low economic status and unemployment have led to a peculiar sort of neurosis and consequently maladjustment in life. Uncongenial home environment together with harsh treatment within the school premises, based on theory and practice of repression have led to a strange type of juvenile behaviour - popularly known as delinquency. It has been experimentally found that these juvenile delinquents are not necessarily mentally deficient, as previous psychologists and educationists thought and hence, the reason can be traced to uncongenial home and school environment and faulty education. For the latter, our teachers are responsible.

WHAT IS OUR PROBLEM?

1. Guiding children into various types of activities, with the former as centre and adopting creative activity through the playway. The term creative has essentially been used to replace the fantastic runriot imagination of the children. The very concept of this type of education is based on cathartic theory of play together with projective techniques of personality assessment and adjustment. The teacher has a role of only a benevolent gardener, in this phase of life.

Pictorial education can easily be associated with the creative activities of children. The best place of this type of education is home. According to "Freud", the famous Psycho-analyst, all the neurosis of adulthood has its seeds in childhood and hence the value of educating children on right psychological lines is of primary importance. However, nursery schools can cater well to the needs of children of this age.

2. Guidance to adolescents is equally difficult. It is the period when mental and bodily growth are very rapid and hence, it is popularly known as the period of stresses and strains. Every adolescent has to adjust to his immediate and remote environments with sagacity and flexibility while every adolescent girl has to submit to the demands of society, home and above all, of the internal self. The stresses are naturally frequent and hence the adjustments are equally important. Guidance at this stage consists in: (a) Emotional adjustments of adolescents by creating in them a scale of sentiments and a master sentiment, (b) high type of education, physical, mental, and moral suited to the individual's capacity of intelligence, attainments and aptitudes. This can be achieved only with the help of trained psychologists and teachers who have taken an orientation in experimental and practical psychology. We need more clinics where these adolescents could go and consult freely about their problems. Such work is being done by the Education Department, U.P., and by certain universities. In fact, most of the juvenile delinquents can be put on the right track if they are thoroughly examined by a trained psychologist and then are assigned some work suited to their abilities and limitations. They need sympathetic treatment. Adolescent guidance has to be based on intelligence and aptitude tests. The problem of selecting a suitable type of course in class IX for a higher secondary school boy or girl is crucial and hard.

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Here comes in the psychologist, along with the teacher to help them. In U.F., the student has to select one of the six groups, viz., literary, scientific, agriculture, aesthetic, commerce, or constructive and this can be done scientifically if we know his or her general intelligence, aptitude, attainments and personality qualities. These can be very well assessed by the most modern tests and apparatus of a psychologist. The type of guidance is known as Educational. The Bureau of Psychology, Allahabad and its five regional centres at Varanasi, Kanpur, Lucknow, Meerut and Bareilly are rendering valuable service to the society by concentrating mainly on this type of guidance and thereby checking a lot of wastage of adolescent energy. A few other states have also opened Bureaus for educational and vocational guidance.

3. Guiding adults for selecting right type of vocations. In fact, it is the question of putting the round peg in the round hole, the square peg in the square hole. It can readily be seen that much of the dissatisfaction amongst workers in offices, factories and other employing agencies is not so much due to economic disparity as due to misfits in the particular vocation. The wrong choice of vocation is responsible to a greater extent towards a completely dissatisfied and rebellious life. This can be marked both in social and individual adjustments. A close relationship between intelligence and socio-economic status of individuals has been discovered. It has been found that different levels of intelligence are associated with different occupations. e.g. if an individual with a level of general intelligence much below the average somehow manages to become a teacher, he can never be happy and will not be an asset to the institution, for, he cannot cope with the high intellectual activities and other extra-curricular demands with flexibility. Several such examples can be quoted. To avoid the frustrations arising out of a wrong selection of vocation, the youth counselling and youth placement services can be opened. The work can be divided in two parts, in which the role of a teacher will be preponderant:

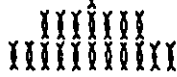
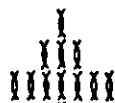
- (1) Assessing the abilities and aptitudes by a standardized test;
- (2) Judging the requirements of a job and then matching the ability of the individual with them.

Thus, much waste of energy can be stopped by putting the youth on a track where he can walk with confidence and show his performance according to his abilities. This will in turn eradicate his inferiority and will imbibe in him more self-confidence with the result of a better integrated personality.

and
If all the above stated agencies/methods of guidance and counselling are amalgamated together, it will create an extensive exercise in developing proper mental hygiene for our youths with the result that they will be more balanced and of a well-integrated personality. It is not bread and butter only that we require, it is in fact well-balanced, disciplined gentlemen that we need for a strong nation and for that we should plan every activity from childhood to adulthood. The role of the educator in this plan cannot be underestimated.

TECHNIQUES OF STUDENT GUIDANCE & COUNSELLING IN
SECONDARY SCHOOLS

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TECHNIQUES OF STUDENT GUIDANCE & COUNSELLING IN
SECONDARY SCHOOLS

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With the changing environmental factors, involving a craze for industrialisation, a quick advancement of scientific and technological studies, and a grim struggle for existence, the problems of secondary education have undergone a tremendous change. The age old traditional system of imparting rigours of 3 R's has slowly given way to a considerate understanding of the child rather than to defining the boundaries of the curricula. In other words, education has now become child centered, rather than syllabus centered. The undue emphasis on the training of memory has now been shifted to the overall development of the personality of the child, with balanced development of the various mental abilities, constituting what is known as the general intelligence. Similarly, the schools are no more structures of cement, concrete or straw; they are regarded as the society in miniature. In fact, the new type of higher secondary schools is more than a mere centre of learning. The multipurpose schools not only cater to the common masses with literacy as their main aim but they plan future education on broad based postulates of intelligence, aptitude, achievement and personality.

Hence the obvious problems of a secondary school student are regarding (i) the choice of an educational course of study viz., literary, scientific, constructive, aesthetic, commercial, agricultural etc., (ii) the choice of a suitable type of vocational career and preparing for it from the very beginning, and (iii) the solution of the personality adjustment problems relating to internal adjustment and adjustment with the external environment.

These problems are very common because the concept of normalcy in human individuals is very fluid and non-stable. There is such a thin boundary between normal and abnormal behaviour, that one is led to think that abnormality in human behaviour is a matter of degree rather than of kind. During the adolescence period, when the students are at the higher secondary stage, the problems of physical and mental adjustments are at the highest pitch because of the sudden physiological and psychological changes occurring in that period. Backward and exceptional children need help to build up their personality structure on a sound edifice. Similarly problem children, specially juvenile delinquents, need constant vigilance and proper orientation to proceed on socially acceptable channels.

