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SOME KEY ISSUES IN SCIENCE EDUCATION

N. VAIDYA

EDUCATIONAL TECHNOLOGY IN TEACHER TRAINING

V. G. GUPTE

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There are three articles related to humanistic view of education, issues in science education, and mathematics at the school stage.

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A Humanistic View of The Process of Education

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All over the world the education system is under fire from all sections of the society as it is not imparting proper education. The system seems to be concerned mainly with the syllabus of examinations. Thus the human aspect of education is lacking, in spirit even, in the present practices. To make education more fruitful, keeping in view the future as well as present and past of mankind, we shall have to give it a humanistic touch

The humanstic psychology has emerged as a third force after behaviourism and psycholanalysis as the later two did not explain fully the human behaviour. It stands for respect for the worth of persons, respect for differences of approach and openmindedness of new aspects of behaviour (Suitch. 1963). The primary focus of humanstic psychology is on the experiencing person with an emphasis on distinctively human qualities such as choice, creativity, self-realization, valuation and self-actualization (Buhler, 1965) Humanistic psychology is much involved with work in helping people to grow and evolve more fully in realization of their potential (Bugenthal, 1967). Thus the focus of attention is the individual. The major aim is to make him discover his being and get himself related to other groups and ultimately to the society. The notion implied therein is that a healthy society is composed of healthy individuals.

A humane education means an education which increases freedom, spontaneity, originality, creativity, self-confidence, compassion, sympathy, kindness, fellow-feeling and non-violence (Mitra, 1975). Let us see and analyse the role and responsibility of the educationists and the administrators in the recruitment and training of the teachers, the selection and development of the pedagogy and the determination and framing of the curriculum with respect to the process of humanistic education.

Recruitment and Training of the Teachers

There has been a great stress, in the past as well as at present, upon the improvement of teacher education The teacher training institutions took valuable measures to improve the quality of the teachers. But for whom this was being done, the pupil, has never been consulted. Thus it seems to be all superficial until and unless we come to know from the pupil, the focus of activity according to humanistic viewpoint as to (a) what sort of teacher he wants, (b) what traits of personality and other qualities he desires most in a successful teacher.

Now a days even the ordinary firms such as cosmetic and textiles have started conducting opinionnaires on the customers to know their wishes and desires about the stuff being produced for them so that the quality may be improved according to their tastes. But the educationists seem to be least bothered to know the desires of the pupils regarding the qualities of the stuff, the teachers, being prepared for them.

Also there does not seem to be any scientific and psychologically sound criteria for the recruitment of the teachers For clerical, defence and other such professions, there are screening tests and other formalities to make sure the suitability of the candidate for the profession or the job but in the case of teachers' recruitment it has been taken for granted that whosoever takes the so-called training for a period of one year or so will be a fully capable teacher and an ideal of the pupils. This mistake on the part of educationists and administrators has culminated discontentment among the students as many of them do not find an ideal teacher of their choice to admire and to follow. This has led them to indiscipline and strikes in the educational institutions. When we analyse any such problem, mostly we find that one way or the other its roots lie in the discontentment of the students, the maximum responsibility of which goes to the teacher. As a result of this more and more students are losing faith in teachers and day by day it is becoming a hard task for the teachers to control the students. Were the teachers equipped with the qualities and traits of the students' likings, the situation would have been different.

Selection and Development of the Pedagogy

The advancements in science and technology definitely have impact on the development of new innovations and techniques of instruction. But inspite of all this, still in majority of the cases, we are imparting through the traditional methods

the already known facts. The pupils are not allowed to think the way they like to think. The discourse of a student (Anne, 17) in *'The School That I'd Like'* illustrates the phenomenon well as "Lord, let those in authority realize that we are human beings, with brains and minds capable of acting without prompting, not computers to be programmed, switched on and off" It is happening because we are mainly concerned with making them acquire a body of knowledge, memorise facts and find answers to problems—all of which are already known to some one else. No doubt knowledge is also essential but it should not only be transmitted as the students themselves can reconstruct, with reasonable approximation, new knowledge putting together the already with them, if they are armed with the operations to do so. As Mahatma Gandhi remarked. "By education I mean an all round drawing out of the best in the child and man—body, mind and spirit." The major emphasis, therefore, should be on inside-out rather than outside-in as the processing of data is more important for the pupils than merely receiving it. The pedagogical practice should encourage the formulation and testing of hypotheses which can lead to the development of the habit to think and construct new ideas, very necessary, to cope up with the challenges of the future.

Determinations and Framing of the Curriculum

All over the world, curriculum development schemes are in abundance. But we do not know what knowledge, the children who are going to the preparatory school today, will need in 30 years time in order to come to terms with their environment We may be certain that it will be different from what we are imparting them today. Thus it is more important to educate the students towards modes of conduct which enable them consistently to adjust to new situations, to examine and grapple with problems and to have ideas and methods for changing their environment. As knowledge is getting doubled after every ten years, even in a precise discipline of science, so we can't make the pupil acquire all the available knowledge as we are trying to do. We can simply enable him to get familiar with the processes of growth of knowledge and modes of the changing world The curriculum should be framed in accordance with the stages of development of the pupils and it must match the pupil's rate of growth.

Concluding Statement

If the teachers are trained and recruited with respect to skills and traits analogous to the aspirations and desires of the students for their ideals at different

stages, the pedagogy is developed giving top priority to the importance of the pupils as the focus of attention and the curriculum is determined and framed according to the stages of development of the pupils, woven into the life oriented processes and products then we may succeed in making the process of education able to accept the challenges of the present as well as of the times to come in a most humane way.

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Some Key Issues in Science Education

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Introduction

Culturally speaking, teacher occupies an important place in our system of education. But it is just recently that the entire gamut of his work has attracted close attention and examination at the hands of philosophers, psychologists, method specialists and others in general. Why consider critically the classroom behaviour of the descendent of 'Great Guru' ? Why unhook him now ? Because we want to evaluate what he does to children placed under his care in his day to day work. In the area of formal, informal and mass education, he ought to be judged by his clear purposes of firm functions and, not at all, by his age-old vague status or position. He must demonstrate that he is an effective professional in a wider context rather than a survival in his profession on the basis of a degree, both academic and professional. At its worst he should not merely satisfy the administrative requirement alone. In this context, the Editor of the Education and Training of Teachers (1963) has aptly remarked :

> The strength of an educational system must largely depend upon the quality of its teachers. However enlightened the aims, how up-to-date and generous the equipment, however efficient the administration, the value to the children is determined by the teachers.

It is precisely for this reason that it is of prime importance to invest resources into conceptual analysis of philosophy of life to be developed among teachers, theory of instruction to be researched upon in the form of demonstration and experimentation; and innovation to be carried out for breaking day to day classroom o redom.

Posing the Problem

Colleges of education and schools are pathological places for they very successfully negative each other's efforts as if bacteria exist to advance medical

science, a territory for educational researchers in the country. This led Albert Einstein, while speaking on Aims of Education, to remark, "In order to speak out the truth, I have to tell lies". "She is very beautiful". This inherent meaning equally applies to educational studies as well as to its detachable component ; Science Education, if one goes deep into the problem. Unfortunately, over the years, within our own profession, we did not have the benefit of personalities having thorns in their flesh (Socrates called them philosophers) who could speculate freely and successfully over educational problems. The cumulative result of this sufficient long state of affairs is that teacher training in this country is characterized by dullness, drabness, drudgery and doggedness. There is a rigid stay-put in educational studies. Occasionally, a few of its terms are disturbed here and there in the name of modernity. According to Morrison and Mac Intyre, (1969) "The problem is that the educational courses are not about teaching, and that methods, courses, which are about teaching, have no theoretical foundation". In 1893, a Committee of Ten strongly recommended the introduction of chemistry as an individual school subject and then stated :

> Every subject which is taught at all in a secondary school should be taught the same way and to the same extent to every pupil so long as he pursues it no matter what the probable destination of the pupil may be or at what point his education is to cease. (School Science and Mathematics, 1976)

Science education at the pre-college level in modern India is an intriguing blend of much of the best and some of the worst science teaching from all over the world. American teaching methods can be seen being applied to a basically British curriculum, using Russian-built equipment. In another area, a Russian style programme is taught by teachers trained in the British fashion, using equipment developed with American help (Brown, 1976)

The situation now stands much improved, theoretically speaking, in the light of the new curriculum as well as recently discussed, taking the global picture into consideration, Caleb Gattegno, (1971) could not help remarking :

> Much current teaching, far from feeding and developing the learning process, actually stifles it. Memory, for instance, the weakest of the mental powers available for intelligent use, is almost the only faculty to be exploited in the educational system, and holds little value in preparing for the future.....

This problem is deeper than the supply of bricks, mortar and kits. Science is not equivalent to content of science, up graded or down graded. It means 'subject and method, content and activities and knowledge and behaviour' It is only then that the objectives become alive when pupils begin 'to evaluate what they learn and act accordingly' (International Review of Education, 1976) The absence of this search in our profession is creating many imaginary problems which we regard as real for the basic problems lie elsewhere.

The Nature of Science :

Unlike countries, science has open frontiers. In this century, it has come of age : endless, faceless, stable and fluid, its inside and outside exploding and imploding at the same time. It lacks hypothesis setting and testing philosophy for it is still approached dogmatically in its entirety. Under the influence of Nuffield Project, it is confined to Problem, Hypothesis, Experiment and Result. This concept of science is still weak because the obtained result has to fight for its survival for the principle of authority which is completely discarded in the field of science. The pieces of knowledge so obtained have to be utilized in theory building and abstraction, a part of the philosophy of science, The house of science always remains under repairs. Its teaching implication, according to Robert Kraplus, is :

> To my mind, a frank and open relationship between pupil & teacher lies at the basis of good science teaching. The teacher must have confidence in the pupils' integrity and the pupils must feel free to give their own answer if they have one (or to say they can't see, or do not know, do not understand, if that is the case). It is possible for the class, with the teacher to arrive at a consensus or conclusion if there is sufficient agreement among the pupils. If there is not widespread agreement, then the matter has to be left open and should lead to further classification by means of additional observations or new experiments. In that case, the teacher should not insist that a conclusion be reached. (Vaidya and Rajput, 1977)

This statement places science teaching in sharp contrast to the teaching of other technical subjects even vocational subjects including work experience in which principle of authority is accepted. This distinction stands lost when teaching skill regardless of the nature of the subject as well as the objectives of teaching that subject are all lumped together. This naturally raises the problem of purpose of science education for the various categories of pupils. Pupils need to be

familiarized at their level of mental development with the characteristics of scientfic enterprise or its values as they are exemplified in rational thought :

(i) Longing to know and understand
(ii) Questionning of all things
(iii) Search for data & their meaning
(iv) Demand for verification
(v) Respect for logic
(vi) Consideration of premises and consequences (Education and Spirit of Science, 1966).

And this is a very persistent deficit situation necessary to put on the anvil soon with a view to hammer it effectively for building excellence into our science education programmes.

Confluence of Un-understood Phrases :

It is necessary to develop an integrated frame of reference in which varied aims and objectives, activities and evaluation of outcomes could be fruitfully visualized, hypothesized, realized and acted upon. If not developed it will be difficult to distinguish between a syllabus and a catalogue, thus, leading to confusion in all its varied aspects for any one of the school subjects. Other noted examples are use of terminology rooted in superficial understanding ; content cum method. environmental science, integrated science, inquiry or discovery approach, activity oriented science, concept approach, problem solving and theme basis. To illustrate, when one talks of environmental education, the very context of objectives, learning situations and evaluation changes If here, element of self reliance is injected, one need not be afraid of walking on one leg. Potatoes, fruits & cotton need no longer grow on the blackboard. The mechanical appliances need no longer function on the black-board. At one go, one sees the exit of microteaching and interaction analysis. Consider the following two exercises :

(i) What possible things do you see when you dig a pit 1 m × 1 m × 1 m ?
(ii) Make a diagram of the school's electrical circuits, marking in the position of lights and switches and taking care to economize on electricity and wiring while maintaining adequate safety standards.

Threat of examination or failure goes, co-operative evaluation comes in. For every new move, you do not need an orientation programme. You throw two ignorant individuals : student and teacher into an open situation in which they

make varied efforts to solve the problem. There are no arbitrarily imposed time limits for alternate problems, methods, materials and solutions. If more imagination exists, experimental production centres under the control of schools can provide bases where 'production, education and scientific research' can be combined.

Despite the work of Dewey, Montessori, Froebel, Hall, Prezer, Binet, Stern, Max Wertheimer, Piaget, Bruner and Asubel, the century of the child in this century did not click for it 'surely involved applying as much of science and psychology to the child's education as possible'. Surveying the contributions of psychology to education, Shelley (1975) summarizes as follows:

> To the question asked at the beginning of this paper, whether there has developed within education an educational psychology with a whole set of theories and principles over and above purely psychological ones, the reply must be largely in the negative

Where do the well known principles of teaching stay? They stay where they were for they clar ify nothing. How nebulous are the bases of our work? The theoretical foundations of our work are so insecure.

Consider another illustration from the content aspect of our curriculum, which we have tried hard to modernize within the last over two decades. The concept of curriculum ensuring a need-based syllabus is, in fact, missing. The entire effort simply consists in shuffling and reshuffling the only one available basket of potatoes spread over the higher classes The seshort comings do not end here at all for they appear to cut deeper. A point of view in teaching and learning two aspects of science, namely content and method is yet to emerge in our country.

> It is more useful for the future chemist to know that $2H_2$ represents two molecules of Hydrogen than it is for him to know that the formula of hypo is $Na_2S_2O_3$ $5H_2O$. it is more useful for the future technician to know that acids can be stored in polythene than it is to know details of the lead chamber process. It is more useful for the future citizen to know that it is safe to touch his car battery terminals but dangerous for him to know the Wheatstone Bridge Circuit. And it is more useful for all pupils to know some facts about reproduction than it is to know how to dissect a dogfish (Lucas and Chairman, 1973)

Role of Methods

It is possible to consider classification of methods in different ways : oral methods, observation methods and practical methods (Zverers, 1967). There are several methods available which we can try easily for achieving varied objectives of instruction. These are lecture method, demonstration method, lecture cum demonstration method, problem solving method, project method and historical method (for History of Science) There are other additional methods : guided discovery, supervised study, mini lessons, and mini projects. If industry is brought into the picture, programmed instruction is another promising approach leading to computer assisted instruction. Under certain circumstances, it is possible, to bring more than one teacher into the classroom. The team teaching is another approach to solve part of our day to day problems. There is nothing new in these methods Most of them are known to everybody. Cycle is also known to everybody but everyone cannot pedal it successfully simply on seeing it or knowing the laws of locomotion Experience is of crucial importance here for the basic function of teaching methods is not at all to transmit knowledge passively but to 'excite a determination in the child to acquire it for himself' according to his needs. As already mentioned, simply change of content will not do for the basic home work lies elsewhere The philosophical, psychological, sociological and empirical structures of individual school subjects need to be worked out at depth urgently. The growth of scientific temper among pupils is also now one of our constitutional responsibilities. These issues can't simply be washed away. They will continue to revisit us.

Internship in teaching

Over the years, it has become more of an organizational concept rather than a conceptual one. Considering its purposes, benefits to a varying extent accrue to the trainees :

(i) The theoretical ideas are related to the classroom situations and vice versa and providing individualized data for self evaluation in the process for the purpose of self improvement.

(ii) Contacts are established with pupils both individually and in groups with a view to develop sensitivity towards their way of thinking, feeling and acting.

(iii) Opportunities are provided to experiment with new ideas and find out for oneself the method of teaching which would suit various categories of pupils (Vaidya and Chaturvedi, 1975)

It will be difficult to find schools providing stimulating environment for the above mentioned benefits of internship to the trainees for the colleges of education. It is a sort of 'road block' some how to be negotiated rather than using it as fulcrum for educational change. A firm administrative intervention in favour of colleges of education is long overdue.

Experiment in Teacher Training

It is of interest to refer to one of the projects voluntarily undertaken by the staff and students at the Regional Colleges of Education, Bhopal and Ajmer. It did away with the lecturing way of training. The main aim lay in approaching the entire prescribed syllabus differently from concrete to abstract which was highlighted. Methodology of teaching and internship in teaching were placed at the centre and other educational constructs were gradually introduced and developed through methods other than chalk and talk methods. Focus remained on self sudy methods and skills. The project ran for two years. If given the opportunity and forum even in the face of difficulties, some 20 percent to 30 percent teachers are available who wish to be trained differently They appear to have gained in several ways : enhanced self study skills, added inner strength not to run away from the problems, understanding in concrete terms the difference between theoretical possibility and practical actuality, intense concern for submitting quality work and better understanding of the studied materials. The project progressed forward on mutual faith and self reliance in which every project tried hard not only to show his or her best but also to improve on her/his weakest point. The outstanding reaction here was that almost all of them found themselves 'in a new atmosphere which grew' (Rajput and Vaidya, 1975). M. B. Buch et al. (1976) reported similiar experiences and add :

> The success of innovations depends more upon the felt needs of the institution than on its intellectual and pedagogical adventuris a..... The innovative culture must not be leadership centred.....