The above details bring us to the conclusion that the problem of student guidance and counselling in secondary schools can be conveniently classified into three broad categories (a) Educational Guidance (b) Vocational Guidance and (c) Personal Guidance.

It must be remembered that there is considerable overlapping between these three broad classifications. So far as counselling is concerned, it is not a particular broad headline but it runs parallel to all the three types of guidance because in each of these, counselling in one form or another is required.

EDUCATIONAL GUIDANCE

It has already been pointed out that the problems of educational and vocational guidance at the higher secondary stage are not discrete in nature but in fact go hand in hand. After an individual has passed the 'delta' class, the most important problem before him or her is the suitable curricular choice viz., which one of the seven groups of studies be chosen literary, scientific, commercial, aesthetic, technical, agriculture or

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constructive. If a student chooses a course of study without consulting the course contents or his aptitude, to fulfill the wish of his parents or to keep company with a close friend who has offered the course, the chances of success at such an academic enterprise are at the best fifty-fifty. What will be the plight of a student who after reading for 6 months discovers that he is unfit for the scientific or the commercial group? Evidently, he will try to seek a change over to another group success at which, again, will be by the hit or miss process. If we can help the students at this critical juncture to choose a particular type of course, after knowing fully well their own basic potentialities e.g. intelligence, aptitude and personality qualities, the process shall not be full of the perils of stagnation. This statement has been proved by several follow-up studies, where it has been established that those students who accepted psychological advice from the counsellor or the psychologist, fared better in the public examinations both qualitatively and quantitatively.

The question that arises now is: what should be included in the battery of tests and inventories for rendering suitable educational guidance? The answer to this is not simple and may vary from one set of experts to another. I think, the following tests shall serve the bare minimum requirements:

(a) Psychological Test Battery:

- (1) Verbal group Intelligence Tests. Any one group verbal test of intelligence like those used by Bureau of Psychology, Allahabad; Guidance Bureau, Bihar; Dr. Jalota's intelligence test; Dr. Sohan Lal's Intelligence test; Dr. P. Mehta's Intelligence test or Terman & Merrill group test (form M) adapted at the Department of Applied Psychology, University of Calcutta.
- (2) Non-Verbal Group Intelligence tests. Any one or two of the foreign group tests adapted and standardised under Indian conditions e.g. Pidgeon non-verbal test; N.I.I.P. 70/23; N.I.I.PF/R; Raven's Progressive matrices.
- (3) Objective Achievement Tests. These can be applied only when standardised over a wide sample. Separate tests for various state schools have been in use e.g. achievement tests in General Science, History, Geography, English at Guidance Bureau, Bihar; Hindi Attainment test for Delta class at Bureau of Psychology Allahabad; achievement test in General Science for Delta class by K.N. Saxena; Scientific comprehension test by Baqar Mehdi; non-verbal Science Selection test by S.K. Roy Chaudhry, Achievement tests in Algebra, Arithmetic and Geometry prepared at B.R. College of Education, Agra etc.
- (4) Students' self inventory. This will be a comprehensive one like the one prepared at the Bureau of Psychology, Allahabad or by the author himself.
- (5) School Records. Properly formulated cumulative records are essential for rendering suitable educational guidance. Many such record forms are available in many institutions and at State level, also. These include all information about the individual, his other circumstances; his scholastic records; interests aptitudes; personality qualities and above all a record of the ambitions and levels of aspirations. The detailed medical report should also be included.

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- (6) Personality Inventory. This is a necessary tool to be employed in any guidance programme. It may be designed or adapted. Bureau of Psychology, Allahabad has designed one; while at the Indian Statistical Institute, Calcutta, Bernreuter's Personality Schedule has been adapted; Dr. G. Rose's Personality Inventory is also used by some counsellors.
- (7) Vocational Preference Record. As already pointed out the educational and vocational guidance cannot be regarded as discrete and may be regarded as inter-dependent, hence the necessity of a vocational preference record. The Bureau of Psychology, Allahabad has prepared a Vocational Preference Record on the lines of Kuder Preference Record. This record may be utilised with suitable modifications.
- (8) Guardians' Schedule. This is of vital importance because it shall not only educate the parents but also help them to understand their children better. It should be as comprehensive as possible.
- (9) Interview form. Since guidance is more of a personal process, final interview should be recorded with utmost care and precision. This may be developed according to local needs and should be maintained properly.
- (10) Profile Card. Each individual's record of all the data collected by above means should be plotted on a profile in the shape of standard units (in the case of Intelligence and scholastic records) or in the form of short relevant words or statements. Sufficient space should be provided for the follow-up work.
- (11) Over all report. A short report be issued for each individual child, indicating briefly the level of general intelligence and other abilities together with interests, hobbies and extra-mural activities-mention should also be made of the past scholastic record and personality adjustment. The report should also mention the suitability of a particular course of study with indication of a vocational choice.

This general pattern of educational guidance is alright for multitudes of children. But what about the problem cases or cases where individual testing and counselling are needed? Evidently, they require individual attention from the counsellor. They come under the purview of personal guidance.

VOCATIONAL GUIDANCE

The general pattern of vocational guidance at the secondary stage will almost be the same as in educational guidance programme, except that the use of Differential Aptitude tests and special aptitude tests be made. The D.A.T, Kuder Preference Record - Vocational, Strong's Vocational Interest Blank, Crockett manual ability tests, Cox's finger dexterity test, Stenquist manual ability test, steadiness tests and Tweezer's dexterity tests are to be employed according to need. Secondly this type of guidance must be preceded by occupational information. In this connection a suitable vocational information unit be set up in each institution with the help of material available at the Directorate General of Employment and Training, Government of India and local Employment Exchanges. Once, on the basis of detailed testing and careful observations, the counsellor has rendered Educational and Vocational Guidance at the end of delta class, he has to observe the pupil for 3 years and in this follow-up study he has to decide if the original advice was correct. Any difficulties, arising in between the process, can well be resolved by the inter-personal relationship between the counsellor and the counsellee.

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PERSONAL GUIDANCE

In fact this is a specialised type of guidance, to be rendered by trained counsellors and psychologists. Wherever inservice training courses for teachers have been organized at clinics or Bureau of Psychology & Guidance, such teachers may be entrusted with this work. The process involves detailed study of the individual's potentialities, his personality qualities and shortcomings and then giving him or her detailed counselling so as to ensure proper adjustment to the self and the environment. Undoubtedly such cases arise from the two types of guidance discussed above. For instance, a student is intelligent enough but has failed twice in class IX. Such a child needs careful study and proper guidance; in fact on a design which may be designated as counselling for fit-fails.

This means that the psychologist or the counsellor deemed the pupil fit for higher education but repeated failure has occurred owing to some unforeseen circumstances. Personal guidance for such cases shall include detailed diagnosis with the use of individual tests of intelligence e.g. Koh's Block design, Passalong, Cube Construction, etc; of personality, like Rorschach, T.A.T., W.A.T. etc. and then detailed counselling by a trained person. At times, it becomes necessary to send a few cases to a Psychiatric clinic also but such cases are rare.

EVALUATION OF THE GUIDANCE PROGRAMME

On the empirical basis and on the basis of planned experimentation, it has been established beyond doubt that the pupils who get regular help from a trained counsellor or a psychologist and who follow their advice, have shown better academic results and adequate personality adjustments. In a follow-up study (1957) done by the Bureau of Psychology, U.P. Allahabad, it was found out that 21 students got first class in high school out of 137 who passed and accepted psychologists' recommendation. 76 such students failed. Amongst those who did not accept the recommendations as many as 87 failed and only 65 passed. Out of those who passed, only 5 got the first division. The usual tests and inventories used in guidance work were verbal group tests of intelligence, one test of spatial ability, the self-inventory, the school schedule, the guardians' schedule and the vocational preference record.

These results have been confirmed by some research studies conducted by other State Bureaux and research departments of some universities. The efficacy of personality schedules, interest-inventories and tests of differential aptitude is too obvious to be discussed here. They are accepted tools for guidance purposes in all the parts of the world.

In short, if we want national reconstruction on a sound edifice, guidance and counselling at the secondary stage is extremely fruitful because only then democratisation of educational opportunities can be realised with minimum wastage of human energy and avoidance of frustration in our youths.

THE SOVIET CHILD'S LEISURE

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THE SOVIET CHILD'S LEISURE

Education today poses the problem of how undesirable tendencies in children can be substituted by constructive and socially acceptable behaviour patterns. With all the naturalistic philosophy of Rousseau, the pragmatism of Dewey and the faith of Montessori, one finds oneself in a state of bewilderment when multitudes of children fall into the trap of juvenile delinquency. Every country tackles this problem in its own way. In the Soviet Union, from the earliest stages a child is trained in such a way that there is little scope for vagabond tendencies. In other words, his abilities, aptitudes, interests and energies are directed towards such balanced and constructive activities that his motivation is sustained in a natural way. He finds life a continuous chain of thoughts and pragmatic actions.

PIONEER HOUSES AND PALACES

For sustaining the multitude of interests and aptitudes of children, Soviet educationists have established a number of pioneer houses and pioneer palaces and centres for young technicians all over the Soviet Union. There are over 3,500 of the former and 1,500 of the latter.

The pioneer houses and palaces provide a number of activities for children, such as aero-modelling, scientific work, marine engineering, model rocket-making, mountaineering, music, cinematography, and debating. At the pioneer palace at Moscow, there are more than 600 different extramural activities, and at Leningrad there are more than 350. All work at such palaces is done under the guidance and leadership of highly experienced workers. The library is usually excellent. One is amazed to find a 13-year-old child working on an aircraft model, taking due care of the laws of aerodynamics.

The young technicians' centres are again places where children come at least twice a week to work as well as amuse themselves.

The Young Cosmonaut clubs at the palaces and stations are of special interest to children and adolescents. Complicated 'space programmes' are being carried out in such clubs in fifteen Soviet republics. Children study astronomy and space navigation, learn to handle apparatus, to make motion pictures and to establish radio communication.

A cosmonaut must be ready for any surprises that outer space has in store for him, and so he takes his place in home-made centrifuges, and becomes acquainted with the sensation of overloading during flights in the high-speed jet planes of the adult sports air-clubs. Some of the Young Cosmonaut clubs even have altitude chambers, given by factories that have taken these clubs under their wing. The children know that even though all of them will not fly to Mars, there is enough scope for all of them in the vast world of space.

Aircraft-modelling is a hobby which once taken up seriously is never dropped. The children also like to work with different types of valve mechanisms—the electric train and automobile models sound sirens, begin moving and with their headlights on and off. The valve has inspired children to turn their thoughts to the Moon. Today almost every young pioneer's house has a functioning model of a lunar caterpillar vehicle.

These caterpillar vehicles, their electric motors rumbling efficiently, crawl over heaps of sand and gravel which serve as replicas of lunar craters. These clever machines obey the commands of 13- or 14-year-old Sonia or Kolya.

With the introduction of semi-conductors, children are specially attracted to radio work. They are not satisfied with merely converting home-made transistor radios for reception, but try to become masters of the air. A group of children from a pioneer palace once got into touch with a radio ham from Poland. This showed that they were able to master the principles of transmission as well as any adult.

As soon as children finish their formal schooling, their interests and aptitudes, which have been usefully canalized, help them to decide on a career of their own choosing. This long apprenticeship at a Palace or a station is of special significance from the point of view of a career-guidance psychologist.

NEWSPAPERS FOR CHILDREN

To encourage children in their extramural work and to sustain their motivation, a newspaper is published for all Soviet school children. It is called Pionerskaya Pravda. This paper runs contests every year for the best invention by a child. For a period of three months, the editorial office of this daily paper is transformed into the designing bureau

of the future scientists of the Soviet Union. The themes for the projects are chosen by the children themselves and cover a very wide range of current problems of everyday life. Sometimes ideas originate from technical journals and science books. In every case, such new projects fire the pragmatic imagination of the children who work out the models and designs, and they also motivate other children who are comparatively indolent or sluggish.

Selected exhibits from houses, palaces and stations find a permanent place of pride in the well-known Exhibition of 'USSR Economic Achievements'.

The 'Young Naturalist Movement' has brought new interests to young nature-lovers. These groups are very popular in rural areas. The young naturalists are primarily researchers or discoverers. From their own empirical experiences they learn a great deal and thereby improve their knowledge of agriculture.

The most popular youth magazine in the USSR is Yunost. It voices the feelings of Soviet youth and also highlights the important work done by young people. Another important newspaper is Komsomolskaya Pravda, meant for senior form pupils.

All these newspapers contain valuable information about the Olympiads. These are academic competitions which identify students talented in science and mathematics. The Olympia's are held all over the Soviet Union and form an important link between the students of today and the scientists of tomorrow. The selected scholars are admitted to four special schools at Moscow, Kiev, Leningrad and Novosibirsk. These secondary schools are run by universities and have an accelerated programme of education. The Moscow Special School is often called 'The School of Newtons'. Academicians, doctors and scientists deliver lectures there. With such efforts to canalize the energy of the young, it is evident that the Soviet Union has done a great deal to nurture the talents of children and adolescents. Soviet educationists claim that the rate of juvenile delinquency and social misfits is very small in their country. Perhaps this is due to the multitudes of opportunities for work provided for them. It is the fruitful utilization of leisure that brings out the best in youth.