In-service Education and Research in Science Education

We have to produce competent teachers who can see beyond their noses and who are skilled in 'methods of teaching, in stimulating thinking, in preserving

and extending creativity, making them reexamine those values from time to time." (Rosecrance, 1958). We achieve this objective through inservice education in the form of summer institutes, workshops, conferences and even educational field trips. We can succeed reasonably well only if these programmes become the integral part of the educational administration. A model of in-service education is yet to develop. It is yet to be evaluated in a wider frame of reference. Its transfer effects to classroom instruction have yet to be determined. A similiar question mark remains on research in science education. Department of Education in Science and Mathematics (NCERT) and the various State Institutes of Science Education spread all over the country are trying hard to revamp science education. The critical evaluation of their efforts up to this time simply indicates that the development of the Integrated Frame of Science Education with one of its sides open in the light of the new curriculum is still far away. The only optimistic note here is that our country happens to be one of the fewest countries in the world which has jolly good knowledge of Science Education Programmes going on all over the world, thanks to the efforts of Ministry of Education, Govt. of India, All India Science Teachers Association and our beloved NCERT.

Concluding Statement

Neither lovers nor smugglers declare their aims and objectives very specifically before they begin their work. They are acid tested as they grow out of the varied situations in which they live. This statement should equally apply to teacher educators who like defeated school masters talk too much in their classrooms. Schools have to play varied roles in our country : disseminating information, providing quiet conditions critically as in the case of maternity homes and act as workshops for the nation. Being reflective members of the teaching community, one need not survive in the training environment with a 'death' wish for the current atmosphere which not only rubs in salt but also eats us on both sides must be eliminated altogether. It is, therefore, essential to personalize our classroom environment and curriculum against the backdrop of community so that the teacher is himself 'taught in dialogue with the students provided he keeps his cognitive rather than narrative function up' (Paul Freire). One is really in a wrong business if under one's care, the three coordinates of science education : Learning, Teaching and Training instead of becoming a liberating and intellectually stimulating experience becomes another kind of cut-and-dried dogma (Rais Ahmed).

It is now easy to pose an elementary question which was earlier lost in the jungle of question marks : What is the ultimate objective of training ? It is to help teachers to help themselves. How ? Through a series of activities which exercise their personality traits and attitudes towords themselves, their work and children. Is it possible to train an 'apt' teacher in the absence of these activities ? Answer is yes, administratively speaking. Is training received at the college of education used after training is over ? It gets short circuited, generally speaking. A content oriented curriculum is not going to modernize our science education because it centres on products of experiences rather than on processes leading to these very products of thought. Talking—listening—obedient response favours the former and question mark under each favours the latter. Since the initial reaction to the latter type of learning situation is going to be invariably erratic, there is bound to be dip in achievement. But as soon as the concepts settle down, they become readily available for 'maximum travel' in the phraseology of Bruner, in other problem solving situations. It is hypothesized to be a very vital experience which need not be denied to teachers under training. Otherwise when will they learn to tackle problems relevant to their professional work not only in their own lives but also in the lives of growing young children going to be placed under their care ? Who is going to smash whose illusions ? It is safe to conclude what teachers ultimately do to children at school is to a great extent the function of type of training received by them Will they be 'covering' or 'uncovering' the course ? It is only obtaining answers to these questions which will determine how the trained professional spends his time at school. Both teacher trainers & teachers have to wash their ugly faces with a view to formulate as well as to solve jointly each other's problems more and more fruitfully. Alvin Toffler then need no longer remark that 'all education creates images of the future' for present and past teach their own lessons which can be ignored only at great cost to any nation anywhere in the world (Toffler, 1974) Lastly in the furtherance of any branch of human knowledge. one need not be afraid of committing mistakes, nay of even becoming a temporary joker ! He who refuses to be confused in the face of elusive reality is a danger to our community ! (Vaidya, 1968, 1971, 1974, 1976, 1979)

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Educational Technology in Teacher Training

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To-day, we live in a world of rapidly accelerating change brought about by the application of science and technology to almost every aspect of our daily life. Paradoxically, however, this revolution has virtually bypassed education and training, despite vast and increasing investments in teaching systems. Indeed, the methods and techniques that we as teachers use have changed little from the original socratic model on which they were founded. However, after a long period of gradual and placid evolution, the conservative and traditional practices in the educational and training process are gradually giving way through EDUCATIONAL TECHNOLOGY.

Educational technology has been defined in various ways amongst which the most accepted definition is the "development, application and evaluation of systems, techniques and aids to improve the process of human learning." Technology may be described as the science of the application of knowledge to practical purposes; and hence educational technology would seem to comprise the process of applying available knowledge in a systematic way to problems in education and training. It is more profitable, therefore, to begin by identifying a quite general aim, namely to seek out the most effective and the most efficient solutions to specific problems in education and training. using whatever methods and techniques might promise to be relevant in our present state of knowledge. It has been seen that educational technology has wider connotation than simply the use of electro-mechanical and other aids in teaching. It places as much stress on educational ideas as on technological inventions, largely because it accepts that fundamental advances usually come from the interaction of changing concepts (leading to new ways of looking at things) with changing techniques (leading to new ways of doing things.)

More generally at this time along with the development of new communication media there has been growing concern for the individual learners' needs and difficulties. However, the patterns in which education and training have in the past been organised with a steady sequence of examination hurdles designed to eliminate all except the most academically abled, a curriculum geared to deal uniformly with sizeable numbers of students grouped in terms of their level of ability have seriously inhibited the practical realisation of this important conceptual change. In order to accomodate the shift in emphasis from teachers' teaching to learners' learning the structure of the education and training system is beginning to be reshaped. It is in this reshaping process that educational technology aims to make its major contribution.

Educational Technology can be regarded as the application of systematic knowledge about learning and instruction, to teaching and training, with the aim of improving their quality and efficiency. For this reason, a wide range of presentation control and feed-back devices may be called up such as teaching machines, simulators and computers. It should, however, be emphasized that techniques such as critical path analysis, curriculum development methods, and task analysis are essential components as well as the hardware systems.

Teacher education is an area of professional specialization similar to the education of other professionals. It is, therefore, safe to postulate that attributes of educational technology which enhance the process of communication and instruction in any area of specialization will also do so in teacher education. While professionals in other specialities are confronted with the process of educational technology mainly during their formal training, teachers are expected to be involved intensively with educational technology throughout their careers. It is therefore surprising that teacher education has been slower than other fields to incorporate educational technology into its instructional processes. Oddly enough teacher educators, and even experts in the use of educational technology and media, often profess to prospective teachers on the importance of educational technology and its uses, while they themselves are employing the most conventional instructional methods.

Teacher education programmes which utilize educational technology should serve a dual purpose. First, they should increase this efficiency and effectiveness of the instructional and educational processes in the programme. Second, and more crucial, a programme and teacher training should itself be a model for teach-

ing and embodying the most effective and most innovative procedures and concepts of instructional technology. Because such programmes are inherently an example of what they purport to teach, they should embody the very qualities of teaching which it is sought to instil in their students These programmes must constitute the penetrating edge of new developments in the art and science of teaching Thus, for example, the concept of individualised instruction and use of individualised learning packages and multimedia system should first be applied in teacher education programmes.

The evidence collected so far indicates a growing recognition among educators the world over of the need for education and teacher instruction to be based on a more systematic approach, such as is embodied in the concept of educational technology. It is widely felt that only by these means can a solution be found to the many problems of education and its diverse goals be realized. As stated, this growing awareness of the value of educational technology is not always based on research evidence, but frequently depends on rational analysis of its underlying theory, on the recommendations of those who already employ such methods on inference from related fields and finally on the desire of innovators to introduce new methods.

Relative to other groups in education, science educators, have been more prone to accept concepts of educational technology and media. The intensive use of various technology media has played a dominant role in most innovative curricula in Science education. This example has been followed by educators in other disciplines, though teacher educators have in main been more reluctant in applying educational technology to teacher training.

In would seem to us that teacher educators in general and science teachers in particular cannot afford to sit passively and wait until conclusive research evidence to support the use of educational technology in teacher education is forthcoming. Most educational practices have yet to be tested through rigorous research. They were introduced mainly because they were based on psychological theories and pedagogical principles, and are in the process of being tested under practical conditions. The following are the selected practices which can be incorporated in teacher training,

Selected practices of Educational technology in teacher education :

1. Application of a systems approach to teacher education :–
   (i) The use of behavioural objectives and performance criteria

(ii) Learning modules utilising multi-media systems for individualised self-instruction

2. Simulation in teacher education
3. Microteaching in pre-service and in-service teacher education
4. Observation and appraisal systems of instructional process :
   (i) Direct classroom observation
   (ii) Observation and appraisal through media
   (iii) Self confrontation through audiotape
   (iv) Systematic observation techniques
5. Presenting college level courses related to teacher education
6. The use of supplemental media resources for pre and in-service education programmes.

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Educational and Psychological Research on Transcendental Meditation

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Leading think tanks have been crying from the house tops that the ultimate aim of education is the development of full human potential. Erich Fromm wrote about this historic process. Adolf Adler proposed that the primary motivation of man was to develop beyond his limitations. Abraham Maslow talked about self actualization.

M. Edgar Faure, the Chairman of the International Commission on the Development of Education, stated about its report (1972), that one of its underlying assumptions is "that the aim of development is the complete fulfilment of man, in all the richness of his personality, the complexity of his forms of expression and his various commitments" To many of us, all round development of personality is the sine qua non of education. But it seems only lip service is paid to this very noble aspect of education. Education is producing men of professions rather than men of developed personalities. What we need are men of professions with developed personalities. The modern educationist has come to realize that the child is not the plastic material to be moulded and pressed into a shape as desired and decided upon by the parents and the educators. He has a unique and vast potential which remains unexplored and he does not utilize even a small fraction of it. Deep exploration of this vast potential has been done by the Indian systems of Yoga and Meditation. Our ancient sages have developed techniques which are claimed to expand awareness, improve clarity of perception and ensure full development of the individual in a natural way. Considerable scientific research has been done, specially in the Western Countries, on our systems of Yoga and Meditation. One of these which has attracted the attention

of Western scientists to a great extent is the phenomenon of Transcendental Meditation propagated by Mahesh Yogi. It is claimed that by this method one can reach the deepest level of one's own self, the very depths of one's own being. In practical terms it brings peace of mind and relief from stress and strain. An unstressed mind is able to concentrate and to use its full potential. The TM technique has been defined as a simple, natural, effortless process that allows the mind to experience subtler and subtler levels of the thinking process until thinking is transcended and the mind comes into direct contact with the source of thought.

Though scientific research seems unable to express fully the holistic effect of Meditational techniques, yet the improvement in performance on a host of variables as a result of Transcendental Meditation seems to make extra energy available to the individual for all round development of his personality.

Tjoa (1974) conducted two studies to show that there are greater increases in intelligence among meditating students than among non-meditating controls. His findings indicate that the TM programme increases general fluid intelligence, which enables the meditator to respond to new situations with greater adaptability, creativity and comprehension. After the age when intelligence growth is expected to reach a plateau, meditators continue to grow Reddy et al. (1975) administered IQ tests to 30 athletes before and after six weeks of pre-season training. Of these, only 15 were taught the Transcendental Meditation at the beginning of the six-week period. Retesting at the end of pre-season training showed that the IQ of the meditating athletes increased singnificantly more than that of the non-meditating athletes. Shector (1978) measured intellectual performance of 80 students in a Canadian public high school by Raven's progressive Matrices Set II, before and after a 14-week Transcendental Meditation programme. The meditating students showed significantly greater gains in intellectual ability than did the non-meditators' scores.

Abrams (1974) found that subjects who had practised the TM technique for an average of 28 months performed better than beginning meditators on short- and long-term recall tests as well as tests of paired-associate learning. Miskiman (1975) showed that after the first 40 days of TM programme, meditators increased markedly in their tendency to spontaneously organise memorized material in their minds (as measured by the index of Clustering in recall), members of the control group, who relaxed twice daily by sitting with eyes closed, did not change significantly. In the studies by Collier (1974), Heaton and Orme-Johnson (1974),

and Kary and Hufuegel (1975) academic performance, as measured by grade point average, was shown to improve sharply after students began the TM technique. The ability to succeed in academic studies is brought about by generalised improvement in neurophysiological and psychological functioning caused by TM.

Mac Callum (1975) used the Torrance Test of Creative Thinking (TTCT). Verbal Form A, to compare 44 subjects practising the TM technique for several months with 41 subjects who had just learned Transcendental Meditation. The two groups were equivalent in age, sex, education, and income level. The experienced meditators scored significantly higher ($P < 0.01$) of all three scales of TTCT—Fluency, Flexibility and Originality—indicating that the practice of Transcendental Meditation increases creativity. Shector (1978) found that meditating students' scores showed signficantly great gains in creativity (as measured by Match Problem Test) than the non-meditating students' scores.

Studies have also been conducted to explore the effect of TM technique on the development of personality. In a study by Seeman, Nidich and Banta (1972), subjects practising TM, measured once prior to beginning the technique and again two months later, showed significant positive improvement in the following traits when compared with a matched control group of non meditators : inner-directedness, time competence, self-actualization, spontaneity, and capacity for warm inter-personal relationships. The test used was the Personal Orientation Inventory (POI) developed by Shostram. Two independent studies by Nidich, Seeman & Dreskin (1973 and Hjelle (1974) also using the POI confirmed these results. Hjelle (1974) compared in subjects practising TM technique with a control group of non-meditators on Rotter's Locus of Control Scale and Bendig's Anxiety Scale. He found that meditators were significantly more internally controlled and less anxious than the non-meditators.

When the mean scores on the Freiburger Personality Inventory (FPI) for a group of subjects practising TM over a long term were compared with appropriate norms by Fehr et al (1975), the meditators exhibited:

1. Less nervousness, less psychosomatic disease
2. Less depression, more self-assurance and contentment
3. Less irritability, more tolerance and calmness in frustrating situations
4. Greater sociability, liveliness, friendliness
5. Greater self-assurance, more self-confidence good humour

6. Less tendency to dominate, more respect, cordiality, flexibility and tolerance
7. Less inhibition, more naturalness, spontaneity and self-sufficiency
8. Greater emotional stability, greater ability to concentrate
9. Greater self-reliance, staying power and efficiency.

'Self actualization' is the term applied by Abraham Moslow to the experience and expression of an individual living his full potential. A study by Ferguson & Gowan (1974) indicated that subjects practising the TM technique showed a significant increase in self-actualization compared with a group of non-meditators, as measured by the North-ridge Development scale. The level of self-actualization was highest in long term meditators, indicating that the benefits of the TM programme are cumulative. Shector (1978) found that students who practised TM showed a significant increase in self-esteem, innovation, individuality, energy level and tolerance, whereas the control group did not.

Anxiety is of central importance as a determinant of human behaviour. Personality theorists consider anxiety to be an important factor in producing discrepancy between performance and potential of an individual. It is associated with impairment of functioning in almost all areas of life-physiological, perceptual, motor, intellectual, and emotional. Anxiety also causes psychological rigidity and blockade of creativity. Therefore, a reduction in anxiety can be expected to be accompanied by greater availability of the individual's inborn resources in every area of life. A considerable number of studies (Davies, 1975, Kory and Hufuagel, 1975; Lazar, Farwell and Farrow, 1975; Nidich, Seeman and Seibert, 1975; Ross 1975; Stern, 1975; Ferguson and Gowan, 1976; Russie, 1976; Block, 1977; Dillbeck, 1977; Shector, 1978) have shown that the practice of Transcendental Meditation significantly reduces the level of anxiety.

These wide-ranging effects of Transcendental Meditation are indicative of the fact that it acts at so basic a level that every aspect of life is enlivened by this one simple technique. It is worth experimenting within our schools as its application is claimed to improve the quality of life generally by allowing everyone to develop full potential of mind and body, to spontaneously contribute maximum to the progress of mankind, and to enjoy complete fulfilment in life.

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A Factor Analytic View of Adolescent Thought in Piagetian Context*

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With the persistent efforts made under the leadership of Professor Jean Piaget, the work of Geneva School has come of age in this decade. Being influenced by the genetic epistemology, he propounded a stage-wise theory of intellectual development which ran counter to the currently held psychometric view of intelligence. His views could not be confirmed or rejected because of the 'Methode Clinique' which he himself developed and used. (It is a highly imaginative but, at the same time, a most-consuming technique in the collection of data on pupil thought.) Secondly, another serious handicap here was the use of unconventional methods and tools, lacking scientific vigour. Despite these two difficulties, quite a few workers have attacked the Piaget's formal stage whose main characteristics of this complex stage are :

(i) The adolescent pupil's thinking is no longer tied to the concrete situations.
(ii) He imagines and considers all sorts of facts, hypotheses and possibilities.
(iii) He develops the ability to reason by hypotheses.
(v) He goes even to the extent of finding empirial and mathematical proof for his observations.

It is not difficult to grasp the above mentioned characteristics in isolation. But the feel of difficulty is reflected when he suggests certain schemes of thought along with their corresponding experiments. If the current status of research in this field is evaluated, one really draws a blank. The schemes of thought along with their experiments as suggested by him are as follows :—

* ERIC NCERT PROJECT : The Determination and Development of Schemes of Thought in Science During Adolescence Under the Direction of Professor N VAIDYA

S. No.	Scheme	Experiments
1.	Combinations	Chemical combinations, in a system containing a substance to be coloured: a dye, an inhibitor, and a neutral agent.
2.	Proportionality	Equilibrium on a balance beam where the multiplicative relation between length and weight must be dealt with.
3.	Correlations and Probability	Discovering the relations between a pair of imperfectly correlated variables (hair and eye colour).
4.	Conservation beyond empirical experience	Conservation of movement in a system containing some friction, i. e., rolling balls on a horizontal plane.
5.	Inversion and reciprocity coordinated in maintenance of equilibrium	Behaviour of liquid in communicating vessels (equality of water levels, relation between water pushed out of one tube and into the other).
6.	Mechanical equilibrium	Hydraulic press (a more quantitative version of the preceding).
7.	Coordination of two reference systems	Snail moving on moving platform.
8.	Equilibrium of work mechanical proportion	Behaviour of wagon on variably inclined plane counter balanced by variable weight on pulley.
9.	Geometrical proportionality	Predicting size of shadow cast with objects varying in size and distance, screen and source varying in distance.
10.	Compensation of interacting variables	Behaviour of balls on rotating platform, relation between weight and distance from centre in determining centrifugal motion.