SOME HIGHLIGHTS OF HIGHER EDUCATION
IN THE SOVIET UNION

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Some Highlights of Higher Education
in the Soviet Union

By

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In the Soviet Union education is regarded as a vital pivot of national reconstruction. The educational system is very well-knit and has many balanced facets which provide a wide range of academic divergence and unification. School education has a uniformity all over the country, while higher education is varied and covers different areas of academic knowledge. There are two main types of courses in higher education. The first is intended for day-time students while the other is meant for evening and correspondence students. Higher education is imparted through universities and through special and polytechnical institutes.

The universities play a very significant role in the Soviet System of national reconstruction. This faith is reflected by the fact that in 1914 there were only 12 universities in the Soviet Union and now there are 41 universities with the number of students increased to more than threefold.

The Soviet universities cater to a wide range of academic specialities, including some rare fields of contemporary knowledge. These universities are the places where suitable environment is provided for the germination of the congenial seeds of future scientists, linguists, academicians, historians, philosophers etc. The centres of higher learning also produce a band of well qualified secondary school teachers.

There are universities in all Union republics and these are so well-situated geographically, that they cover students coming almost from all the regions of this vast country. Out of these, the famous Lomonosov State University at Moscow needs a special mention because it is really the soul of the country.

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It was founded in 1755 by the famous scientist Lomonosov with a very limited number of faculties and students. Later on it expanded by leaps and bounds. The special care of this University started after the revolution and in 1953 the new building was constructed on the Lenin Hills, a romantic place not far from the river. The old part of the University still continues to be near the Red Square, where the famous Institute of Psychological Research is located along with some Departments of the Faculty of Arts. There are 14 Faculties now and out of these seven are at the new premises. It will be interesting to note that from 1755 to 1917, 40,000 students graduated from this University, while 80,000 students have graduated from 1917 till recently. Thus this centre of higher learning is a place of perpetual joy for the Soviet people. The new building of this State University is very extensive and it accommodates 168 lecture halls and more than 1700 laboratories. This massive and artistic structure lodges many museums of international significance.

There are 32,000 students and out of these 1,000 are working for the candidates degree (equivalent to our Doctorate in Philosophy). The teaching staff consists of 3500 very qualified persons. There are students from many countries of the world living together in the same hostels. The cost of living and that of studies is negligible because 95% of the students receive scholarships ranging from 30 to 80 roubles a month. The rooms of the hostels are small but have essential necessities of life. The common kitchen for a wing has all the modern amenities and hence on holidays the students prepare ^{for} themselves their special dishes and entertain friends.

The entrance to the University courses is really very tough and hence only deserving students can get admission to the different academic courses, specially those of basic sciences, and technology. Every student, including the foreigners, has to be very proficient in Russian language and literature. The

academic standards of teaching and learning are very high and every effort is made to keep a congenial atmosphere for hard work and academic distinctions. Suitable encouragement is provided to meritorious students and teachers take a keen interest to foster the talents. It is a fact that the Russian educationists believe that there is no royal road to learning or to teaching. They feel that the teacher has to pass through the same ordeals of hard labour as the student. The interest that the teachers take to hold periodical oral examinations is an indication of their continued zest to maintain a balanced tempo of academic work. One more striking feature characterises the Soviet higher education and that is the provision of equality of opportunity to members of both the sexes. It is very pleasant to see young boys and girls working shoulder to shoulder for the acquisition of knowledge in some of the rare branches of sciences and technology. This fundamental belief in the equality of sexes is very vital for the building up of the Soviet economy.

The Moscow State University maintains very high academic standards as will be evident from the fact that one fourth staff of the Academy of Sciences has graduated from this University. Regarding the maintenance of the academic standards, it is a fact that all the Soviet Universities try to maintain a well defined balance. Another remarkable feature of the Soviet higher education is that the Academicians and Professors of distinction always extend maximum cooperation for the development of school education because they regard that education is a continuous process and hence cannot be broken up into small fragments of unequal weightage. This is the reason why the world-known olympiads are run by the topmost educators of USSR. Furthermore, education at any stage is never divorced from the objective facts of reality and from the demands of the society. This connecting link makes the process of education living, real and utilitarian.

The Soviet centres of higher learning also provide very extensive opportunities of co-curricular and allied

activities which prepare the Soviet youth to excel not only in academics but in other spheres of education namely sports, music, dramatics, oratory, social service, party organizational work etc.

Thus the concept of polytechnical approach to education is also present at the centres of higher learning, although the foundations are slightly broad-based.

Thus one observes that a Soviet youth of to-day has not only to prepare himself for better higher education but he has to shoulder the basic responsibility of doing monumental work of speedy reconstruction. They go out of doors in the vacations and help the younger generation to grow stronger and develop a desired attitude towards life in general and towards national efforts in particular. This minimises the chances of stagnation of human resources and accelerates the pace of useful productive work. Thus the Soviet people seem to believe more in the process of occupational therapy rather than tasting the luxurious formula of Mental indolence and consequent cumbersome processes of cure.

The Soviet educators further sincerely believe that if you have to reap a good harvest you must sow seeds so well deep into the soil that not one of these is wasted. This belief has led to peculiar turning up of soil to produce best results. School education is considered a vital step to move up and hence courses are designed in such a way that there is no gulf between higher and lower education. Secondly, teacher training is imparted by very efficient university staff or of the Pedagogical Institutes. A third step also needs a detailed mention. The world known "Olympiads" are held all over the country and one is astonished to see that the highest intelligentsia of the country is automatically motivated to run these academic tests and gymnastics for the students from grade V to XI. It is out of these olympiads that some of the best scientists and engineers of Soviet Union have emerged. In this uphill task of organization of olympiads all over the country; the academicians, professors, and teachers are helped by the research fellows from Institutes of Higher Learning.

The latter join hands very actively and in fact on their shoulders lies the major responsibility of identifying the future talents for the country. The system of examination is still traditional and the educationists have great faith in oral and essay type tests. The identified talents are honoured by the well-known academicians and educators and this process is so well designed that it does not occur in a very sophisticated way. Thus the seeds of success are sown deep into Soviet soil each year and the credit goes to the architects of higher education.

The most striking feature in the Soviet Universities is the basic uniformity in the organizational and structural patterns of education. Although the number of faculties and the students differ from one university to another, yet there is a peculiar note of concordance running through the entire system. This makes many problems solved and leads to better exchange of thoughts and academic research. Some of the universities are situated in very beautiful surroundings e.g. the Tbilisi University in the republic of Georgia and the Leningrad University in R.F.S.F.R.

The Tbilisi University is situated in the romantic surroundings of the world known Caucasus mountains. It was founded in 1918 and is still regarded as a traditional centre of Georgian history and culture. There are a number of research institutes attached to this University and the Department of Oriental Studies still commands a high priority amongst the sibling departments.

The University of Leningrad stands on the historically known banks of the river Neva and it has many well known faculties. The laboratories of physiology and human engineering and the Department of Oriental Studies are well-known for their academic output.

The Lomonosov University of Moscow also needs a special

mention. It was founded in 1960 and it has students from more than 85 different countries of the world. There is a congenial atmosphere under which these students from various lands get together and receive the highest type of education in humanities, basic sciences and technology.

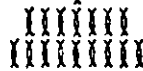
Thus one observes that in the Soviet Union education is regarded as one of the vital means to strengthen the country and also to develop the individual personality within the framework of social exactations.

Higher education is regarded as a connected link to the secondary and lower stages of education. It is also regarded as a means to an end namely preparing the youths of today for the social responsibilities of tomorrow. The Soviet educators do not think it desirable to sit in the ivory towers of higher education and are willing to step down and caress the low lying fencings of school education. This is the main edifice on which rests the future success of this mighty country.

SHARMA

INTERNATIONAL UNDERSTANDING AND COOPERATION THROUGH
EDUCATION - SCIENCE EDUCATION - TEACHERS'
ROLE - A SYMPOSIUM

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INTERNATIONAL UNDERSTANDING AND COOPERATION THROUGH EDUCATION
SCIENCE EDUCATION - TEACHERS ROLE - A SYMPOSIUM

By

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This is an axiomatic truth that science knows no barriers of nations and ideologies. Its application in social, economic and political spheres has indeed, an international bearing. Co-operation and understanding in the field of science education, therefore, becomes much easier. To bring about this co-operative spirit, science education needs to be broadbased and directed to development of constructive concepts and scientific attitude in children.

Science has played an outstanding role in our lives in recent years and is now changing our entire existence in such important aspects as food, health, transport, communication and power. The social, economic and political implications of the application of science are both national and international in character. With the progress/^{live} democratization of educational opportunities, it has become imperative that the entire process of education should be so planned that it may bring about social cohesion, intellectual growth and national reconstruction followed by international progress.

Since science is a systematic study of the problems that crop up in the minds of curious children, inquisitive adolescents and mentally alert youths as they live and grow, it is very necessary that the teaching of science should be so controlled as to allow maximum opportunities to the individuals to understand the natural environment with a constructive attitude and frame of mind. No doubt, the wonders of Nature are so thrilling to the young boys and girls that these enhance their curiosity for unravelling the secrets of Nature and finding an explanation of the fundamental phenomena.

We are living in an age of atoms when human mind has utilized the minutest particles for extending maximum amount of comforts to the existing generation on one hand, and gratifying a queer sadistic craze for power on the other.

Swinging between these two extremes, the present position of science teaching is slightly precarious. While science has led to the growth and diffusion of culture to an extent never possible before, it has also provided

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* An article published in "The Education Quarterly" Sept-Dec. 1965 issue

dangerous tools of self-destruction.

Considering that the importance of science in shaping the destiny of mankind is of a unique nature, it is imperative that it should be treated in such a way as to produce enlightened citizens for the nation, who can re-orient their mental faculties for social cohesion on both national and international levels.

Science knows no barriers of Nation and Ideology

The phenomenal advancement in science and technology in the Soviet Union in the recent years, the expenditure of millions of dollars in United States for the promotion of scientific education and research, the introduction of science as an important tool to bring about social advancement in Great Britain and the development of science as a discipline in several other countries have made it absolutely imperative that the learning and teaching of science should not know any national, international and cultural barriers. In fact, the teaching of science and the entire basis of scientific education can be so broad-based and extensive in nature that millions of dollars or other parallel currencies which are spent on mere repetitive processes can be minimized by sharing the experiences of one by the other. This can be done only by creating a closer understanding of mankind, by mankind, /by removing geographical, political and ideological barriers, cultural taboos, social dissensions and above all by the removal of a mental complex based on feelings of competition, rivalry and inferiority. This leads us to lay the foundations of good science education.

Since facts in science are devoid of emotional turbulances, personal prejudices, it is easier to build up such postulates which will make science an international subject matter rather than the monopoly of a limited few, working in a secluded atmosphere.

It is an admitted fact that for national prosperity we need planning, for planning and for its execution we need scientific and technological manpower and for this purpose we need the cultivation of science through various agencies. If we try to extend this postulate, we will come to the conclusion that for the progress of the entire world different nations should pool their resources and work for a single aim, i.e. the betterment of humanity.

Educational Administrators' and Teachers' Role

Based on this philosophy, the teachers and administrators while framing

the curriculum or during the process of teaching can build up constructive concepts in the minds of their children who are to develop into the citizens of tomorrow. This can bring about better national and international understanding and weed out the evil forces of rivalry, competition and antagonism. Teaching of science on a broad-based basis shall also be able to eradicate irrational beliefs and superstitions which exist in every country, however advanced it may be.

The teacher of science has a very important role to play in developing in children a scientific attitude towards problems and a sense of appreciation of what is good in humanity and nature. This the teachers can do by building up such effective teaching programmes as may draw upon materials and information available in various countries. They can also help children to correspond with peer group from different countries and thereby build up a scientific world of their own consisting of varied type of experiences available from such a broad-based sample. This broad vision and wide-spectrum will ~~not only~~ develop in children systematic and organized concepts of a superior nature than in a suffocated one which generally surrounds them in some cases. This is exactly the important role of a teacher and an educational administrator in fostering national and international understanding.

These two agencies can also promote better understanding by cooperating and contributing in international seminars, symposia and conferences without any reservations arising out of political ideology, social differences and personality angularities. Some instances of international cooperation can be quoted here like the International Geophysical Year, Indian Ocean Expedition, Development of Water and Power Resources. The cooperation of the teachers can also help the children to understand the work of international organizations like F.A.O., W.H.O., Unesco, the Red Cross etc. The teachers can also encourage the children to understand the implications of some international agreements and conventions so that they may understand the problems facing mankind and appreciate the ways and means adopted to reduce and solve these problems.

To enhance the entire process of national and international understanding and cooperation, the teachers and administrators can also form national and international organizations through which the advanced countries can help the developing countries. This will again depend on the development of a philosophical attitude that mankind is one and helping each other, irrespective ofA....

caste, creed, race, social beliefs, political ideologies. It is a vital step to build up world brotherhood wherein the total progress of mankind will suppress the ordinary selfish motives and acts.

Scientific research has had a very handsome contribution to make towards the international understanding and since this research is mostly manned by teachers in various spheres of life, it is again the teachers who have been and are playing a vital role in fostering an international understanding and cooperation. The inventions, discoveries, and scientific achievements such as wireless communication, cancer research, space conquest, radio-activity, meteorological observations, antibiotics etc. contribute a lot towards the annihilation of human suffering. They do not know any barriers and they contribute to the happiness of man, wherever he lives.