At this stage, it is necessary to say a few words about the schemes of thought and how the transition of thought takes place from the concrete stage to the formal stage of mental development. Regarding the 'Scheme of thought', the following terms more or less loosely cover it : 'Strategy, concept, plane, decision, process, orientation, sequence of links, learning set and key factor having past, present and future.' In this context, the conditions of transition from the concrete stage to the formal stage, according to Jean Piaget are :

1. The adolescent pupil is in a position to state as well as test hypotheses. This type of reasoning is called the hypothetico-deductive one.

2. The adolescent pupil is able to make the effective use of proportional logic.

3. The adolescent pupil is in a position to separate form from content. Where possibility rather than reality becomes the chief distinguishing characteristic of his thought.

4. The adolescent pupil is able to deal effectively with the entire combinatorial nature of operations that is, from the 16 binary combinations to 256 tertiary operations.

5. The adolescent pupil is in a position to generate all the possible cases which are derivable from 'one single identifiable mental structure i. e. the INRC group. It is a fascinating mental structure arising from the fusion of two different structures,' namely, the lattice and the group of reversibilities

The Presentation of Studies

Vaidya (1964) investigated problem solving among certain group of adolescent pupils in Central London. The problems selected from physics inhered the following schemes of thought : Schemes of summation, constant difference, conservation, proportion, categorization, stating as well as testing hypotheses and discovery of principles from incompletely supplied data. Using Hotelling method,

four factors appeared namely, Attainment factor, Practical factor, Interest factor and Adjustment factor. Working with highly restricted age group of grade X,. Mishra and Vaidya (1974) investigated the role of hypothesis formation and testing in learning of science and showed the existence of five factors, namely, General Adjustment, Ability to see the problem as a whole, Formulating hypotheses, Interest in generating difficult problems and Newness of the problem.

In another comprehensive study using case study approach, Vaidya (1975) investigated certain aspects of thought among certain groups of adolescent pupils (N=200) with the help of seventeen problems, each inhering a continuous chain of reasoning. His study showed the existence of the following ten factors: Schematic learning general adjustment, Problem learning general adjustment, Problem orientation, Sensing problems, Symbolization, Testing hypotheses, Using constant difference, Aspect character, Seeing the problem as a whole and Intelligence.

- As a part of an ERIC project, Sandhu (1980) investigated the structure of formal thought with the help of ten Piaget Type tasks loaded with scientific contents on 986 adolescent pupils drawn randomly among the students of twelve high schools of rural areas in Punjab taking almost equal number of boys and girls belonging to the age groups of 11+, 12+, 13+, 14+, and 15+ studying in grades 6 to 10 respectively. The analysis of his data indicated the following factors : General intellectual factor, Academic achievement factor, Adjustment factor, Behavioural factor, Emotional factor, Temperamental factor, Group factor of adolescent thought and Social factor.

Lawson (1975) showed that the tasks used by Piaget measured formal reasoning. It is also of interest to add here that according to him the formal of the test affected males and females differentially. Using cluster analysis technique, only one factor appeared in the acquisition of algebraic concepts during the secondary school years in a study by Joshi (1970). However, the centroid method clearly hinted at the existence of two factors, namely, abgebraic aptitude and symbolic substitution in the same study too.

As already pointed, it is difficult to collect data in Piagetian context on Piagetian thought using the clinical method. So other workers like Longeot, Raven, Shayer, and Wharrey, Tisher, Staver and Gabel have attempted to develop paper-pencil tests for investigating adolescent thought. All of them have

extracted factors using different tasks and tests, populations and techniques of analysis. The result of all these studies indicate that the formal stage which appears during adolescence is just being scratched factorially. Also there is yet to become available a single study investigating Piagetian thought in full without violating the underlying assumptions. If some pointers in this direction are any guide towards the clarity of the field, structurally speaking, the developing picture is somewhat as follows :

(i) Piagetian tasks as given in the Growth of Logical Thinking as well as tasks inhering a continuous chain of reasoning, measure what is called 'formal thought' (Bart, Gabel, Gurein, Lawson, Lovell, Lunzor, Misra, Peel, Renner, Sandhu, Shayer, Staver and Vaidya)

(ii) Formal thought is necessary to proportional reasoning (Lovell and Lunzer etc.)

(iii) The structure of formal thought is bi-factorial, viz, Verbal and Non Verbal (Bart).

(iv) Analytic thinking, intuitive thinking and strategy appear during adolescence. (Abou Hatab, Austin, Goodnow and Guilford).

(v) Adolescent thought shows a form of grouping : Concrete operational and coordinating concrete-logical (Gurein)

(vi) The factorial structure sex-wise during adolescence is not the same on Piagetian type Tasks presented individually as well as in a group (Lawson and Vaidya).

The Current Factorial Structure of Adolescent Thought:

The consolidated factorwise picture as currently obtains in literature is as foll.

The Current Picture

S. No.	*Factors*	*Psychological Interpretations*	*Authors*
1.	First Factor	(i) General Intellectual Factor	Abou Hatab, Beard, De-Lemos, Mac Arthur, Peel, Sandhu, Staver and Gabel, Tuddenham, Vernon.
		(ii) Schematic Learning General	Bart, Renner and Lawson, Vaidya
		(iii) General Adjustment	Vaidya and Misra
		(iv) Formal Operational Thought	Abramowitz
		(v) Exclusion of Variables	Shayer
		(vi) Attainment Factor	Vaidya
		(vii) Algebraic Aptitude	Joshi

2.	Second Factor	(i)	Piagetian Cognitive Development	Staver and Gabel
		(ii)	Seeing the Problem as a whole	Vaidya and Misra
		(iii)	Academic Achievement Factor	Sandhu
		(iv)	Adjustment	Vaidya
		(v)	Practical Factor	Vaidya
		(vi)	Symbolic Substitution	Joshi
3.	Third Factor	(i)	Piagetian Logical Operations Test	Staver and Gabel
		(ii)	Formulating Hypotheses	Vaidya and Misra
		(iii)	Adjustment Factor	Sandhu
		(iv)	Problem Orientation	Vaidya
		(v)	Interest Factor	Vaidya
4.	Fourth Factor	(i)	Interest in Generating difficult problems	Vaidya and Misra
		(ii)	Behavioural Factor	Sandhu
		(iii)	Sensing Problems	Vaidya
		(iv)	Tackling Algebraic Symbols	Vaidya
		(v)	Adjustment Factor	Vaidya
5.	Fifth Factor	(i)	Newness of the Problem	Vaidya and Misra
		(ii)	Emotional Factor	Sandhu
		(iii)	Problem Orientation	Vaidya
		(iv)	Symbolization	Vaidya
6.	Sixth Factor	(i)	Temperamental Factor	Sandhu
		(ii)	Testing Hypotheses	Vaidya
		(iii)	Using Constant Difference	Vaidya
7.	Seventh Factor	(i)	Group Factor of Adolescent Thought I	Sandhu
		(ii)	Aspect Character	Vaidya
		(iii)	Using Constant Difference	Vaidya
8.	Eighth Factor	(i)	Social Factor	Sandhu
		(ii)	Aspect Character	Vaidya
		(iii)	Exclusion of Variables	Vaidya
9.	Ninth Factor	(i)	Combinational grouping	Vaidya
		(ii)	Seeing problem as a whole	Vaidya
		(iii)	Group Factor of Personality I	Sandhu

10. Tenth Factor	(i)	Intelligence	Vaidya
	(ii)	Verbal Description procedures	Vaidya
	(iii)	Abstract Thinking Factor	Sandhu
11. Eleventh Factor	(i)	Group Factor of Adolescent Thought–II	Sandhu
12. Twelfth Factor	(i)	Stating and testing of Hypotheses	Sandhu
13. Thirteenth Factor	(i)	Group Factor of Personality-II	Sandhu
14. Fourteenth Factor	(i)	Group Factor of Adolescent Thought-III	Sandhu

* Some factors from the bottom upwards could be eliminated through Scree test.

In this frame of reference, it should not be forgotten now that factor analysis is a highly mathematical technique as well as advanced educational technology The various factors failing to appear in a definite way should be further subjected to empirical testing by carrying out highly imaginative studies using factorially known tests as reference points. The various tests used should cover as many diverse populations meeting fairly well the intended objective criteria of reliability and validity Similarly, the sizes of the samples should not invariably be less than four times the number of tests used. After having done this, the growth of factors should be clinically explored and the same be checked empirically to test whether the findings come from different chips of different blocks or the different chips of the same block. Whatever be the nature of those findings, they are bound to alter the already proposed structures of intellect. A periodic table of intelligence like the one in chemistry, if it exists, may become available for the benefit of learning psychologists. Until then, as it is apparent, the studies documented above simply as well as superficially reflect the possible structure of adolescent thought as imaginatively proposed by the Geneva School, using symbolic logic. Lastly, it will not be out of place to mention that the role of hints and cues in the development of concepts as well as problem solving is yet to be investigated with focus on acceleration of thought along with the varied modes of presenting subject matters, a very worthy aim of any first class educational system anywhere in the world.

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A Study of Creativity in Teachers in Relation to Their Self-concept and Attitude Towards Teaching

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The concept of creativity has its genesis in the concept of intelligence. Initially the psychologists equated genius or giftedness with superior intelligence. Ultimately it was Guilford who declared that creativity cannot be identified with high I. Q. as it is distinct from intelligence. While Guilford's work helped to overcome the tendency to equate genius with superior intelligence, it led to the development of the tests of creativity and the analysis of the creative process. Later, research on the development of creative behaviour, characteristics of creative individuals, relationships between creativity and intelligence etc. accelerated. For instance studies of outstanding scientists were published by Rao and Eiduson. The study conducted by Getzels and Jackson (1962) on high school children produced considerable information about the performance and characteristics of highly creative children. Very little is, however, known about the self-concept and attitude towards teaching of creative teachers, particularly secondary science teachers.

The adjustment of an individual depends to a great extent upon what he feels about himself. Self-concept also determines the behaviour of an individual to a great extent. In view of the importance of self concept of an individual on his adjustment and behaviour, a need was felt to determine the self-concept of creative teachers. Teachers' attitude towards teaching seems to have a sufficient bearing on his classroom behaviour. In view of the importance of teachers' attitude towards teaching on their classroom behaviour, a need was also felt to explore the relationship between teachers' creativity and their attitude towards teaching.

Objective of the Study

The study was conducted with the following two objectives in view :

1. To find out the relationship between creativity in teachers and their self-concept.
2. To determine the relationship between creativity in teachers and their attitude towards teaching.

Sample

The sample of the study consisted of one hundred trained graduate teachers in Science (T. G. Ts Science) working in higher secondary schools of Delhi. These teachers belonged to 33 schools which were selected randomly. Of these teachers, fifty-seven were men and forty-three women. These teachers were in the age-group of 23 to 44 years. Most of the teachers were B. Sc., B. Ed.

Tools used

The following tools were used for the collection of data :

1. Verbal test of creative thinking by Baqer Mehdi.
2. *Personality Word List* by Pratibha Deo
3. Minnesota Teacher Attitude Inventory by Cook, Leeds and Callis.

The Results

The product-moment method of correlation was used for determining the correlation between creativity in teachers and their self-concept scores. The correlation co-efficients are given in Table 1.

TABLE 1

Coefficients of Correlation between Teachers' Creativity and their Self-Concept Scores ($N=100$)

Sr. No.	Variable	Self-Concept (r)	Intellectual Dimension of Self-Concept (r)
1.	Creativity	0.29**	0.29**
2.	Fluency	0.28**	0.25**
3.	Flexibility	0.23**	0.23**
4.	Originality	0.24**	0.28**

** *Significant at 01 level*

It is observed from Table 1 that teachers' creativity and fluency, flexibility and originality factors are positively correlated with teachers' self-concept and its intellectual dimension. Co-efficients of correlation which range from 0.23 to 0.29 are significant at .01 level.

Co-efficients of correlation between creativity in teachers and their attitude towards teaching scores are given in Table 2.

TABLE 2

Co-efficients of Correlations between Teachers' Creativity and their Attitude towards Teaching scores

Sr. No	Variable	Attitude Towards Teaching
1.	Creativity	0 03
2.	Fluency	0.06
3.	Flexibility	0 07
4.	Originality	−0.06

It may be observed from Table 2 that coefficients of correlation between teachers' creativity including its factors and their attitude towards teaching are very low and not significant.

Discussion

There is a significant positive relationship between verbal creativity in teachers and their self-concept. This may be due to the reason that an individual's perception about himself affects his creativity and its factors of fluency, flexibility and originality. "Each of us has a mental picture which governs much of his conduct and outlook. When one has confidence and pride in his self-image, he feels free to be and to express himself. But when this image is a source of shame, the tendency is to hide rather than to express it and creative expression is blocked." (Steinberg, 1967). Therefore, the creativity and the self-concept of teachers are positively related. These findings find support in the study conducted by Mackinnon (1962) who found the high creative architect as self-confident. Further a creative individual has originality which helps him to achieve success. This in turn enhances his self-concept including the intellectual dimension. The findings of this study are similar to those obtained by Sears (1960), Dukes (1965), Parloff and Datta (1965), Ron Maduro (Kagal, 1970) who conducted their studies on boys in their middle childhood years, fifth grade students, scientists and painters respectively.

There is no significant relationship between creativity in teachers and their attitude towards teaching. This may be due to the reason that creative individuals have liking for professions which are challenging in nature. Teaching may not be challenging to teacher with high creativity and, therefore, no favourable attitude towards teaching has been found among them. Similar results were obtained by Weiser and Bates in their studies Weiser (1963) found no significant correlation between creativity and MTAI scores of 282 education students. Bates (1964)

also found no significant difference between high and low creative elementary student teachers on MTAI. Tan (1968) however, found significant negative correlations between elementary student teachers TCI (Teacher Creativity Index) Fluency and Flexibility and the MTAI scores.

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Perceptual Response of Distress as Measure of Institutional Stress Development of a Scale

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Institutional stress is comparatively a new construct which is attracting the attention of psychologists, sociologists as well as educationists. This construct is inferred as an outcome of the interaction of environment and individual. It means that there is something in the institutional setting that makes the behaviour stressed. When a child goes to school, he has to adopt the role of a student. McDill et al. (1967) and Lynn (1971) have concluded that the quality of administration, teachers and students body influence the child and he has to make his social adjustment to this new setting In this process of adjustment, some fail (Barker, 1968) and feel institutional stress. This type of stress not only makes his school tenure dissatisfying but also lowers his level of performance and achievement, for the stress has been found to generate negative effects (Maher, 1957; Lazarus, 1966). This shows that there is high need of diagnosing institutional stress of our students and taking proper steps for not allowing them to degenerate stressed behavioral patterns. So, the authors have developed a measure of institutional stress for school going adolescents in order to understand this hitherto unexplored phenomenon.

Selection of Measuring Technique : Many developed and used techniques of measuring stress have been critically examined by the social scientists. Only physiological evidence (Selye, 1956), defence mechanism (Hokanson & Burgess, 1962), social readjustment (Holme & Rahe, 1962) and perceptual responses of distress (Langer & Michael, 1963) have been found scientifically appropriate. The first three techniques are restrictive because of their individual treatment. But the last one does not carry any such restriction. So it was adopted in order to

develop a scale of institutional stress. It appears to be more appropriate in contrast with the others (Bourne, 1969).

Approaches to Measuring Object : In order to develop this scale, three approaches were adopted :

(i) Static approach,
(ii) Rational approach, and
(iii) Empirical approach.

Static Approach

The static approach demands the analysis into its structural components which has been theorized as constituted of four components viz : institutional frustration; institutional conflict; institutional pressure; and institutional anxiety. The sum of these four components has been inferred to be indicative of the amount of institutional stress.

Rational Approach

The constitutive definition of institutional stress is taken to be the rational base of this scale. Institutional stress has been defined as a state in which some particular situation threatens the attainment of aspired institutional goal. Students of different schools were asked to write some lines on stresses they felt in schools. An inventory of 100 items (in Hindi) was prepared after content-analysing the essays and the information gathered from other sources such as literature, consultation and general observations These 100 items were allocated to different components by the judges which resulted in having 25 items on each. The institutional frustration items were based on (i) delays (ii) lack of resources (iii) losses (iv) failures (v) meaninglessness. Institutional conflict items showed (i) approach-avoidant conflicts (ii) double-approach conflicts (iii) double-avoidance conflicts. The items of institutional pressure measured pressure for (i) competitive achievement (ii) sustained concentration (iii) rapid changes Institutional anxiety items were on (i) worry, and (ii) emotionality after cognitive and affective components of anxiety.

Empirical Approach

A group of 10 judges was asked to evaluate the items of the inventory with respect to (1) theoretical framework of institutional stress (2) items' representativeness of the four components of institutional stress On the basis of 80% aggrement of judges, 84 items were finally selected.

Item Analysis

These 84 items were so edited as to elicit yes-no two point responses. The scale was given to 150 students to fill up. The responses collected were analysed with the help of point-biserial correlation. 73 items were found to be positively correlated and significant at .05 level. Therefore, these 73 items were selected to constitute the final scale.