The institution of Nobel Laureateship is another important contribution towards the unbiased recognition of talents at an international level. It is through such international organizations that international cooperation can emerge.

In short, it will be enough to say that the role of teachers and administrators in fostering national and international understanding and cooperation through the field of science education is of vital importance, on which will rest the progress of not only of a particular nation but of a group of nations, nay the entire world.

On this occasion of the celebration of I.C.Y. Day it will be a fair contribution to mention that the teachers and administrators have ever fostered a philosophical understanding that humanity can advance only when education can be broadbased on postulates of respect of mankind, understanding of individuals by individuals, social cohesion, cultural integration and above all an understanding between groups of people to work for a higher and a nobler cause.

This is actually the message for this significant day and it will be enough to say that the hazards of science can easily be eliminated if such a broad-based education can take the place of water-tight, compartmentalised education of individuals based on restricted flow of knowledge arising out of misconceptions.

ACHIEVEMENT TEST IN GENERAL SCIENCE : SOME
SALIENT FEATURES

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THE investigator prepared an attainment test in General Science for the 'delta' class (class VIII) students of Uttar Pradesh. The initial two parallel forms of the test consisted of 100 items each, and were based on a wide variety of topics included in the course of the delta class. In framing these due consideration was given to the objectives of teaching science by splitting the objectives into specific terms. The items were of four major types: recall, matching, completion and multiple choice.

ITEMS FOR THE FINAL FORM AND TEST ADMINISTRATION

On the basis of item-analysis and course content, 100 items were selected for the final form and the time limit of the test was determined. The test was then administered to 2190 students drawn from 30 institutions and from 10 districts of the State. Three institutions were selected from each district on the following major considerations:-

- a) results of the schools in public examinations;
- b) opinion of the educational authorities; and
- c) opinion of the parents regarding the efficiency of the institution.

The test was administered by the investigator and his experienced colleagues. The instructions of the manual were strictly followed.

DISTRIBUTION OF SCORES

The distribution of raw scores is given below:

Class Interval	Frequencies
80-89	1
70-79	1
60-69	18
50-59	77
40-49	227
30-39	520
20-29	671
10-19	566
0-9	109
	2190

In order to determine the normality or otherwise of the distribution, co-efficients of skewness and kurtosis were worked out. The value of Y_1 came to 0.51 which is both positive and significant. The value of Y_2 (kurtosis) came to 0.15 which is not significant. Fitting the distribution to the data and applying the Chi-square test it was found that the positive skewness of the distribution could not be attributed to sampling fluctuation. The test, it seemed, discriminated better in the middle and higher ranges than in the lower range.

OTHER STATISTICAL FEATURES

The mean of the raw-scores on the final form worked out at 28.80 and the standard deviation at 12.40. The reliability of the test by the Rational Equivalence method came to 0.88. The empirical validity of the test against the average school marks in science for the last three years (classes VI, VII and VIII) came to 0.46. Considering the subjectivity of the essay type of examinations (against which the scores of the test were correlated), the validity appears to be satisfactory.

NORMS FOR THE TEST

Percentile norms have been provided and to make the test functionally useful, standard scores have also been given with a mean of 50 and standard deviation of 10.

DETAILED ANALYSIS OF TEST ITEMS

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Since the test comprises three main subjects of study viz., Biology, Physics and Chemistry, an analysis of the scores under these three different sub-heads have the following results. On the average, students were able to answer correctly 29.6 per cent of the questions in Biology, 34.65 per cent in Chemistry and 24.6 per cent in Physics. The questions in Physics are harder in nature in comparison to those of Biology and Chemistry. Sixty-six items in the test were from Physics because Physics is considered to be a subject of fundamental importance in higher studies and research. The remaining items (34) were from Biology and Chemistry together. Since knowledge tested in these two subjects is more of a factual nature, it was not considered desirable to include more items for these. Inter-correlations among the three sub-tests, the total and the criterion scores (Science marks) are given below:

Biology	Physics	Chemistry	Total	Criterion
Biology	0.61	0.42	0.73	0.28
Physics		0.36	0.94	0.46
Chemistry			0.57	0.22
Total				0.46

(Contd.)

of misconceptions.

The correlation between Physics and Biology is greater than between Biology and Chemistry or between Chemistry and Physics. It is interesting to observe that a student doing well in Physics does well in Biology also but not so well in Chemistry. This is somewhat contrary to the conventional belief that Physics and Chemistry rather than Physics and Biology are correlated. The co-efficients of correlation of the various sub-test scores with the total are all sufficiently high.

A COMPARATIVE STUDY OF THE PERFORMANCE OF RURAL AND URBAN CHILDREN

As a side study the test scores obtained by 750 students reading in delta class of rural, 'urban boys' and urban girls' schools were compared to investigate whether there is any significant difference between:

- (1) scores of boys reading in urban and rural schools;
- (2) scores of boys and girls reading in urban schools; and
- (3) scores of girls reading in urban schools and boys reading in rural schools.

Two samples of students were taken up for each of the above investigations. A comparison of the average scores could test the significance of their differences in achievements in science.

The sample of this study consisted of the following:-

- (1) 3 rural schools for boys
- (2) 3 urban schools for boys
- (3) 3 urban schools for girls

The number of students tested from each of the three categories above was 250. Out of the three institutions in each category, one was of an average standard, one above and one below the average. The selection of institutions was made after taking into consideration the results of public examinations and the opinions of the inspecting officers and the parents.

The means and standard deviations of scores of children in the three types of institutions are given below:-

	Rural boys	Urban boys	Urban girls
Mean	26.18	31.78	26.78
S.D.	13.50	12.60	12.70

(Contd.)

The significance of difference between the means of the different sets of scores was calculated and following results were obtained.

- (a) The C.R. between rural and urban boys came to 4.8 and is significant at 0.01 level in favour of urban boys.
- (b) The critical ratio between rural boys and urban girls came to 4.4, which is significant at 0.01 level in favour of urban boys.
- (c) The critical ratio between urban girls and rural boys came to 0.51 which is not significant at even 0.05 level.

The reliability co-efficients of the test (by the rational equivalence method) for different samples are given below:-

Rural boys sample	r11 = 0.90
Urban (boys) sample	r11 = 0.87
Urban (girls) sample	r11 = 0.88

The predictive Validity co-efficients of the test (against average school marks in Science) for different samples are shown below:-

Nature of Sample	Predictive Co-efficient
Rural boys	0.29
Urban boys	0.54
Urban girls	0.29

The low figures obtained in the case of urban girls and rural boys may be due, among other things, to inadequate qualifications of science teachers and to inadequate laboratory facilities. These impressions were strengthened by the on-the-spot study of the qualifications of science teachers and adequacy of laboratory equipments in these schools.

INTERPRETATION OF DATA

There is a significant difference in the average performance of boys reading in urban and rural schools. Similarly there is a significant difference in the average performance of boys and girls reading in urban schools, while there is insignificant difference in the average performance of girls reading in urban schools and boys of rural schools. The superiority in the performance of urban boys to the performance of rural boys and urban girls may be due to differences in (1) the standards of teaching, (2) qualifications of science teachers, (3) quantity and quality of apparatus used and (4) other factors.

An on-the-spot observation of the working conditions of the schools concerned furnished further evidence in support of the above-mentioned reasons. It was found that (1) science is taught in some schools by untrained teachers; (2) there is, in general, a dearth of apparatus, models and charts in most of the institutions; (3) the teaching of science (except in two schools) is done mainly through textbooks; (4) the amount spent

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on apparatus in rural schools/ (5) there is a dearth of audio-visual aids, science libraries and good science journals in rural schools; and (6) there is dearth of trained science teachers in girls schools.

A study carried out by D.S. Rawat (of B.R. Training College, Agra), is of interest. He compared the scores of 185 fourth form boys and 127 fourth form girls (on an achievement test in Science prepared by Shri Rawat) in England and found the difference between the scores of boys and girls to be significant (C.R. being 7.9). However, he found no difference between the means of 56 boys reading in rural schools and 104 in urban schools (of U.P) in class VII (C.R. being 0.308).

THE BASIS AND STRUCTURE OF EDUCATION IN THE
SOVIET UNION - A BROADCAST FROM THE MOSCOW
RADIO FOR INDIAN LISTENERS

DR. K.N. SAXENA

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DEPARTMENT OF SCIENCE EDUCATION
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING
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THE BASIS AND STRUCTURE OF EDUCATION IN THE
SOVIET UNION - A BROADCAST FROM THE MOSCOW
RADIO FOR INDIAN LISTENERS

By

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Education in the Soviet Union is regarded as the most vital pivot over which the sound postulates of a socialistic society can be rotated without obstruction. The investment in this particular sector leads investments in many others and this is because of the fact that there is a common belief in the Soviet Union that cultural and economic growth of the country can be brought about only by educating people. This fact can be borne out by one simple example that before October Revolution, Uzbekistan had 98 per cent illiteracy but now there are more than two million people in educational establishments and there are many higher professional institutes including one University together with many vocational and technical schools, ordinary and specialized secondary schools. There are more than 3,000 kindergarten schools. Thus, there has been a mass awakening in the educational sphere. Such examples are not uncommon in many other Republics, where the economic achievement and industrial output has been enhanced by several times within fortyfive years due to the general raise in the educational sphere.

Education in the USSR is regarded as a process of evolution of child's personality and also as a connecting link between individual's capacities and social output. Soviet educators think that it is possible to educate the human mind to an infinite limit and hence free compulsory education is provided to all, without believing too much in the psychology of individual differences. The main aims of Soviet education are defined as:-

1. Intellectual education, through which a systematised type of academic knowledge is imparted as a basic means to develop a scientific outlook. Here the faith in the drawing up of a common curriculum for all children of all grades needs a mention. Enough space is left for the crystallisation of individual's ideas and potentialities.
2. Moral education, is aimed at developing patriotism, collectivism, sense of discipline and development of intellectual honesty and integrity. This part is given sufficient premium in the Soviet system of education.
3. Physical education is aimed at developing a strong body, endurance, self control, courage and above all gracefulness in the overt behaviour. The pedagogists believe that a sound mind can reside only in a sound body.
4. Aesthetic education, is directed at developing an understanding and appreciation of what is beautiful and graceful in nature and society. The children are introduced to art, dignity of mankind,

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dignity of manual labour and to esprit-de-corps from early childhood. Thus aesthetic education is a vital link in the development of the intellectual aspect and the growth of the total personality.

5. Polytechnical education is aimed at developing an intimate understanding of the various technological and scientific skills and of the processes of production which are vital pivots of developing national economy.

An overall effort is made to unite all these superficially diversified aims into an integrated one and thus to impart the best education of the body and mind, of the home and hearth and of the socialistic and patriotic nature. The curriculum is so well constructed that it gives a systematized, well articulated and unified bunch of scientific knowledge. The psychological foundations of such a curriculum are well defined and head their way to develop the integrated personality of an individual, directed towards social reconstruction.

The Soviet educators do not look upon education as a static process of hurling specks of knowledge but they view it from the broadest point of view viz., the utilization of the best in an individual to bring about maximum efficiency for the community. Thus the qualitative improvement never suffers at the altar of its expansion. Every individual gets an opportunity to learn and improve his mental outlook, no matter how old he or she is. This brings us to the vital changes brought about in the country by the introduction of the evening schools and correspondence courses.

Co-education is one of the bed-rocks of Soviet education. At no place in USSR can one detect any difference in the attitude towards boys and girls. There is spontaneity of human behaviour and a natural relationship between the two sexes at all the levels: primary, secondary and higher education. This resolves many social, cultural and economic problems because a young girl of Soviet Union prepares herself for the development of the country absolutely at par with the young boys. There is no difference in the curricula for the two sexes because the Soviet educators believe that the physiological and psychological differences do not play any significant role in the total development of the personality. Hence women take the same place in national economy as men.

Talking about the emphasis on curricular subjects, it is quite clear that there is a place of pride for mathematics and science in the Soviet secondary curriculum. The laboratories of even incomplete secondary schools* are well equipped and the teaching is done on sound foundations.

Compulsory education begins when the child is of seven years. Pre-school establishments cover the age-group upto seven years. The creches and nurseries cater to children upto three years. The "Deatsky sad"*** cater to the education of children between three and six years. Formal education of a child begins at the age of seven and is compulsory for

* These are schools from classes I to VIII
**These are kindergarten schools.

the first eight classes. Compulsory education for classes I to VIII is uniformly applied throughout the country. The complete secondary education lasts for 11 years but the Soviet educationists are thinking seriously to revert back to ten years of secondary education, as was before the 1958 reforms.

The largest portion of the school population is receiving education through the general education schools. The Inter-nat schools, which are boarding schools, are now growing in number because the Soviet educationists think that the school instruction and out-of-school work should be integrated very closely. There are special schools for sports, music, ballet, foreign languages etc. Separate schools have been established for mentally defective or physically handicapped children.

Higher education is provided by the universities and institutes. The University is primarily concerned with academic and fundamental subjects and the professional training is imparted through the research institutes. The Diploma courses run from five to six years and then the students can enrol themselves as aspirants and prepare for the degree of "Kandidat".* A candidate has to devote four years for 'Doctorate of Science'. This doctorate is the highest academic distinction and is earned on the basis of a research publication of a very high order.