Final Experimental form of Institutional Stress Scale :

The final scale contains 73 items with 5 point response categories : almost always, often, sometimes, rarely and never. Thus the scale measures the institutional stress as a trait as conceptualized by Speilberger (1972) in analysing the phenomenon of state-trait anxiety. Scores on the alternatives ranged from zero through four. The sum of all the scores shows the institutional stress scores.

Reliability of Mean, Median and SD :

The measures of central tendency (Mean and Median) and variability (SD) calculated from the data were found to be representative of their parameters. This is obvious from the standard errors of statistics which are small enough in magnitude. (Table 1).

TABLE 1

Standard Errors of Measures

N	Mean	SE_m	Median	SE_{md}	SD	SE_{sd}
400	199.00	.55	206 00	.69	10.99	.39

Boys=200, Girls=200

Skewness and Kurtosis :

The skewness and kurtosis (Table 2) show that the scores of institutional stress are normally distributed with little or negligible divergence.

TABLE 2

Skewness & Kurtosis of Institutional Stress Scores

N	SK	Type of SK	KU	Type of KU
400	−1.91	Negative	.19	Leptokurtic

Reliability of the Scale

The reliability of the scale was established through test-retest method with time variations. The reliability coefficient was found satisfactorily high.

TABLE 3

Reliability Coefficients and their Indexes of Reliability

N=100

Time Variations	r	Index of Reliability
(1) After one month	.77	.88
(2) After one & half months	.74	.86

Table 3 shows reliability coefficient along with indexes of reliability.

Validity

The validity of this scale was ascertained in a four-fold fashion. These are :

(i) Content validity,
(ii) Item validity,
(iii) Criterion validity, and
(iv) Construct validity

The procedures of item construction and item analysis confirm the first two types of validity. The criterion validity and construct validity were estimated as follows :

Criterion Validity :

A four-flag-item scale was developed. The flag items were on institutional frustration, institutional conflict, institutional pressure, and institutional anxiety respectively. A sample of 100 students was randomly selected. They were asked to rate themselves on this scale as well as on institutional stress scale. The scores on both the scales were recorded. The correlations computed between both types of scores were :

(1) Between flag-item-scale scores and institutional stress scale scores, and
(2) Between each flag-item-scale score and its corresponding institutional stress component score on institutional stress scale.

The first correlation was .57 which is significant at .01 level. The second correlation coefficients are shown in Table 4. All are significant at .01 level.

TABLE 4

Correlations between each flag item and corresponding component of Institutional Stress

N=100

Correlation between	r
Institutional frustration & self-ratings	.54*
Institutional conflict & self-ratings	.48*
Institutional pressure & self-ratings	.39*
Institutional anxiety & self-ratings	.59*

* Significant at 0.01 level.

The significant correlations between criterion and institutional stress scores ascertain the criterion validity of the scale.

Construct Validity

A negative relationship has been found between stress and academic achievement by Lazarus (1966), Mahar (1957), and Alpert and Haber (1960). So we can assume that institutional stress which is a subset of stress also debilitates academic achievement. In order to ascertain the construct validity of the scale, the following hypothesis was tested : H. There is significant negative relation between institutional stress and academic achievement.

The hypothesis was accepted when tested on 100 students ($r=.68$; $P=.01$). Consequently, it confirmed the construst validity of the scale.

Thus the empirical findings prove that this scale is a valid and reliable instrument for measuring institutional stress.

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Relationship Between Achievement Motivation and Academic Achievement Among Science Students

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Introduction

The strength of a nation depends mainly upon the persons who have the drive to push forward and achieve. To lead a society from static to dynamic position, we need persons who have the earnestness of purpose and keenness to make progress. This dynamism in a society is all the more needed in developing countries which have been left behind in social and economic developments due to some reasons.

Studies reveal that motivation for achievement is mainly due to environment. If it is so, the educational institutions have to share greater responsibility, because, it is they who can find out the ways and means to properly motivate the students to make them better achievers. A growing nation demands achievement oriented people who may be able to handle suitable responsibilities in the society.

Many studies (Mc Clelland, 1955; Flescher, 1963; Atkinson, 1964; Baruch, 1967; Feather, 1967; Mehta, 1969 etc) have been undertaken to see the relationship of n-Ach with academic achievement mostly in the foreign countries and a few in India also. The results of these studies, in most of the cases, are ambiguous and inconclusive. These studies have directly or indirectly encouraged many workers, all the world over, to undertake similar studies to confirm how far their findings are true. The present investigator, therefore, wanted to probe into the relationship of n-Ach and academic achievement in Science students.

Purposes of the Study

While working on the above problem, the investigator had the following objectives in his mind :

1. To find out, whether achievement motivation (n-Ach) is significantly related to academic achievement in science students.

2. To see whether low and high n-Ach groups have significant relationship with the academic achievement in science.

3. To see whether n-Ach and academic achievement have the same or different type of relationship in biology group and physical science group of students.

Method and Procedure

Science students of class XI of two schools of the city of Ajmer, were taken up for the purpose of the study. School—I had thirty-three students in all, out of which eighteen students belonged to Biology group and fifteen students to Mathematics group. School—II had fifty students in all, out of which thirty-one students belonged to Biology group and nineteen to Mathematics group.

Tools used

The following tools were used for the purpose of the study ;

1. Achievement Motivation Test

For getting the scores on n-Ach, TAT pictures (six) were used. These pictures were the copies of the same pictures that were used by Mehta (1966)

The students were instructed to write stories about each of the pictures in accordance with the instructions of the manual. The stories were, then, scored for getting the scores on n-Ach.

2. Academic Achievement

The Rajasthan Board Examination marks of these students in the science subjects, only, were taken as the measure of their academic achievement.

Statistics used

Coefficient of correlation was calculated by Product-Moment method where students were more than thirty and Rank-Difference method was used where students were less than thirty. Fundamental statistics in 'Psychology and Education' by Guilford was consulted to see the significance of correlation at 0 05 level. Analysis of variance was used to see the relationship of n-Ach scores with the achievement scores in science subjects of high and low n-Ach groups. Scatter diagrams were also drawn to confirm the relationship between the variables.

Findings of the Study

The results of the present investigation have been presented in Table-1 and Table-2

TABLE 1

Relationship between n-Ach and Academic Achievement of Science Students (N = 83)

Group	Total Science group (N=83)	Total Biology group (n_1=49)	Total Maths group (n_2= 34)
Relationship between n-Ach and Academic achievement	0.05	0.05	0.56*

*Significant at 0.05 level

TABLE 2

Analysis of variance and 'F' ratios (High-low n-Ach and Science Subjects

Source	Sum of squares	Df	Estimates of variance	'F' ratios
n-Ach	2792.57	1	2792.57	2.83*
Subjects	6117.11	3	2039.03	2.06*
Interaction	1897.74	3	632.58	0.64*
Within Sets	128140.57	130	985.69	

*Non-Significant at 0.05 level

The relationship between n-Ach and academic achievement in the whole science group (N=83) was found to be 0 05 which is, no doubt, positive, but statistically non-significant (Table 1) at 0 05 level.

The biology group and mathematics group showed 0.05 and 0.56 as coefficient of Correlation respectively (Table 1). The latter correlation (0.56) was found to be significant at (0 05) level of significance. This finding indicates that mathematics students are definitely more dashing than biology students in the field of academic achievement.

Analysis of variance statistics, employed for finding out whether academic achievement in science subjects shows significant relationship with high n-Ach groups, showed 2.83, 2.06 and 0.64 respectively as 'F' ratios (Table 2). These ratios were found to be non-significant at 0.05 level. 'F' ratio of 2.83 indicates that there is no significant difference between high n-Ach and low n-Ach students' achievements in science subjects.

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Teacher Preparation and Service of Society

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Teachers play an important role in moulding the behaviour of boys and girls. In teacher training programmes emphasis is laid on the development of values which are dear to the society.

Community through organised institutions establish schools for the education of children Education is imparted with a view to help children grow and develop according to the wishes and desires of parents, needs of the community and aspirations of the nation. The effect of the persons and their behaviour and modes of working, their real wishes and desired wishes, aspirations, ideologies of the community and goals set by the national leaders affect the process of education. In technical words, it is said that philosophical, psychological and sociological principles operate in an integrated manner in the process of education. Futurology also (a peep into the future social life) plays its role in education. The persons engaged in the process of education and especially those related to schools are the persons charged with the responsibility of bringing up children with a view to make them useful citizens who would contribute their mite to help in *social transformation* and *social change*. In our present society the most useful process to bring in social change is education. This education is imparted though home and school and informal agencies of education which include the mass media of education (radio, T. V., newspapers, magazines etc.) in urban areas and its limited extension in rural areas A large number of our grown up people in rural areas did not receive formal schooling and to a large extent these people are not finding it convenient to allow their children to pursue studies in the school system Thus there is a gigantic task to attract all children of age group 5 to 14 in school system. The teachers and the Education Department have a great challenge in this regard.

Teacher Education

Success in reforming education depends mainly on effective implementation of educational planning. The teachers have to perform crucial role in its

implementation. In view of this, effective teacher education programme is needed both at pre-service and in-service levels. The National Council for Teacher Education, Delhi, in collaboration with UGC panel on Teacher Education and NCERT worked intensively for about two years on the preparation of a teacher education curriculum. Eminent educationists and teacher educators prepared the curriculum which incorporated an important area of *'Working with the Community'*. Twenty per cent of the time during teacher education course is allocated to this programme. The teacher who undergoes the new teacher education programme should (1) perceive his role as an agent of social change in community, (2) perceive his role not only as a leader of the children but also that of a *guide to the community*, (3) act as a liaison between the school and the community and (4) not only use but also help in the *conservation of* environmental resources and preservation of historical monuments and other *cultural heritage*.

The emphasis in the curriculum has been on the preparation of a teacher who understands his unique role as a worker in bringing changes in the society through his active participation in all functions, festivities and cooperative ventures of the community. In order to realize this the student teacher has to *develop attitudes* and *values related to social service*.

Activities for Teacher Trainees

Some of the activities suggested hereunder may be selected by a teacher training institution. These activities are reproduced from Draft B Ed. Syllabus, prepared by Department of Teacher Education, N.C.E.R.T. (1978)

(a) *Study of the problems of the community in the neighbourhood* of the teacher training institution, problems regarding health and hygiene, supply of drinking water, adult literacy, school drop-outs, untouchability, etc.

(b) Survey of population, its composition, major occupations carried on in the community.

(c) *Community work related to agriculture. For instance, the teacher trainee* may motivate the farmers under the guidance of the extension agricultural worker to use the right kinds of manures and in the right proportion for different crops. *Similarly, the teacher trainee may help in soil-analysis*

by collecting samples for various places in the neighbourhood and getting them tested at the agriculture extension centre. This will enable the farmers to know what kind of manures should be applied and what other treatment could be given to have better crops.

(d) Another activity for the teacher trainee could be to make the people aware of certain useful things that can be secured with very little effort, for instance, making use of the non-formal and adult education centres if provided in the community, making use of the facilities provided by the agricultural extension services, *health of workers, animal husbandry department personnel* and the like.

(e) Another important activity which could be undertaken by the teacher trainee in the community is *non-formal education* for drop-out children. There is a large number of boys and girls, particularly in the villages who leave the school at some stage or other without completing the full course. This phenomenon is a major obstacle in realising the objective of providing free and compulsory education to all children in the age group of 6-14, as enunciated in the Directive Principles of our Constitution. Starting centres of *non-formal education* will, therefore, be a very useful and concrete activity which could be undertaken by teacher trainees.

(f) In many places, the agriculture department has developed demonstration-farms where improved methods of raising crop production are practised. The teacher trainee may help the community members by not only motivating them to learn better methods and techniques but also by bringing them into contact with the development personnel, with whose help they may solve certain problems they are facing. A number of developmental agencies for health, education, social service, agricul ure, animal husbandry, etc. are working almost everywhere throughout the country. The teacher trainee may undertake to study the services being provided by such agencies and to apprise the villagers of these facilities. He may also assist them in actually taking advantage of the services.

(g) The teacher trainee may study the various *arts* and *crafts* activities, *vocations, festivals, songs, folk dances and other folk lores*, customs and habits of the people not only to understand the community better but also to participate in some of the activities and functions to *improve their tone in the spirit of the national goals of democracy*, secularism and socialism. *Dramas and songs are effective media for this purpose.* Moreover, the information so acquired may be used by the trainee in the education of children, particularly, in teaching social studies and work experience activities

Cognitive and Conative Domains

Community service comprises values which are to be developed in each individual through group work. '*Divinity resides in each one of us*' is the essence of many attitudes to be developed through community service activities. Some of the values relevant to community service are (1) Respect and love, (2) Spiritualism, (3) Sacrifice, (4) Honesty, (5) Brotherhood, (6) Truth, (7) Justice (8) Hospitality, (9) Fatherhood of God, (10) Ahimsa (in its wider meaning). Teaching of poetry, History and Geography, Science and Mathematics and other subjects should be related to the aforesaid values. This is the cognitive domain of community service.

In the conative domain of learning the pupil teachers of the training institutions should be expected to take up *small acts of work* for the benefit of the people in his neighbourhood. This work may be done in groups of four or five. Some of the following activities may be taken up :

(a) Planting trees during rainy season at appropriate places and watering and looking after them through the year,

(b) Working for a week in a hospital to provide a helping hand to those who need small services,

(c) Restaging the selected cultural programmes for the joy and recreaction of people of various localities near the training institution,

(d) Building a kaccha road or cleaning of a road around the institution,

(e) Assisting some families in the villages for a week in their agriculture work, cottage industries, dairy farms etc.

(f) Working as a Service Volunteer in Melas and congregations of people,

(g) Cleaning the surrounding and campus of *primary schools, secondary schools, police station, water works, market, Panchayat Ghar etc.*

One of the main purposes of community service is to sharpen the *social sensitivity* of the pupil teacher so that he may be able to take up his proper role as an agent in the transformation proposed to be brought about through education or more specifically by the teachers who are the builders of the future citizens.

Community Service is generally recognised as a useful manual work for members of the society. Another dimension of Community Service is the *sharing of knowledge, information* and *skills with those who need them.* In this respect the pupil teachers can assist various organised agencies like clubs, associations of various groups of workers, like bidiworkers, rickshawdrivers by speaking to them about topics of national importance The future teachers have to work intimately with various organised groups in order to understand their functioning and to widen their knowledge and understanding for the benefit of children in schools. The teacher educators have to take initiative in this direction so as to lead the pupil teachers.

Conclusion

Non material aspects of culture must form a part of our training curriculum. The trainee has to play the role of an agent for the continuance of this culture and its preservation. Community Service should be the motto of the teacher. The teacher has to serve the community and to provide it a direction This he can do by wider studies and larger contacts with all sorts of persons in the community.

In the words of Swami Vivekananda, "So long as the millions live in *hunger and ignorance*, I hold every man a traitor who, having been *educated* at their expense, pays not the least heed to them."

It is a matter of great felicitation that Orissa has taken a lead in preparing courses for Community Service which will be a compulsory subject for classes VI to X from the next session. In the present times there is imperative need to develop a positive a titude and a brotherhood feeling among all classes of people.

The students should be aware of their responsibility towards the people who stay around their school. It is in the fitness of things that community service should form a part of our school curriculum. It may be noted that social service should have component of technical work and technical service to community instead of manual work. So far our schools had done some service by way of manual work but in the present times we should think of providing *technical service* to our people. This service includes soil testing, knitting pullovers, stitching or tailoring clothes for children, teaching children of lower classes, orgainising classes in moral education and the like.

It is hoped that the traits such as tolerance, cooperativeness, social sensitivity, adaptibility, participation, sympathy etc. will be developed in the student teacher through community work and he will try to develop these traits among school children. Service of the society is one of the highest goals of education.

In the words of Swami Vivekananda, "Look upon every man, woman and everyone as God. You cannot help any one; you can only serve; serve the children of the Lord, serve the Lord Himself, if you have the privilege. If the Lord grants that you can help any one of His children, blessed you are; do not think too much of yourselves. Blessed you are that that privilege was given to you when others had it not. Do it only as a worship."

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The New International Economic Order The Contribution of Education to Equality[1]

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The New International Economic Order (NIEO) and its Programme of Action adopted by the Sixth Special Session of the UN General Assembly in April/ May 1974 is a decision to replace the existing unjust and unequal world order by one based on *"equity, sovereign equality, independence, common interest and co-operation among all states."* Both the resolution 3201 (S-VI) setting forth the Declaration, and 3202 (S-VI) elaborating the Programme of Action are silent about the role of educational policies for the attainment of the basic objective of equality, except for the rather obscure reference under the programme of action on industrialisation expressed in these terms: "the international community should continue and expand with the aid of the developed countries and the international institutions, the operational and instruction-oriented technical assistance programmes, including vocational training and management of national personnel of the developing countries, in the light of their special development requirements." This silence of NIEO on education policies may mean either that the relevance of education policies to the attainment of an order of equality and justice was regarded as unimportant or that it was assumed that education would be a promoter and contributor to equality and justice and hence not much need be said about it. Probably there was a bit of both in regard to this silence, and certainly the time is now almost past when what educational policies are doing to promote or frustrate the NIEO objective of equality should be made explicit.

This silence about education's role also characterises the various futurological models that we are familiar with, the Club of Rome model, Limits to Growth, the Japanese Club of Rome model, Strategy for Survival, and the UN (Leontiev) model, Future of the World Economy. What is common to all of them is the incorporation of the manpower skill requirements of the global economy over the

1. Nehru Memorial Lecture, Delivered at Rgional College of Education, Ajmer on March 22, 1979

two decades into the models, which raise a host of technical problems. Some of them are : the manpower budget is either an aggregated undifferentiated labour pool calculated pro-rata against installed capital or an estimate arrived at through a production function with little or no capital labour substitution. Except for the outstanding model—the Bariloche model, Catastrophe or New Society, there is no attempt in these models to trace the input role of education and its various alternative, policies but only that of education as consumer of a fixed proportion of the national income. Here again the question is, why this silence of the role of educational policies in the attainment of the futurist world projected in the models. Is it due to the unimportance or irrelevance of education policies in the eyes of the authors ? The familiar excuse that education does not fall within the universe of discourse of the economist who deals with gross capital formation, balance of payment and net inflows, and outflows, labour supply and demand and factor costs is no longer true, as the economist has come to recognise education today as an independent variable (as seen not only in writings on the economics of education but on the so called mismatch between Education and Employment).[1] The need to examine education's role in any futurist projection and attempt to outline means of modifying educational policies in the desired direction must be recognised.

A decade and half before the Declaration of the NIEO, the member countries who form UNESCO recognised education policies and programmes as they then existed as being a contributant to educational and social inequality and hence formulated and finally adopted on December 14, 1960 the Convention and Recommendation against discrimination in Education. Referring to educational inequality as between the industrialised and less developed countries as encouraging discrimination and inequality of opportunity in education and as being an almost universal condition and infinitely greater than the extent of discrimination, it states that beyond the causes of discrimination and the factors making for inequality, it is ineqality itself which is the dominating element and proceeds to lay down how educational policies can be turned around to contribute to equality within the education system in the following terms : "the States undertake further more to formulate, develop and apply a national policy which by methods appropriate to the circumstance and national usage, will tend to promote equality of opportunity and of treatment in the matter of education and in particular : (a) to make primary education free and compulsory : make secondary education in its different forms generally available and accessible to all : make higher education

equally accessible to all on the basis of individual capacity : assure compliance by all with the obligation to attend school prescribed by law; (b) to ensure that the standards of education are equivalent in all public educational institutions of the same level, and that the conditions relating to the quality of the education provided are also equivalent; to encourage and intensify by appropriate methods, the education of persons who have not received any primary education or who have not completed the entire primary education course and the continuation of their education on the basis of individual capacity; (c) to provide training for the teaching profession without discrimination'[2] In reviewing this rather unusual international instrument, it is not without significance to note that it recognises inequality of opportunity to be a characteristic of education everywhere, so that the legislation is drawn up "not only to proscribe any form of discrimination in education, but also to promote equality of opportunity for all in education." A first clarifying exercise would be a brief overview of the anti equalising forces working within the education system

Education Policy as Promoter of Educational Inequality

That educational policies promote educational inequality within a country, specially as between urban and rural areas, sexually as between boys and girls, generationally as between the younger and adult generation, and socially as between rich and poor has been documented extensively particularly in most Third World countries. UNESCO's educational survey, and the statistical studies of the Asian region of the UNESCO Regional Office of Education in Bankok document the differential facilities between school and schooling in the well equipped and staffed urban schools and the poor environment and staffing of the rural schools together with the fact that all technically sound school level institutions and all universities (including Agricultural universities) are all urban based. One country tried just before and immediately after its independence, under the leadership of Mr. Gandhi and his educational advisers, to break away from this spatial unequality and develop a truly rural based educational policy and system. The history of the short lived scheme of Basic Education, Basic teacher training schools and Rural Institute of Higher Education (which were the equivalent of universities) in that country poses the question whether this inequality in the form of the urban-industrial sector bias is not inbuilt into any educational policy.

The unequality between the education of boys and girls has also been documented, the inequality rising sharply with the educational level. From near

parity at the primary school enrolment (not attendance) level, it declines about a third at the secondary, and a quarter at the tertiary level. In the teaching profession, the primary school profession (as well as the pre-primary school ones) is almost entirely for the major part staffed by women, with both the absolute number and ratio of women teachers and professors falling off sharply at the second and third levels. Here again the question is posed as to whether there is something inbuilt in education policies, that both when left to themselves, and when not directed to the contrary, there is an unequal treatment of girls and women as one ascends the educational ladder.

The intergeneration inequality in educational policies is seen in the absolute priority in educational expenditure given to the education of the young, and the near absence of any provision for the education of the adult—both those who have not had any school as well as those who have been forced to stop before or at the primary level. Adult Education allocations in all countries are a fraction of that of formal education : in industrialised countries, they average in the best of conditio: s to 4 percent, in the Third World countries they form a fraction of 1 percent.[3] Here again the question is raised whether there is something in education's texture which makes for a policy which regards the education of adults as the benevolent conceding of a second opportunity to the deprived and deficient, while education itself is education of the young

The most serious and persuasive expression of inequality in the educational system is the intra generation one, namely the bias of the system in favour of the children and students from the richer sections of society as against the vast majority who are from the poor families This is seen in the fact that the 60% of the students who drop out before class V, the stage at which lasting literacy is acquired, and the 80% before the end of the second level, are from the poverty sector of society, mainly because the system requires full time attendance with a single entry point and a sequential chain which cannot be broken, whose opportunity cost no amount of free education, free text books, free midday meals and free school uniforms can compensate. Also within the educational allocation in every state, the highest priority is given to the development of secondary and higher education, with subsidies of large and varying amounts for these stages of education, which means that the children of the well to do minority of society who are the survivors of the primary and post primary education have somewhat exclusive access to secondary and higher education. In one rather large country in Asia,

field studies in the early seventies showed that 80% of high school and college completers are from the top 20% of society.[4] Thus the completion or continuation *rates both within each stage of education* and from one stage to the next are higher for children from the affluent section of society than for those from the majority sector which is poverty sector of society. Here again educational policy seems to be *developing and directing a system* which has an inbuilt tendency to inequality. If to this is added the effect of the public financing and heavy subsidy of secondary and higher education, the inequalities worsen Unlike the industrialized countries where the *major part* of public revenue is from direct taxes, in the Third World countries the major part is from indirect taxes. This regressive tax instrument involves transfers from the poor, low income and lower middle income groups who countribute around 80% of the indirect tax revenue to the upper middle and upper income groups. In this sense our source of educational financing are worsening the unequal distribution of assets, wealth and income levels, to which should be added the hidden private costs, including opportunity costs of education which tend to fall disproportionately on the poor majority of the country.

In fact, the question may be posed whether at the national level, the inequalities within the education system are not more serious, are not steeper than inequalities of income or in per capita consumption in society as a whole. If the educational system excludes and/or drops out 60 per cent of primary school age children from that level of education, that is a higher ratio of deprivation that the income or consumption inequality, where something like 40 to 50 per cent of society are living below the poverty line established on the basis of the level of income or a basket of consumption goods.

At the inter country level all that has been said about intra educational inequalities at national levels are replicated. In addition the inequalities in education represent a much steeper gradient than inequalities based on income levels as between countries. The World Bank Atlases for the years 1970-77 show a ratio of 12-13 in the per capita income variations between the top decile of the industrialised countries and the lowest income decile of the Third World Countries while the education variation between the two groops of countries indicate a ratio of 50 to 100 at the various levels of education. A simpler empirical test of international educational inequalities being steeper than international income inequalities is that reported in UNESCO'S Educational Trends in 1970 to the effect that illiteracy rates were 1 5 to 3.5 per cent for Europe and North America compared to 47 to 74 per cent for the Third World.

At this point it is necessary to turn to the contribution that education makes to inequality in the wider societal context.

Education as Promoter of Societal Inequality

At the national levels, educational policies at present result in transfer of resources from the poor sections to the rich ones of society The content of education particularly at the secondary and university levels reflect the value of the dominant class. The training and skills imparted at these levels are those required by or those related to the urban-industrial sector. The degrees, diplomas and certificates resulting from this secondary and tertiary education from the entry qulification for employment in the organised sector, resulting in a high degree of correlation between future incomes and the completion of secondary and university education, where, as noted earlier, the majority of survivors or completors are from the richer sections of society. In this context education policies which involve large scale (and in some cases) priority financing of secondary and higher education also become policies for widening the socio-economic gulf between the rich and the poor within the country Even as the policies permit some of the poor sections to enter the elite group, there is developing greater specialisation and differentiation of the elite groups, who represent a meritorcracy which accommodates the new comers from the poorer strata and where the new norms of 'educability' replaces the older wealth and social status criteria, while maintaining the traditional and inequitable forms of social selection. The other force making for societal inequalities within the country of educational policies are related to the education employment nexus which is complex and which can only be summarised here. Educational policies in Third World countries result in an educational system which acts as a factory for the production of the unskilled and semi-skilled labour masses which the primary and unorganised sectors of the economy need, are as a filter for training and producing the small elite which the management of the economy and society in general needs. Within this broad unequal functioning is set the comment of the 1975 UNESCO meeting of Senior officials of the least Development countries relating to the 'mismatch between an educational strategy aiming mainly at quantitative expansion of the academic streams and an economic strategy, which until rather recently, focussed on expansion of the modern sector which cannot absorb most of the academically trained people searching for jobs.' Also to be included within this broad factory-filter functioning of the education system is the limited labour absorbing capacity of the organised sector (in India of

the 260 million labour force, 24 million are employed in the organised sector, and of the 5 million entering the work force every year, only 450,000 are absorbed in the factory sector), and the organised sector's lack of links to the massive unorganised sector (seen in years of agricultural bumper production not being followed by growth in the agro-industrial area). Furthermore the organised sector conditions and is conditioned by its educational linkages, and as a result the rural primary and secondary education system promotes the suction effect of the urban/industrial sector, drawing into its ambit the best and most talented of the rural society, at a time when the application of science and technology to the primary agriculture sector needs their services urgently.

At the international levels inequalities in education make their own contribution to economic inequalities. Even granting that the causal relation of education and income is a loose one, international educational inequalities are one of the factors which result in the kind of international division of labour which the 1976 ILO World Conference on Employment, Income Distribution and Social Progress highlights. A somewhat arresting typology resulting from analysis of this international inequality issue states : "An important set of questions can be asked in this connection : Is there an intimate correspondence between economic production and education production ? If economic growth is seen in terms of processing and processing is carried out by means of division of labour, involving unskilled labour, skilled labour, scientists and other professionals, then will the educational system have to turn out people roughly in the proportions induced by this division of labour ? If this is the case, both at the national and international level, does this mean that without basis structural change (*the new Instructional Economic Order*), we shall end up with the world divided into three types of countries : at the bottom countries with primary (basic) education doing extraction work and subsistence labour; in the middle countries up to the level of secondary (including vocational) education doing some simple processing; and at the third end top level, countries where everybody is a university graduate and working in high research intensive industries with large science and technology components?"

This typology is not as futuristic as it suggests. The brain drain from the Third World countries, which has been computed monetarily at somewhere between 25 to 50 per cent over and above the financial flows from the industrial countries in a kind of reverse foreign aid to the industrial countries is one expression

of international educational inequalities as between any two groups of countries reinforcing the science and technology of the industrial advanced countries and leaving the other groups with lower educational and scientific levels to further weaken their weak international competitiveness. Still another present reality is the migration of unskilled labour from Asia, North Africa and the Carribean to the industrialised north, labour who are employed in the many kinds of labour intensive sectors of both industrial processing units and the public and private welfare and service units. Thus international education inequalities reinforce international economic equalities.

Educational Policy and the Equality Objective : Some theoretical thoughts and suggestions :

As against the normative prescriptions for equaliity of educational opportunities set forth in Unesco's convention and Recommendation, and the actual inequitable functioning of national and international educational policies, some of the theoretical issues involved in educational policies aimed at equality might be set forth.

We might begin by putting out of the way the trickle down theory. The use of the cost benefit tool to formulate educational policies usually results in concentrating education on those who can most quickly acquire it and benefit themselves and society from it, as was the case with Unesco's Experimental literacy programme and India's farmers functional literacy programme, in each case education and training being offered to the relatively well *'educable' or motivated adults.* Though this may worsen distribution by making the relative well off farmers even better off and some adolescents and adults earn more than other adults, these inequalities, it is held, can be corrected by fiscal measures. All that I would say here is that India actually incorporated this theory and method in its Fifth Plan. and it did not even get off the ground because of the well known constraints.

Educational policy can be aimed at horizontal equality that is, treating persons in similar circumstances equally. This is the raison d'etre for free universal and primary education with provision for part time as well as full time learning and multi-point entries and exits wherein all children from all classes and all areas and regions of the country are given tuition free education, and in the case of children from poor families free text books, free uniforms and free midday meals. The same type of reasoning applies to non formal functional education for adult illiterates, particularly to the more deprived enclaves within them, namely women and some ethnic groups. Representative cross country and cross sectional studies

show that even the unreformed primary education raises incomes and to that extent *mitigates inquality*, as does adult literacy after a threshold point, which varies according to local conditions. This means educational allocations and expenditure to reformed primary and adult (functional literacy) education, which meet both the efficiency of investment and equity of benefit Criteria. It means also raising questions about the simplistic conclusions drawn from manpower studies which attempt to show that the transfer of national resources to expand primary education and introduce qualitative improvments in it increases urban poverty and leaves rural poverty unchanged.

Education policies can contribute to both educational and societal equality by maintaining its level of secondary and higher education expenditures (to avoid the dangers of developing a dependent and partial learning system), but making it fee based, with an extensive system of scholarship both as loans and grants—to students from the poorer sections of society. In addition to restructing this level in the direction of multidisciplinary problem oriented learning in place of present discipline based study, there is need to open this level to part time and non formal learning of various kinds. For instance the experience of one of the countries in this region in training village level workers by substituting 5 years of field work for the two year university degrees as the entrance qualification and the shortening of the course from 3 years to two years, both in terms of personal pay off (higher life time earnings of the participants) and social benefits (the participants coming from a lower farming group than that of the average agricultural university graduate) may have some important lessons.

Educational policies can contribute to equality by reviewing and re-fashioning the non existing links between education and employment. It has been observed that our present system moves the child and youth from the ghetto of study in the school to the ghetto of work in the farm or factory. A start would be for educational policy to introduce work at all levels of learning. Such work should be both productive and learning based. One way of ensuring this at all levels, which I have tried upto and including the university, is for academic credit to be given to the teacher and the student who are required in the curriculum to apply the classroom or library learning in a specific field to the related problem faced by the village or urban slum. This also had a feedback in making the content of learning problem oriented. A second aspect of this desegregation of learning and work is that the teaching community should be drawn from beyond the professional

teachers, from farmers, artisans, musicians, writers, as well as from many and any institution where a learning experience can be had. Finally the existing Third World tradition of dropping out of school to work at the home, farm or factory should be formalized and embodied in an educational employment policy which will mix education and employment in a number of different ways. Further while education cannot create employment (except for employment of teachers), it can avoid producing unemployable persons, and while it cannot counter unemployment where the demand for labour is lower than the supply, it can help to spread unemployment more equitably.

A long term suggestion to break this persistent and persisting contribution of educational policy to inequality is to do away with diplomas, degrees, and certificates and replace them by a simple record of learning attitudes and attainments throughout the students' career. This would replace the examination system which is part of the educational policies and system of all countries and which more than anything else contributes to inequality and personal and social snobbery and corruption. The education system should cease creating the system of educational out castes called failed candidates. Linked to this suggestion to abolish the present examination system and its false and futile system of certification is the removal of the relation between educational certification and employment prospects and potential. Just as the abolition of the examination system will help the learning system to develop culture free tests and evaluation of one's learning progress and achievements, it will also ensure that the employing agencies devise their own selection procedures, their examinations and their evaluation Education's egaliarian mandate should not be distorted by having to subserve this non-educational and in the present context anti-social demand to act as a factory or a filter, and not as a home for learning. The inequitable link between the formal education system and the small formal labour market, between the curriculum and the selection syndrome can then be broken and education contribute to learning and well being. Educational policies can also be aimed at vertical equality which involves compensating persons who are at the lower income deciles of society whom the World Bank computes at 700 millions and for whom a minimum or basic needs programme is provided, starting with primary and adult education, as the Indian Programme does. It also involves non-formal education playing its part in the restructing of society, so that the root causes of inequality are brought out into the open and fought by the people concerned. Education policy aimed at developing a non-

formal and formal learning programme which organizes the urban and rural poor to fight for their rights would be its most direct contribution to equality.

A significant normative pointer in all this is the education sector of the Bariloche Model which outlines the NIEO society as one pursuing equality, justice and self reliance in its social, national and international dimensions where the major-issue is not the limits to growth imposed by the physical environment on population grow.h (which will control itself when people's basic needs leading to the expansion of longevity are met) but the unequal distribution of power. Education policy in this new order will institutionalise both change and continuing and continuous education, change brought about by people and society and education, not only as remedial, compensatory and adaptive, but as a system of learning which will create the future as it decides the present through the participation of people. Education then will be a system of learning for the acquisition of the knowledge, information, capacity, attitudes and skills which participation calls for and is the disiderate for the desired change demanded. Educational policies which aim at schooling the pupil in the status quo—the unequal existing order—will be replaced and refashioned into a system which will give the pupil and adult a sense of liberation and the technical know how and skills to stand aside, to evaluate, to criticise, and help fashion a life and society with one's own resources in a spirit of self reliance, and in creative inter dependence, to fashion the just national and international order. The educational policy in such a system will aim at (a) a universal basic education system from age 6 till the person became educationally autonomous; (b) middle level and higher education involving learning and training in culture, science and technology, the critical minimum numbers being the 7 per cent of the people at the middle and 2 per cent at the higher level and (c) continuing adult education to all between ages 20 to 50 as well as compensatory education for illiterate adults all involving instruction upto 10 per cent of adult life, broken up into viable time modules. The Education Policy mandate to contribute to NIEO of equality and self reliance are clearly set forth in normative terms. It now requires the political will of governments and individual commitment, of us, the people and the teaching suggestion to make the normative future and positive present a reality.