For higher research, there are separate research institutes, mostly under the Academy of Sciences.

Thus the structural pattern of education inter-kints the individual's capacities with higher acquisition of knowledge and vocational avenues.

* This course is equivalent to Ph.D. course.

DYNAMICITY AND ELASTICITY IN THE TEACHER TRAINING
PROGRAMME OF THE SOVIET UNION - A CRITICAL STUDY

DR. K.N. SAXENA

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DEPARTMENT OF SCIENCE EDUCATION

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DYNAMICITY AND ELASTICITY IN THE TEACHER TRAINING
PROGRAMME OF THE SOVIET UNION - A CRITICAL STUDY

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Education in the Soviet Union is a vital pivot for bringing about social cohesion and economic prosperity. It is regarded as an important connecting link between individual prosperity and sound national reconstruction. The development of public education and cultural activities owe their existence to the rapid increase in the ranks of educational workers.

It is a fact that the number of teachers in the general educational schools is about ten times the number of teachers employed in the pre-revolution period.

The outstanding feature of the Soviet education is that pedagogy is given the status of a functional science and is usually termed as pedagogical science as against a mere historical and theoretical concept of pedagogy. The organisation of research in pedagogical science in the Soviet Union is characterised by participation of a large number of leading teachers. Their creative activities are attested by their reports to annual district, regional, territorial and republican pedagogical readings. The pedagogical readings organised by the Academy of Pedagogical Sciences in Moscow are the final stage of these pedagogical readings in the R.S.F.S.R. Annually, outstanding reports are received by the Academy of Pedagogical sciences from teachers and educational workers under the auspices of pedagogical readings.

The widely spread pedagogical institutes train the bulk of the teachers in the Soviet Union. A very close watch is kept on the quality of the courses as well as the national requirements, which keep on shifting frequently. To keep the academic interests of the teachers, conferences are regularly held in regions, territories and republics. At these conferences, collective efforts are made to improve the methodology and content of teaching. The union republics hold their republican congress of teachers to review the situation of bringing the school and community together and to encourage extra-mural institutional activities.

With the increase in the number of training institutions, the work of pedagogical research and drawing up of long-term research plans has become difficult. This important and progressive work is assigned to the Academy of Pedagogical Sciences and the Ministry of Education.

The famous R.S.F.S.R. Academy of Pedagogical Sciences - the highest scientific institution uniting scientists in the field of pedagogics - was established in 1943 with the clear-cut objectives of putting education on

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the pivots of functional science. It includes scientific exposition of the problems of general and special pedagogics, history of pedagogics, aesthetic and physical education, psychology, school hygiene and methods of teaching various subjects in the general educational schools and training of scientific workers in pedagogical knowledge among the people.

The Academy has a number of members and corresponding members and this number is periodically increased. The candidates for membership and corresponding membership of the Academy are nominated by scientific institutions, higher educational establishments, public organisations and individual scientists. All the activities of the Academy are supervised by a Presidium consisting of a President, two Vice-Presidents and six members of the Presidium. The Presidium is elected at a general meeting by secret ballot for a period of four years. The main scientific institutions of the Academy are Institute of Theory and History of Pedagogics, Institute of Pre-School Education, Institute of General and Polytechnical Education, Institute of Industrial Training, Institute of Evening and Correspondence, Secondary General Educational Schools, Institute of Child Physiology, Institute of Physical Education, Institute of Psychology, Institute of Aesthetic Education and Institute of Defectology. A new type of research institutions have recently come up, viz., the laboratory-schools, which conduct research in pedagogical problems of schools.

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In addition to the above stated primary research institutions, the Academy has a number of auxiliary scientific institutions.

The problems of accelerating learning pace, condensation and quality of academic content matter, experimentation in the new approaches from some perennial content for continuous analysis and research. Questions of correlating the general, polytechnical and vocational education with pupil's productive work are constantly reviewed and resolved. Research is also being conducted in methods of teaching which ensures enthusiasm for mastery of knowledge and ability to make practical use of it.

To increase the demonstrative aspects of training, questions of more extensively and effectively utilising the modern technical achievements—films, radio, television, sound recording, etc. during lessons are being studied.

As aids to make teaching a lively profession, excursions, laboratory work, practical work, team work in school shops and on school experimental plots are extensively made use of.

One of the most important objectives of pedagogical science is the development of a system of the child's physical education from birth to maturity. The research in the field of psychology includes problems on personality development, formation of moral values, motivated learning and neurological aspects of behaviour.

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The research in defectology embraces a wide range of problems pertaining to typhlo-surdo and oligophreno-Pedagogics and Psychology, as well as logopedics. The Clinico-Phychologic peculiarities of the development of children are studied in the control and experimental groups. New methods of experimental objective studies of the sense organs and higher nervous activity of anomalous children have been thoroughly studied. Theoretical principles and practical recommendation in the field of medico-pedagogical systems of education and training, as well as Vocational training of pupils of special schools are being extended and deepened.

Problems of compensation of defects in vision and hearing by technical aids are being studied on the basis of the achievements of electronics, radio-engineering and theory of information. Special apparatus enabling the blind to read usual books, devices for pupils with impaired vision, school and production training equipment for them, have been developed. This makes it possible to give the blind and those with impaired vision an adequate general and special education and to find vocational employment of them. For the Institute of defectology, a special set of teachers are trained continuously.

The role of the Academy of Pedagogical Sciences in stepping up the teacher-training programme is of vital importance to this progressive nation. The republican pedagogical institutes and the pedagogical departments of the universities maintain a close touch with each other. The two agencies are correlated very closely. The Academies publish outstanding pedagogical literature on varied range of topics.

Regarding the refresher courses for employed teachers, the pedagogical Institutes have a very heavy responsibility of making such attractive courses for practicing teachers that they may rejuvenate their academic knowledge once in five years. This is an uphill task and the Soviet educationists and Academicians are alive to the magnitudes of this problem. They try their best to equip the teachers with current knowledge through in-service courses, mostly based on research in content matter and methodology of teaching. The pre-service training courses are run by the Institutes as whole time day courses as well as correspondence and evening courses. This concentrated effort minimises the shortage of teachers in the various branches of knowledge. The Institutes keep a very close touch with the Academy of the Pedagogical Sciences and hence this straight traffic keeps the teacher-trainers equipped with the current research and consequently helps them to translate it to the best advantage of the pupil teachers.

In short, the success of the Soviet system of school education lies in the network of pedagogical institutes and their direct affiliation with the Academy of Pedagogical Sciences. It is also dependent on the fact that pedagogics is given the rank of a functional science rather than a static process of reviews and reports. Thirdly, there is adequate stress on the in-service training of teachers, specially with regard to advancements in course content and methodology of teaching.