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Piagetian Theory and the Development of Reasoning Through Science Teaching at Elementary School

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Science at Elementary School:

In this 'Sputnik' and 'Computer' age, there is hardly any need today to justify the importance of Science in the daily life of every person whether he is working in a remote small farm or in a sophisticated factory. Science is all pervasive, Modern society is Science based. This has led to the inclusion of Science compulsory upto class X in our new pattern of education.

Science is both a body of knowledge and a process. Science as a process, as a method is as important as, or perhaps more important than, science as a collection of facts, a body of knowledge (Vaidya, 1974).

"..... It is easy to pour out facts of science—the product—but it is difficult to teach students to solve problems scientifically....."

We are very much concerned with the Science and Mathematics teaching in our schools at the elementary stage. In our country although various science concepts are taught at elementary stage, but very little attention has been given by science-educators to the organization of science curriculum, acquisition of science and mathematics concepts and development of problem solving ability.

ı smission of knowledge from teacher to student is a fundamental process in our educational system. The teacher presents and the students master facts and information. We should also see the orderliness with which knowledge may be communicated. The students should be able to use the accumulated knowledge to the new learning situations. The students should be able to apply the appropriate reasoning strategies when required to solve new problems. (Reif et al., 1976).

We should ask ourselves what kinds of science experiences are appropriate at elementary stage. Are some experiences more important tha or are all

experiences equally valid or worthwhile? There should be rationale for making decision as to what science experiences be taught to the children at elementary stage. (Howe, 1975).

Science Teaching and Logical Thinking :

One of the important goals of science curriculum at the elementary stage is to foster logical thinking in children. Thus in elementary school science curriculum, more emphasis should be placed upon the development of logical thinking.

What kind of experiences are most likely to promote the growth of logical thinking? The work of Piaget is the only available guide to understanding the growth of logical thinking as a developmental process. The development of logical thinking has been studied extensively by Piaget (Inhelder and Piaget 1959). Piaget and his co-workers have shown that the ability for logical thinking grows gradually during childhood. There are certain stages of development that follow one on another, roughly in sequence, as a result of maturation and experience.

For the last fifteen years, there is growing awareness for using Piaget's work in the construction of Science Curriculum. Now the curriculum developers throughout the world are trying to use the Piaget's work in developmental psychology for the improvement of Science Curriculum at School level from Kinder garten to the high school stage. The various new curriculum projects such as "Australian Science Education Project" (ASEP) in Australia, "School council 5/13 project" in U. K.; "Science Curriculum Improvement Study" (SCIS); "Science a process approach" (SAPA); "Modular Activities Programme in Science in U.S.A." have been developed for teaching science at School level in which Piaget's ideas and findings are widely used in preparing these curricula.

Piagetian Theory :

In recent years, Piaget has become the most popular and most cited authority in educational literature, particularly in the field of science and mathematics.

Jean Piaget born in 1896 was very active, till his death very recently, in research-work and was one of the most outstanding persons who contributed to psychology and education in the 20th century. Piaget has observed and interacted with learners at all ages from birth to adulthood for the last 50 years and has come up with an approach for explaining the intellectual development and reasoning ability of the learner. Piaget has written many papers and books that describe his ideas on epistemology as it relates to human learning. His writings

include more than 1500 titles, and he continued to produce many new works every year till recently. Now-a-days we hardly find any research study on children's learning which has no reference to Piagetian theory. Piagetian theory has two important central ideas : (1) Children's intellectual capacity passes through a number of quality contrasting stages before adulthood. (2) A child's interaction with his environment plays a very significant role in his transition from one stage to the next stage. (Karplus et al. 1967)

Piagetian theory is receiving wide attention in various countries as a source of insight into questions such as : How do children acquire knowledge ? How can an awareness of children's thinking abilities and learning processes help teachers ?

Key Concepts in Piagetian Theory

Piaget did not set out to study cognitive development of individuals but rather the development of cognition (Maier 1969).

Piaget's ideas have been elaborated and applied to problems in education by various authors. Following are the key concepts in Piagetian theory concerning the development of reasoning : (Lawson & Renner 1975, Piaget 1959, Karplus 1977)

1. The Idea of Mental Structures

Mental structures are hypothesized "mental blueprints" that guide the organism's behaviour. As for example when a child of around five years of age is shown two sticks and asked which of the sticks is longer he will have no difficulty in pointing out the longer stick (stick A $>$ stick B). If the child is now shown stick B and stick C, he will respond by saying that stick B is longer (B$>$C). If he then is asked about the relative lengths of stick A and stick C, without being allowed to see them next to each other, he will be unable to tell which is longer. However, if the same child is given the task at round eight years of age, he will be able to conclude correctly that stick A must be longer than stick C. Evidently something has developed in the child's brain which enables him to make the correct deduction. Piaget calls that something a mental structure, a hypothesized structure which organizes the environment for him so that he can function successfully with it.

2. Intellectual Development

The combination of growth and learning is usually thought of as development. Mental structures provide the basis for our pattern of reasoning which determine how and what we think and how we interact with our environment.

The construction of mental structure is a fundamental process in intellectual development.

3. The Process of Self Regulation

Contradiction to present behaviour or at least awareness that it is not entirely adequate is the first step towards the construction of new mental structures. Piaget calls the process of constructing new mental structures as "Self Regulation."

This process is described as unfolding in alternating phases, beginning with an assimilation phase. An individual's mental structures assimilate a situation, that is, they give it meaning. The meaning is determined by present mental structure. Sometimes this meaning may be inappropriate and it produces, "disequilibrium," "Cognitive Conflict" or "Contradiction." In other words, the child's present mental structures are found inadequate and must be altered. By providing some hints and continued investigations, the child may alter or accommodate his inadequate mental structure. The new structure thus developed is tried. In this way, the child builds new mental structures, which adapt to new situations and this is caled "accommodation."

The entire process of construction and reconstruction of new mental structures, which adapt to new situations is called the self regulation or equilibration. The process of self-regulation underlies all intellectual development. Piaget has insisted that the total process of growth requires an equilibration of accommodation and assimilation.

4. Stages of Intellectual Development

Piaget views development as an inherent, unalterable, evolutionary process. Within this developmental process he locates a series of distinct developmental phases and subphases. Each distinct subphase within any one of his major developmental phases, has been specified by Piaget and his co-workers as a sub-stage of development. Piaget has divided the periods of cognitive development into the four major developmental stages. Piaget's developmental stages serve as a Convenient handle for a presentation of cognitive development. Each stage reflects a range of organizational patterns which occur in a definite sequence within an approximate age span (of that stage) in the continuum of development. The completion of one stage provides a self regulation, as well as the beginning of assimilation, for a new stage.

The stage concept is necessarily linked to the idea of mental structure. We mean by a stage in the development of anything is necessarily a set of

relations prevailing at that time. Perhaps Piaget's most notable and significant contribution to contemporary educational thought and practice has been his characterization of specific intellectual developmental stages of children. (Inhelder and Piaget, 1959). Each only when its predecessor has been properly attained, and that if any early stage is incomplete, later stage will be defective. If Piaget is correct, it becomes imperative for educators to understand these stages of development. Each stage suggests the potential capacity and probably level of behaviour. They provide a possible key for adapting instruction to the learner's capabilities. They further suggest type of activities that could promote intellectual development.

(i) Sensory Motor Stage

r ing this period which lasts for about 6 to 18 months, the child acquires such practical knowledge as the fact that objects continue to exist even when they are out of view.

(ii) Pre-operational Stage

This stage persists upto seven years of age. The children develop their o form mental symbols which stand for or represent the things or events, even in the absence of the latter. The child exhibits extreme egocentricism, centers his attention only upon particular aspects of given objects, events or situations, reasons transductively, and does not demonstrate conservation reasoning. In other words, the child's thinking is very rigid. The major achievement during this stage is the acquisition of language. The explanations may be in terms which are consistent with the child's experiences, and may or may not be consistent with reality.

(iii) Concrete Operational Stage

During this period which ranges from 7 years to 11 years of age, the children show less rigidity. Concrete operations are defined as mentally internaliable and reversible systems of thought based on manipulation of classes, relations, and quantities of objects. The child can now perform what Piaget calls mental experiments; he can assimilate data from a concrete experience and arrange and rearrange them in his head. The concrete operational thinkers can correctly comprehend relationship among concrete mental objects. In this stage the operations involved are to relate directly to objects and not yet to verbally stated hypotheses (Piaget 1973). During this period, the child gains in precision in comparing and contrasting objects of "concrete reality," but he can manipulate relations between the real objects only when they are present.

(iv) Formal Operational Stage :

According to Piaget, the formal operational thought develops between 11 years to 15 years of age. It is the highest level in the development of mental structure. Formal operational thinkers are capable of reasoning with verbal elements alone and there is no direct need for objects (Piaget, 1973).

5. Learning :

Piaget conceives learning as a function of development. Learning cannot explain development, while stages of development can in part explain learning. For learning theories, however, development is perceived either as an independent process, a part of the primary process of learning, or as a function of learning. (Maier, 1969),

Planning of Science Teaching at Elementary Stage

Brady (1970) emphasised that for successful teaching, the teachers should have an awareness of pupils' level of comprehension so that the teaching is meaningful. Vaidya (1977, 1978) has summarised the basic characteristics and abilities of children at different stages of mental development. These are of great significance for predicting the educational implications of children at different stages of development. The Piagetian theory tells us that each student must be engaged in a subject problem situation, which is appropriate to his or her present stage of development (Arons, 1976, Renner, 1977, Griffiths, 1976, Larkin, 1976, Karplus, 1977).

The Elementary school children are able to reach up to the concrete operational stage (age level upto 10-11 years). A few examples, which we may illustrate by working with the children, will serve to illuminate the outline mentioned for the stages of intellectual development.

At concrete operational stage, the child is able to reason by using operations such as classification. Serial ordering and conservation.

Classifying in a process through which one realizes similarities among things which are different. Classificatory behaviour is preliminary and necessary for effective conceptualization to take place (Lowery, L. F. and Allen, I. R. 1969).

It will enable for the development of the reasoning about classes and class-membership. When some geometrical figures, say triangles and rectangles of two different sizes and colours (blue and yellow) are given, the students at pre-operational stage are unable to classify them while the students at concrete operational level will be able to classify them according to size, shape and colour.

Serial ordering is a fundamental capability that underlies many intellectual functions. It is necessarily involved in comprehending the concept of number (Piaget 1965). It also plays a significant role in the acquisition and use of language skills since words, sentences and paragraphs must be sequenced in particular ways before communication occurs. With regard to elementary school science, serial ordering is used in logical operations (if, then) and in cause effect relationships (Schafter and Byers, 1975, Smith and Padilla, 1977).

At the elementary school stage, the children also acquire the concept of conservation, the knowledge that the volume, weight of a substance remains unchanged regardless of changes in shape or form or arrangement of the parts. The importance of this understanding was pointed out by Piaget (1965), who noted that 'every notion whether it be scientific or merely a matter of commonsense, presupposes a set of principles of conservation, either explicit or implicit..... Conservation is a necessary condition for all rational activitity'. The acquisition of the concept of conservation is an important milestone in the development of logical thinking, which is a necessary component of the reasoning at the various situations. The children at the stage of concrete operations can use conservation logic. That is, they recognise that an amount or number remains the same if nothing is added or removed, even though the appearance presented changes. Piaget's view of conservation reasoning as a pre-requisite for rational thought suggests that a strong relationship should exist between a student's ability to demonstrate conservation reasoning and his performance on subject matter examinations (Lawson and Nordland, 1977).

During adolescence they acquire further abilities for logical thought.

Howe (1975) emphasized that the goal of science education in early childhood should be to guide children for developing the logical thinking—Finding ways to bring about these experiences by suitably modifying the environment so that *we may discover how to promote the first beginnings of logical thinking,*

We should also explore the various strategies for the development of reasoning at the elementary school.

Teachers Training for Science Teaching at Elementary School level

Successful implementation of any programme depends heavily on the teachers' ability to make proper use of them. A programme should be prepared for pre-service training of elementary school teachers in the science subject matter and the reasoning ability. The programme should be organised by the faculty with

sufficiently strong science backgrounds. In-service programmes should also be organised for elementary and secondary school teachers and the teachers-educators. The science educators who are having background of both the content and pedagogy should take initiative and prepare the curriculum/instructional materials for the pre-service training of teachers at elementry level as well as for the in-service programme for the elementary school science teachers. It is very much surprising to note that even uptil now there is not even a single unit on 'Piagetian theory' in the syllabus of B. Ed. and M. Ed. of various Indian Universities Regional College, of Education are taking a lead in this direction and some units on Piagetian theory have been included in B. Ed. Elementary and M. Ed. Elementary Courses.

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Mathematics at the Secondary School Stage

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Mathematics, as one of the tool subjects in a school curricula, is taught to educate students in the subject and is basic to the understanding of various other subjects like statistics, economics, geography, biology, chemistry, physics, and other social sciences. It is a tool for the housewife, businessman and the scientist. Mathmatics education in the cultural aspect equips the students with the aesthetic satisfaction accruing from an understanding of logical structure, clear thinking and precision of statement. It is, therefore, important that such emphasis is given to mathematics and its education in schools at all levels.

The National Council of Educational Research and Training, in the 'Frame Work of the Curriculum for the ten-year School' has emphasized the teaching of science and mathematics for productivity and rational outlook. It has been stipulated that the curriculum should have science and mathematics as an integral part of school education upto class X and that the teaching of science and mathematics should be upgraded and the curriculum continually renewed in order to : give our children modern knowledge, develop their curiosity, teach them scientific methods of inquiry, prepare them for competant participation in a changing society and culture, increasingly dependent on a rational outlook, and leading to better utilization of science at least the advances of computer technology, statistical methods and mathematical symbolism into everyday affairs will no longer be misunderstood.

The Indian Education Commission (1964-66) recommended among other things, transformation in school education, which has led to the adoption of 'the New Educational Pattern of 10 + 2 + 3' in India, already laid down in the National Policy Resolution on Education. In its deliberations on the place of mathematics,

the commission urged all those who are directly charged with the duty of mathematics education to see to it that India is placed on the world map of Mathematics The report states :

> "The new revolution in science based on cybernetics and automation which is likely to be in full swing by the end of the century, (to be understood as the 19th century), may have an impact on man even greater than anything that has happened so far in human history. For these and other reasons, it is important that deliberate effort is made to place India on the world map of Mathematics within the next two decades or so."

This statement of the Education Commission calls for an all-round improvement in the teaching and learning of mathematics. 'One of the understading characteristics of scientific culture' the commission states, 'is quantification. Mathematics, therefore, assumes a prominent position in modern education. Apart from its role in the growth of the physical science it is now playing an increasingly important part in the development of the biological sciences. The advent of automation and cybernetics in this century makes the beginning of the new scientific industrial revolution and makes it all the more imperative that special attention be devoted to the study of mathematics.'

The secondary school mathematics is the basic structure on which the whole superstructure of the realm of mathematics rests. It is, therefore, desirable that proper foundation in the knowledge of the subject should be laid at the secondary school stage. Mathematics used to be feared by young men and women perhaps because of its complicated nature or structure. Contributing to the fear were the methods applied in its teaching.

According to the editorial comment of the first journal of Mathematics Education (India) of March 1967 the science of mathematics has made tremendous changes and has brought out revolutions in the world of industry and economics. "The teaching of mathematics in Indian schools and colleges," the Journal points out "is yet to be modernized." We are following the pattern of our teaching mathematics in schools and colleges evolved in the nineteenth century and early part of the twentieth century. A big gap lies between our teaching and the performance of the subject in the advanced countries of the world. Much time and talent is wasted due to lack of appeciation of the up-to-date methods to be applied

to the teaching of the subject." The editorial comment suggests that exchange of ideas among the teachers of the subject seems to be essentially required for evolving out an adequate pattern on which syllabus of mathematics should be chalked out to bring our learners of mathematics in touch with the up-to-date trends in the teaching of the subject.

It becomes a common wish that a concerted effort should be made (a) to validate the percentage of failures in mathematics at the secondary level in comparison with other secondary school subjects, and (b) to survey the root causes of the percentage of failures. No doubt, this is not the time to embark on a problem like this, which has been in existence for more than a century. Since the change of time, conditions responsible for the occurrance of this phenomenon also change, it, therefore, stands to reason that a rethinking be made about (a) the classroom teaching of mathematics (b) learning of mathematics with special reference to the students, the teachers and the school, and (c) evaluation and examination in mathematics education.

The causes of failure in the high school have been found by Watts (1969) as sub-normal intelligence, change of residence, family conflict, emotional disturbances, and unfavourable home conditions of the students. Fernig (1975) in an inquiry into failure in a school and the social background of the students has mentioned that (a) the student's home (b) economic status of his parents, and (c) the kind of neighbourhood he lives in affect the student's chances of benefiting fully from the education he/she receives. Tripathi (1960) has established that the factor of intelligence is the basis for educational backwardness. On the other hand Mishra (1960) found that in spite of good intelligence, a pupil's school achievement is low because of his home environment not being conducive. Intellectual ability, sex, socio-economic background, emotional disturbances, method of instruction, the context in which materials are presented, are reported by Weaver (1965) as the contributing factors for the success or failure in mathematics. Verma (1971) found a low academic aptitude, a slow rate of emotional and social development, and lack of parental interest in child's education, as factors partially influential for the child's failure.

Gupta (1972) established that low intelligence, personality, mal-adjustment, poor achievement motivation, poor socio-economic status, anxiety, bad school teaching and environmental situations are the main contributing factors behind the large percentage of failures at the higher secondary examination of the Board of Secondary Education, Rajasthan.

The current changing philosophy and psychology of school education require that a student be given the opportunity to advance as fast as he can or as slowly as he must. Education is a continuous process in which the teacher guides the progress of his pupil at every stage after ascertaining the rate, direction, and extent of previous development, pupil's personal problems and needs, both at school and at home. Thus, the teacher is in a position to effectively understand and evaluate (a) the extent to which the diverse course objectives, are being attained and (b) the factors which stand in a pupil's way that deter his expected rate of progress.

It is, therefore, a matter for investigation as to why many of our students, who have the capacity to do better, do not make their mark. This investigation has attempted to find an answer to this question. The purpose of this study, therefore, is to derive the main contributory factors behind large percentage of failures in mathematics at the secondary examination of the Board of Secondary Education, Rajasthan.

Sample : The investigation was confined to 76 students who failed in mathematics (compulsory or optional) at the Secondary Examination, 1976 of the Board of Secondary Education, Rajasthan, Ajmer. These students after failing have taken re-admission in the various thirteen institutions in Ajmer city. Some of them (39) have taken re-admission in the same class, while others failing only in one subject, have been promoted to the higher class i. e. XI class.

Source of Data

The data for this investigation was collected from the following sources. Board of Secondary Education, Rajasthan, Ajmer, Reports of the Examiners, School Records from all the institutions, students, parents of the students, Mathematics Teachers and the Heads of the Institutions in the sample.

Tools

Questionnaires for : students, parents, mathematics teachers, and Heads of the Institutions were used as tools to collect the data.

Results

The Heads of the Institutions, the Mathematics Teachers, the Parents and the Students themselves provided information which after careful analysis is presented in the following table :

TABLE I

Main Causes of Failure in Mathematics as Reported by Heads, Teachers, Parents and Students

S. No.	Heads N=13	Mathematics Teachers N=13	Parents N = 63	Students N=76
1.	16.7% stated that students were irregular in their classes	15.4% reported on students irregularity, and 7.7% said students come late	1.6% said students were frequently sick	75% of the students had a total attendance for the examination year of less than 75% which the Board needs before a student is admitted to Board Examination
2.	8.3% said that students do not do homework	46.2% said students do not complete home assignment and 38.5% said students do not come with completed home assignment	3.2% said that the students do not do calculations at home	4.0% said they never finished home assignments
3.	8.3% said students are careless towards Mathmatics	61.5% said students pay less attention to mathematics	1.6% said students are not attentive in the class	28.9% said they spent about four hours for studies, and 35.5% said they devoted 30 minutes for the study of mathematics every day
4.	8.3% said that the students lack intelligence	46.2% said students lack intelligence	3.2% said the students are weak in mathematics	4.0% said they were weak in mathematics
5.	16.7% reported that students lack workmanship etc. in studies	7.7% reported less practice in mathematics by the students	3.2% said that the students had not time for studies	2.6% said they gave no fixed time to self studies but usually more than 6 hours
6.	33.3% said that students are not interested in mathematics		1.6% said the students are not interested in mathematics	23.6% never borrowed books on mathematics and 7.9% reported to have borrowed twice a year

S No.	Heads N=13	Mathematics Teachers N=13
7.	8.3% reported that students came with poor background of mathematics, and 16.7% said foundation in mathematics is weak	7.7% reported poor background in mathematics of the students
8.	16.7% reported that students lack aptitude in mathematics	7.7% reported that the students lack aptitude in mathematics
9.	—	46.2% said that the students did not complete home assignment independently
10.	—	7.7% reported poor facilities in the school
11.	16.7% said the students lacked sustained concentration in their studies	—
12.	—	—
13.	—	—
14.	8.3% reported teachers were not regular in class	46.2% reported to have missed classes because of sickness or other reasons
15.	—	Average teaching load being 31 periods per week

Parents N = 63	Students N = 76
1.6% reported that they were taught Algebra only	—
3.2% reported that the students are weak/poor tn mathematics	—
3.2% reported lack of guidance	78.9% reported no private tutor hired for them at home.
—	2.6% reported no facilities for studies
11.1% reported that the students complained of poor retention of what is taught	5.2% reported that they could not remember formulae, and 1.3% said they had poor understanding of mathematics
1.6% reported that the students changed subjects	1.3% reported to have changed subjects
—	1.3% reported that they could not finish answering all the questions as required
1.6% reported that students complained to them because of teachers' irregularity in class	1.3% dislike teachers who are not punctual for teaching, but students liked teachers who are dutyminded
—	—

16.	8.3% said teachers transferred without replacement	
17.	—	30.7% said that the teachers had too much teaching load
18.	—	—
19.	8.3% said that the students came from poor families	—
20.	8.3% said that students came from families with poor background	7.7% reported that the students came from families with poor background
21.	8.3% reported that the students do not do homework	—

1.6% reported that students complained to them about irregularity of teachers	
20.5% reported that students devoted two hours for games and other curriculur activites	students reported 35 games and co-curricular activities of liking
—	54 0% reported that they had no separate room for studies
—	66.1% reported that their parents were without monthly income and 17.1% said their parents had from nil to Rs. 400 as income p.m.
27% employed with the Railways	37.6% have parents practically unemployed
3.2% reported that there is no time for study for the students. 61.9% said that the students helped them in their work and in their job	31.6% hightest figure reported to have devoted two hours daily for helping the parents compared with 30 minutes which they devoted for the study of mathematics

Conclusions

On the basis of the results presented in the above table, the main contributory causes of failure in mathematics are identified as :

1. Late coming to and irregular attendance in classes by the students
2. Non-completion of home assignment by the students
3. Paying less attention to Mathematics, not attentive in the class and carelessness in completing the assignments
4. Lack of intelligence
5. Inadequate preparation, insufficient study habits and inability to generalise nformation
6. Lack of interest in mathematics
7. Poor foundation in mathematics in lower classes
8. Lack of aptitude and weakness in mathematics
9. No proper guide or tutor to help, direct or supervise the studies at home
10. No appropriate facilities for studies at home
11. Inadequate mastery of fundamental terminology, concepts and skills, and difficulty in remembering formulae
12. Change of subjects in the middle of the examination year (session)
13. Insufficient time given for doing the mathematics paper in the examination
14. Teachers missing classes
15. Teachers having too much teaching load
16. Transfer of teachers during the sesssion
17. Too many extra-curricular or co-curricular activities in the school
18. Crowd in a family
19. Low Economic condition of the families
20. Poor home environment
21. More engagement in helping parents in their jobs or in domestic duties than in studies

Suggestions

On the basis of the findings in this study the following are the suggestions

1. A long term approach to revise curriculum
2. To bring reforms in the system of examinations
3. To bring reduction in the size of a class where there is over-crowding
4. To improve on programme of guidance for students in schools
5. To have extra class activities

6. Work with community
7. To develop equality for opportunity
8. To extend pre-schooling education also in rural areas
9. To have increased provision for special education
10. To educate parents
11. Examination question paper setters to set relevant questions i. e. within the framework of syllabus
12. To inform students in advance about changes, reforms or inclusion of new topics in an examination.

Besides these suggestions there are several other general suggestions to offer to research scholars:

1. The parents, the teachers and the heads of the institutions should co-operate together and there should be constant meetings of the three.
2. Programme of guidance for students in schools and at home should be organized.
3. There should be adequate and efficient staff for the primary and middle class students.
4. Interest and positive attitude towards mathematics should be developed among the students.
5. The teaching of mathematics should be related to everyday application of the subject.
6. The mathematics teachers should be re-oriented to new methods of evaluation.

The 'New Educational Pattern in India,' i. e. 10+2+3, and with it the Government of India's plan of Action on Examination Reform, has gone a long way, specifically for this study in the implementation of some of needed suggestions to improve the teaching and learning of mathematics. Steps have already been taken towards :

(a) revision of mathematics curriculum;
(b) reforms in the system of examination; and
(c) reduction in the size of classes where there is over-crowding.

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Attitudinal Differences Between Creative and Non-Creative Teachers

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The Problem

Popularity of Creative Students with their teachers had been a point of curiosity for many early research workers in the field of creativity. Getzels and Jackson (1962) asked teachers to rate their students on the degree to which they enjoyed having them in the class. The result indicated that the high IQ pupils were rated as more desirable than the average pupils but the high creatives were not. Torrance (1963), working with children in the early school years, arrived at similar conclusions. He reported that "two of the most consistent findings are for the high IQ pupils to be better known by their teachers and to be considered as more desirable pupils than the highly creative subjects". Hasan and Butcher (1966) replicated the Getzels-Jackson study with Scottish children and found that the mean ratings for both the 'high verbal reasoning quotient' and the 'high on creativity and verbal reasoning quotient' groups were significantly more favourable than the mean for the 'high creativity' group. As such, the authors remarked that "Getzel's and Jackson's findings of relatively low approval for creative children thus receives some confirmation".

A resent trend in the field of creativity research seems to be to compare the attitudes of creative teachers with those of the non-creatives towards their students. Halpin et al. (1973), for instance, attempted to test the hypothesis that the more creative teacher would also be more humanistic in her pupil control orientation. Using Torrance Tests of Creative Thinking, What Kind of Person Are You ? Test, and the Pupil Control Ideology Form on 19 male and 80 female subjects, they found that the data supported the hypothesis that the more creative teacher is less authoritarian. Reporting the details of their findings, the investi-

gators write : "the more creative college students majoring in education tend to think that students will be self-disciplining rather than disciplined in a contex of close, personal teacher-student relationships and mutual friendship and respect. They view learning and behaviour not moralistically but in socio-psychological terms and feel that two way communication channels between teacher and pupils should be open". About the less creative potential teachers tested in their study they report that "they are imbued with pessimism and watchful mistrust and are apt to stereotype students in terms of appearance, behaviour, and parents' social status. Their relationships with students are likely to be on an impersonal basis, and they view behaviour in moralistic terms instead of attempting to understand it".

Purpose of the Study

The present study is a further attempt in the above direction. The Minnesota Teacher Attitude Inventory (Cook et al, n. d.) is designed, as the manual of this instrument indicates, "to measure those attitudes of a teacher which predict how well he will get along with pupils in interpersonal relationships, and indirectly how well satisfied he will be with teaching as a vocation". Realising the importance of such attitudes in the teaching-learning situation, the investigator thought it worthwhile to see whether the creative and non-creative student-teachers agreed with or differed from each other with respect to these attitudes.

Hypothesis

The hypothesis formulated for empirical verification in this study was as follows : 'Creative student-teachers are significantly higher than the non-creative student-teachers on mean score for teacher attitude'.

The Sample

The sample for this study consisted of two groups of student-teachers drawn from the total population of B. Ed. (Bachelor of Education) Students in the city of Lucknow. There were 522 students enrolled in the six institutions running B. Ed. classes in this city out of which only 442 could be available to administer the Torrance Tests of Creative Thinking (Torrance, 1966) as others were not attending their classes due to different reasons. From these 442, the two groups were drawn on the basis of total creativity scores obtained by each subject as follows :—

1. The creative Group : These were the subjects in the top 20 percent on creativity Measures (N=89).

2. The Non-Creative Group : These were the subjects in the bottom 20 percent on creativity measures (N = 89).

The Tools

As indicated above, Torrance Tests of Creative Thinking (TTCT) were used to identify creative and non-creative subjects. Since studies (e. g. Basu and Jawa, 1973) have shown that the verbal and figural forms of the TTCT are not the measures of the same ability but they measure rather different kinds of creative abilities, the investigator decided to use items from both the forms so as to get as complete a picture of the subjects' creative abilities as possible. Thus the test items used in this study included (1) Product Improvement (2) Unusual Uses, (3) Unusual Questions, (4) Just Suppose from the verbal form (5) Picture Completion and (6) Lines from the figural form (Torrance, 1966).

In order to assess the attitude of his creative and non-creative subjects the investigator employed the Minnesota Teacher Attitude Inventory (MTAI), Form A (Cook et al, n. d.). There are 150 statements in this inventory to which the subjects are to respond on a five point scale ranging from 'strongly disagree' to 'strongly agree'.

Treatment of Data

Although the hypothesis of this study concerned only the overall teacher attitude score, for theoretical interest and to cross-check the result, the data were analysed in four ways : Firstly, the means, S.D.S. and the t-ratio for the two groups were computed on the basis of the total positive (plus) score obtained by each subject. Since according to the rationale of the inventory these scores represent the attitude of 'superior teachers' (who are defined as those having 'desired type' of teacher-pupil relations and are expected to rank at the upper end of the scale), these scores are termed in this study as superior teachers' attitude (STA) scores. It was expected that the creative group would excel the non-creative on these scores. Secondly, the means, S.D.S. and the t-ratio for the two groups were worked out on the basis of the total negative (minus) score obtained by each subject. Since these scores represent the attitude of 'inferior teachers' (who are defined as those having 'undesired type' of teacher-pupil relations and are expected to rank at the lower end of the scale), these scores are termed in this study as

1. The procedure for computing total creativity score for a subject included conversion of raw scores for the different dimensions of creativity, such as fluency, flexibility, originality etc. into T-Scores and then adding up these standard scores as recommended by Torrance (1966, p. 71).

inferior teachers' attitude (ITA) scores. It was hoped that the non-creative group would surpass the creative group on these scores. Thirdly, the means, S.D.S. and the t-ratio for the two groups were computed on the basis of the total number of zero scores obtained by each subject. Since these scores represent neither positive nor negative weights these are termed as neutral teachers' attitude (NTA) scores. In view of the earlier research finding that creative persons are characterised by independent thinking and judgement (Torrance, 1969), it was expected that these subjects would leave less number of items undecided and as such they were to be comparatively lower on these scores. Finally, in keeping with the hypothesis of this study, the means, S.D.S. and the t-ratio for the two groups were calculated on the basis of the overall teacher attitude (OTA) score (which is 'right minus wrong' score) for each individual. As is evident from the hypothesis, it was anticipated that the mean score of the creative group would be significantly higher than that of the non-creative group.

Results and Discussion

The results are shown in table—1. It is clear that none of the t-ratios reached a level where the differences between the two groups could be considered statistically significant. Nevertheless, the directions of these differences are as expected. To put it more specifically, the mean scores of the creative group for 'superior' as well as 'overall' teacher attitude (STA and OTA) are higher than those of the non-creative group. The scores of the latter group are higher than the former's for 'inferior' as well as 'neutral' teacher attitude (ITA and NTA). However, the differences between the two groups are more pronounced for STA and OTA scores than for ITA and NTA scores.

That the creative student-teachers scored higher than the non-creatives for STA and OTA is in close agreement with the study by Halpin et al (1973) in which they found that the 'creative potential teachers' were progressive in their pupil control ideologies while the 'less creative potential teachers' were conservative or authoritarian. Indeed, this finding is of considerable importance for it suggests, in keeping with the rationale of the inventory, that the high scorer is likely "to maintain a state of harmonious relations with his pupils characterized by mutual affection and sympathetic understanding (Cook et al)." The complimentary view for the low scorer is that of one "who attempts to dominate the classroom. He may be successful and rule with an iron hand, creating an atmosphere of tension, fear and submission; or he may be unsuccessful and become nervous, fearful and

TABLE—1

Significance of Difference Between Means of Attitude Scores for Creative and Non-Creative Groups.

Variable	Creative group (N=89)	Non-Creative group (=87*)	t-ratio
1. STA—Mean	52.02	49.51	1.52
S. D.	11.56	10.50	
SEM	1.22	1.12	
2. ITA—Mean	81.83	82.52	0.35
S. D.	11.00	15.18	
SEM	1.16	1.62	
3. NTA—Mean	16.14	16.87	0.74
S. D.	6.10	6.95	
SEM	0.64	0.74	
4. OTA—Mean	—29.03	—33.37	1.28
S. D.	23.01	22.25	
SEM	2.43	2.38	

*Two subjects were omitted from the sample of 89 non-creatives because they failed to furnish completed data on the MTAI.

distraught in a classroom characterized by frustration, restlessness, inattention, lack of respect and numerous disciplinary problems (Ibid)." Empirical evidence is also available to show that the teachers "whose educational attitudes are progressive tend to think behaviours considered important for a productive, creative personality should be encouraged and teachers whose educational attitudes are traditional tend to think behaviours considered not important for creativity should be encouraged (Ray, 1974)." As such, the implication of this finding for teacher education programmes particularly in the selection of candidates for this course is quite obvious.

An important point emerging from the data of this study, deserves to be noted. As shown in the table, both groups of student-teachers secured negative overall teacher attitude (OTA) mean scores. Why so? Among the possible explanations the most plausible would appear to be that the assumptions underlying the concept of 'inferior' teacher in this inventory (MTAI) are based upon the free and open society of the United States where this instrument was developed and

standardized rather than the more rigid and conservative social set up of India. A section of the inventory, for example, describes the 'Inferior Teacher' as one who "adheres rigidly to conventional middle class standards. There is a tendency to be on the lookout for and condemn, reject and punish anyone who violates conventional rules. All misbehaviour is serious, to be dealt with severely, never to be passed off as a joke .. .. There is also an exaggerated concern with sex, "children have no business asking questions about sex." ("It is better for a child to be bashful than to be boy or girl crazy.") ..... He frequently has a submissive attitude toward authorities over him and a overbearing attitude toward subordinates. ("No child should rebel against authority," Aggressive Children require the most attention"). No wonder, then, if both of our groups generally tended to favour similar responses rather than different ones as in the more liberal or freer society of U.S.A.

The above analysis seems not only to explain the negative OTA scores obtained by both the groups tested in this study but also it appears to explain the lack of a statistically significant difference between the attitude scores of the two groups. Creativity, after all, is the product of culture. It cannot grow and develop in an individual without proper assistance from the social and cultural background. Different societies have their own social and cultural norms which are reflected in the attitudes and actions of their members. India has her own characteristics in these matters. And if, as discussed above, the items of the MTAI are such as to fail to discriminate between the 'superior' and 'inferior' teachers according to the Indian social norm, the likelihood of the failure of this instrument to discriminate between the creative and non-creative subjects in the Indian context also cannot be ruled out. Indeed, this contention is backed by studies which have shown that creativity and progressive attitude go hand in hand (Halpin et al, 1973; Ray, 1974). However, unless some independent studies on these points confirm these hunches, it would be pre-mature to hold anything conclusive in this regard at this stage of our inquiry.

Thus, to conclude, the findings of this study do not confirm the hypothesis formulated by the investigator regarding the attitude of creative and non-creative teachers. The observed differences between the two groups, although in favour of the creative group as postulated, are not statistically significant.

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Level of Aspiration in Relation to Other Factors

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In recent years the aspect of psychological investigation, denoted by the term 'PERSONALITY' has been growing rapidly. The nature of personality has been variously explained along different dimensions by psychologists. Different personality theories have been put forward wherein attempts have been made to explain human behaviour, which is either a directed action or an emotional expression. One of the important aspects of personality which has aroused considerable interest and experimentation is the so called 'LEVEL OF ASPIRATION.' The notion of 'level of aspiration' is invoked in reference to the goal-striving behaviour of an individual when he is presented with a task whose outcome can be measured on an achievement scale.

The concept of 'Level of Aspiration' was introduced by Dembo (1931) while the first experiment in area was conducted by Hoppe (1930). The term 'Anspruchsniveau' was first introduced into the experimental literature in the work of Lewin (1935). However, it gained little importance until the appearance of his 'Dynamic Theory of Personality' (1935). The term was translated as 'Level of Aspiration' meaning thereby the expected level of future performance which an individual thinks to achieve in a familiar task. In the recent experimental literature even in its strictest meaning, this concept represents one of the most interesting personality veriables that has ever been uncovered. Frank (1941) defined level of aspiration operationally as "the level of future performance in a familiar task which an individual knowing his level of past performance in that task, explicitly undertakes to reach." This level of aspiration stands for a goal for which an individual strives.

An individual arranges his aspiration towards his possible attainments in a hierarchy of difficulty that he is likely to face. His level of aspiration is described

to be the most attractive orientation on the continuum of difficulty in relation to the goal he aspires to attain. Therefore, it is quite obvious that a person's level of aspiration is his immediate goal. Something almost within reach, a possible success at hand. The level set is a compromise between the desire for success and the desire to avoid failure, the first pushing the level up and the second pulling it down. But there is an important thing which everybody should have in his mind that there is no feeling of failure if the level is set too high or too low. For instance a high jumper who fails to clear the bar at ten feet does not experience failure since it is too high, similarly if a jumper clears the bar at three feet, he does not experience success since it is too low. Thus the level of aspiration we set falls within the range where we feel we might succeed or fail.

Purpose of the Study

The main aim of writing this paper is to explain and explore the moderating influences of some variables (Locality, sex, caste, risk taking ability and locus of control) on the level of aspiration of the pupils. Before getting the results of the investigation (Ph. D. Project) the author has made an attempt to predict the influence of the said variables on the level of aspiration of students of Higher Secondary Schools. This paper is developed purely on theoretical lines. So it may be treated as an hypothesis. The author is trying to prove the hypothesis based on empirical data that he would develop in a later paper.

According to Maslow, a man is not only a bundle of remorses and repressions, but also a collection of dreams and hopes for the future. He strives to grow, to improve and to become more capable. Moreover, every individual has his own needs which may be psychological, biological or physiological. For the satisfaction of these needs a person dreams, thinks and aspires more and more. These thinkings and aspirations differ from individual to individual and are subject to modifications. Being a modifiable variable, level of aspiration may change in accordance with the real situations through proper treatment and therefore helps a person to escape from the cause of frustration. It has been predicted theoretically, that good students tend to keep their level of aspiration slightly above their past performances whereas poor students tend to show, relative to their ability, excessively high or excessively low level of aspiration. In other words, the poor students have not learnt to be 'realistic' in evaluating success or failure for setting their goals. Apart from these things the level of aspiration may be influenced by many other factors which need to be tested.

Level of Aspiration and Locality

In all censuses throughout the world this dichotomy of rural and urban areas is recognised and the data are generally presented for the rural and urban areas separately as rural and urban social settings differ a lot. The effect of independent variables on the level of aspiration would be predicted in relation to a particular task given to students of all categories. If we see the effect of urban and rural localities on the level of aspiration of the students, it may be predicted that the urban students would prefer to keep their level of aspiration slightly above their past performances. The rural students however would prefer to keep their level of aspiration slightly below their past performances with rare exceptions. However, the students from the most affluent families would always show a consistent level since they are brought up in an atmosphere where they have learnt to be realistic in evaluating success or failure for setting their goals. These things are generally not found in villages where the students are not even aware of the consequences of their doings. For instance majority of the students in the rural areas do fail in making predictions about their results. But it does not necessarily mean that all the urban students do make exact predictions. However, they can deal better than rural students.

Level of Aspiration and Sex

The difference in the level of aspiration of the two sexes is important especially at the higher secondary stage when children are passing through the impressionable age. If we see the effect of sex on the level of aspiration of the students it may be predicted that boys would prefer to keep their level of aspiration above past achievements. Similarly girls would also prefer to keep their level of aspiration above their past performances. The same thing would be implied even if a comparison is made between the boys and girls of urban and rural localities. Though it is the general impression among larger section of the community that girls are bound to accept the decisions of their parents, it has a direct or indirect effect on their decision making abilities. However, at their adolescent age, there would be no discrimination in their level of aspiration.

Level of Aspiration and Caste

In our country, caste has been the sole basis of stratification. If we look at the Indian Society, it is clear that the whole population is divided into numerous castes and sub-castes. The current position of the classification of castes in the broadest aspect shows the existence of two sections viz. scheduled caste and non-

scheduled caste. The predictions have been made keeping in view this broad classification. In case of scheduled caste students it is predicted that there would not be much fluctuation in their levels of aspiration and they would always prefer to keep their levels of aspiration below their past performances. It may be because of their lack of confidence. The non-scheduled caste students, however, would give contradictory results. The same thing would be implied in the case of scheduled and non-scheduled caste students—boys and girls of urban and rural localities also.

Level of Aspiration and Risk Taking Ability

This is the most important aspect of the personality which involves in every walk of life. It differs from individual to individual. There are some creatures who do like to take more risk in order to attain maximum quantity. Contrary to this there are a few who do not like to take risk at all. They may get satisfaction with the minimum output. In level of aspiration a little or more risk is certainly involved while setting the next level of aspiration. It is predicted that a student with high risk taking abilities would always prefer to keep his level of aspiration a little bit higher than his past performance whereas a student with low risk taking ability would prefer to keep his level of aspiration either below or almost equal to his past performance.

Level of Aspiration and Locus of Control

Locus of control is an expectancy variable that one has over the reinforcements that follow his behaviour. At one extreme (internal) the individual thinks of himself as being responsible for his own behaviour. At the other extreme (external) the individual sees others or luck or circumstances beyond his control as responsible for his behaviour. The differences in the level of aspiration of externally and internally controlled persons are therefore important as the latter blames himself for his failure and accepts praise as deserved for his triumphs. The external person on the other hand will not blame himself for his failure and will not think that his success is caused by his own efforts. If we predict about the behaviour consistency it could be said that internally controlled persons would be having consistent levels of aspiration whereas in case of externally controlled persons, there would be ups and downs in their levels of aspiration.

The work of course needs a thorough investigation which may help some researchers to start exploration further in this field. The different variables that have been picked up by the author should be substantiated with the survey results.

This work is no doubt a product of the author's keen observation and intintive analysis, and he has strong desire and hopes to make this study a fruitful one. In the course of this study deviations from the original line are likely to occur. However, they will strengthen the will of the author as well as other researchers to make exhaustive studies at a later stage. The relationship between different variables that have been presented in the paper should be the main focus of study or attack if any. Only then it would be possible to clear the doubts and problems on this issue and lead the hypothesis to stand as a theory.

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Selective Counselling Techniques—Effect of Intermediary Target Behaviours—and Academic Performance of Under-achievers

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Almost all educators, psychologists and counsellors share a common concern for the underachievers. The Education Commission (1964-66) observed that the problem of academic underachievement is of a great concern to a developing country like India. Since underachievement, as a psychological concept, refers to a loss of potential man-power. no society can remain indifferent to it.

Studies of the effect of treatment on the academic performance of underachievers have been inconclusive. Mitchell, White and Piatkowska (1975) reviewed 63 studies of group and individual treatment for school and tertiary underachievers. The percentage of groups indicating positive treatment effects is consistently low overall, although there is some variation in outcome between student' categories, and between group and individual methods for tertiary subjects. Not only that proper treatments of underachievers have never been tried, but the researchers also have failed to show agreement on methods which may be employed for identifying underachievers themselves. Some authors have presented some contributing factors for the predominantly low level of teatment effectiveness i.e.

1. Lack of precision and refinement in posing treatment questions.
2. Failure to sample and control most classes of independent variables (client, counsellors and techniques).
3. Inadequate treatment rationales, which led to inappropriate selection of treatment targets.
4. Use of inadequate criteria to assess treatment outcomes.
5. Predominance of inadequate research designs.

So the need is of

1. a comprehensive behavioural analysis of under-achievers,
2. more appropriate selection and precise specification of treatment goals according to empirically based rationales,
3. the organization and selection of appropriate treatment techniques according to specific goals,
4. greater refinement and control in posing experimental questions and formulating designs, and
5. more stringent methods of assessing change.

So the available evidence indicates that treatment procedures of counselling methods used to improve academic performance have a low success rate, which is frequently associated with both the inappropriate selection and vague description of student behaviours to be treated as targets.

Researches have also been conducted in India and abroad to investigate the various behaviours which affect achievement. The relevant literature indicates that many social, economic and psychological variables are related to the under-achievement syndrome; a definite encompassing description has not been forthcoming. However, Mitchell and Piatkowska (1973) have tried to group these variables under two heads, Intellective and Non-intellective.

Variables reviewed under intellective characteristics comprised study skills (Raygor, 1959 ; Baker and Madell, 1965 ; Entwistle, 1960; Entwistle and Entwistle, 1970; Haslam and Brown, 1968; Srivastava, 1967, study habits (Raplh et al, 1966; Holtzman and Brown, 1968; McKeachie, 1961; Jain, 1967; Pal and Saxena, 1970), academic application (De Sena, 1964; Topkin, 1967; Holtzman and Brown, 1968; Oakland, 1969; Barton et al, 1972), academic productivity, (Lum, 1960; Shaw and Grubb, 1958; Holland, 1959; Oakland, 1969), academic and vocational goal setting, (Brown et al, 1954; Hopkins et al, 1958; Posthuma and Navran, 1970; Gowan, 1957; Merrill and Murphy, 1959; Williams, 1967; Lunneborg and Lunneborg, 1968).

Variables reviewed under non-intellective characteristics are personality traits in terms of general anxiety, neuroticism and introversion/extraversion (Roth & Meyersburg, 1963; Ram Kumar, 1969; Sinha, 1965; Sharma, 1968; Brown, 1954; Entwistle and Entwistle, 1970; Entwistle and Wilson, 1970; Elliot, 1972; Vidhu, 1968), text anxiety (Biggs, 1971; Albert and Haber, 1960; Kastenbaum and Weigner, 1970; Saroson, 1971; Spielberger, 1966), self-evaluation (Mehta, 1968; Haynes and

Kanfer, 1971), interpersonal relationships (Faunce, 1968; Alexander, et al, 1971; Miller, 1970), environmental stressors (Wilkinson, 1969), academic interests (Carmical, 1964; Krug, 1959; Reitz, 1970; Miller, 1970; Farley and Troug, 1971).

The effectiveness of treatment will depend both on the relevance of target behaviours to the goal of improved academic performance and on the appropriateness of the techniques applied to the correction of the target behaviour. What then are the crucial behaviours that must be modified in order to change underachievers into normal achievers? Several writers have reviewed the literature in attempt to answer this question. (Burgess, 1953; Gebhart, 1957; Goldberg, 1965; Koranrich, 1965; Morrow, 1970; Taylor, 1964; Willington and Willington, 1965.) However, all have limitations for example, some of these authors confined their reviews in the main to the personality characteristics of under-achievers (Gebhart, 1957). Some to academic behaviours and behaviour-defects (Morrow, 1970) and some Taylor (1964) to the personality traits characteristic of discrepant achievement.

In order to enable selection of treatment targets appropriate to the goal of improved academic performance, it is essential to examine evidence for the relationships of all variables studied with academic performance Mitchell and Piatkowska (1974) reviewed 224 studies to formulate well grounded hypotheses as to which variables maintain (or cause) under-achievement and hence facilitate the selection of appropriate target behaviours for treatment. They reported that (1) Test anxiety (2) Academic anxiety (Intellectual) (3) Study habits (4) Study skills and (5) Academic application (Non-Intellective) have direct relevance for treatment.

So, it is assumed that academic performance would improve following the treatment of certain target behaviours. Emphasis is placed on treatment targets for particular individuals rather than on a collective common denominator of targets as so often happens with group programmes It was, however, not implied that every target necessarily applies to every instance of underachievement, nor that all targets are equally important for any one underachiever.

Therefore, a hierarchy of target behaviours helps in establishing specific goals and which ultimately leads to seeking of treatment techniques. It has become evident that more than one type of technique is necessary to facilitate behavioural change. A recent group treatment study (Mitchell and Ng, 1972) showed that multimodel treatment of three specific targets in the appropriate sequence (exam-anxiety followed by study habits and skills) had the highest probability of success.

Recently, Mitchell and Piatkowska (1974 b) recommended a similar treatment strategy for major targets isolated in their review of the literature. The steps in this strategy were to (1) Clarify client's academic and vocational goals prior to enrolment (2) Contract client to commit himself to his academic courses (3) Arrange removal of extreme stressors in study conditions (4) Alleviate excessive test-anxiety (5) Re-train the client in study skills and (6) habits.

Researchers have tried to manipulate various treatment techniques to facilitate behavioural change in the desired direction. Systematic desensitization and Relaxation training have been demonstrated to be an effective technique for the treatment of a wide range of problematic non-intellectual behaviours (Cooke, 1966; Lang and Laxovik, 1963; Lazarus, 1961; Paul, 1969). One area in which both systematic desensitization and relaxation training procedures have led to successful outcomes has been the treatment of test-anxiety and academic anxiety. The effectiveness of systematic desensitization has received impressive support (Emery and Krumboltz, 1967; Johnson and Sechrest, 1968; Kathan Stranger and Cherry, 1966; Suinn, 1968; Donner, 1968). It was found that when test and academic anxious students were exposed to desensitization, there was a reduction in anxiety and an improvement in grade point average. These desensitization procedures were based on the reciprocal inhibition principle proposed by Wolpe (1958, 1961). He suggests that if a response which inhibits anxiety (such as relaxation) can be made to occur in the presence of anxiety-evoking stimuli, it will weaken the bond between these stimuli and anxiety. Recently it has been consistently demonstrated that systematic desensitization is an effective treatment for test-anxiety. (Anton, 1976; Geer and Hurst, 1976; Joseph, Melnick and Russell, 1976; Mitchell and Ingham, 1970; Mitchell and Ng, 1972; Mitchell, Hall and Piatkowska, 1975; Allen, 1971; Cohen, 1969; Dawley and Wenrich, 1973; Freeling and Shemberg, 1970; Garlington and Cotler, 1968; Ihli and Garlingham, 1969; Mann and Rosenthal, 1969; Taylor, 1971; Cornish and Dilley, 1973; Laxer, Quarter, Kooman and Walker, 1969).

The evidence regarding the effect of systematic desensitization and relaxation training of test and academic anxiety on academic achievement is less clear. Improved grades were found in 5 studies that compared desensitization to a non-treatment control group (Allen, 1971; Donner and Guerney, 1969; Johnson and Schrest, 1969; Katahnetal, 1966; McManus, 1971; and Ng, 1972) but no differences were found in 8 studies. A closer look at the 6 desensitization studies in which improvement in grades was found, revealed that four out of these studies

employed some form of counselling, in addition to or in combination with desensitization. It is interesting to note that in all 8 studies that failed to find any improvements in grades the treatment consisted of desensitization only.

Only two studies that used desensitization without study or test related counselling found improvement in grades. (Donner and Guerney, 1969 : Johnson and Schrest, 1968). Thus, in the research literature the evidence of the effects of desensitization on grades is equivocal (Anton, 1976).

Study habits, attitudes and study skills are related to achievement. Bedner and Weinberg (1970) suggested that Re-educative training is the appropriate conselling technique for the improvement of study habits, which ultimately raised the grade-point average of under-achievers. Similarly it is shown by research evidences that structured group discussion could be used to remove the stressors in study conditions, course commitment, goal-setting, accademic applications, and study skills (Gilbreath 1967, 1968).

The evidences in the fore-running paras show that more than one type of technique is necessary to facilitate behavioural change. However, use of a cluster of techniques assumes that the client has all the symptoms for which the counselling techniques have been used. But it is not always so, it is possible that a few underachievers may be suffering from test-anxiety or academic anxiety and for some the cause of underachievement may be poor study habits and skills and hence the appropriate technique should be used for each target behaviour.

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