CHAPTER I

INTRODUCTION
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CHAPTER-I
INTRODUCTION

INTRODUCTION

From radio to television and now from television to interactive multimedia with internet, innovations in the world of technology are making great impact on education at a breathtaking pace. Information and happenings around the world are received within very short span of time. Teaching and learning are undergoing a sea change and the traditional educational system everywhere.

After decades of neglect, education is now increasingly being considered as an imperative development. "The first educational loan was offered by the World Bank in 1963, 15 years after its inception. Until then, education was never viewed as an ‘investment’ with tangible economic benefits, the way other investments were assessed. Countries like Japan and Germany proved to the world that investments in education could indeed yield rich dividends. Cost-benefit analysis applied to educational projects shows that returns on investing in education are at least as high as returns from most other types of investments by the Bank in developing countries”.

India and China account for more than half of the world’s illiterates which increased from 760 million in 1970 to over 960 million in 1985. The year 2000 will see 920 million illiterates in the developing world.

The rapidly growing population and explosion of knowledge are not only affecting the pattern of human life but also inflicting their full impact on education. The explosion of population and knowledge have raised the serious question of both quantity and quality of education

Educationists are of the opinion that the educational problems relating to quantity and quality could be tackled by the development of educational technology.
Over the years, the average age and time spent by students in school has also increased. The system of 10 years of schooling has been replaced first by 11 years and then by 12 years of primary and secondary schools at a tremendous cost. Public spending per student is typically 50-100 times higher for secondary education and several times higher than secondary education for education at the tertiary level.

United Nation's Publication quotes a study (1992):- Children in India spent more time in school compared to their counterparts in the industrialized countries, but achieved only 48% as much in reading and about 50% in science. This is due to our reluctance to move beyond traditional modes of teaching and apathy towards harnessing the electronic media, whose potential remains unharvested.

"Modern communication technologies have the potential to bypass several stages and sequences in the process of development encountered in earlier decades. Both the constraints of time and distance at once become manageable. In order to avoid structural dualism, modern educational technology must reach out to the most distant areas and the most deprived sections of beneficiaries simultaneously with the area of comparative affluence and ready availability". (NPE, 1986)

Instructional design, as a domain of educational technology, responds to the complexities which characterize the instructional episode and its role is related to the teaching-learning process and strategies as an introduction to the field of educational technology.

All along, the main emphasis was on teacher and teaching whereas the modern psychological theories have given sufficient evidence to prove that education becomes meaningful and relevant when it is learner-centred and when the entire system revolves around the central pivot which is the learner.

In recent years, there has been a rapid development of educational technology at all levels of education, paving way for the extension of educational facilities and upgrading instruction.
WHAT IS EDUCATION?

Schofield (1976) observes that modern philosophers have abandoned the attempt to define education. There is only uncertainty and the criteria for its application. First, we should understand the basic or central criteria of education. The three criteria in education are:

1. Education implies transmission of what is worthwhile to those who become committed to it.
2. Education involves knowledge and understanding and some kind of cognitive perspective which are not inert.
3. Education may not accept some procedures of transmission that the learners do not accept willingly and voluntarily.

The criteria refer to the matter, the manner and cognitive perspectives of education, the matter means subject matter taught to students, the manner means the process of teaching the matter to students. According to Poters (1976), "participation in shared experience of exploring a common world". Cognition means acquiring the knowledge, understanding and application related to subject and integrating the acquired knowledge into the student's personal view of the world.

Education is a transaction and it requires the teacher and a student for the transaction to take place. There cannot be any coercion or manipulation in educational transaction. In this transaction, knowledge, understanding and application result from teaching and practicing.

Teaching and instructing are not simply passing on information, the content, the subject matter as if it were absolute truth. Therefore teaching and instructing should be considered as a process of critically analysing subject knowledge and developing new perspectives based upon individual experiences and knowledge. Teaching and instructing are the integrating and balancing of content and process issues. According to Gavrison (1981), "Education is a special kind of learning concerned with the integration of differing and seemingly opposing views and ideas; not the fragmentation of learning that leads to narrow ideological and dogmatic views of life and living".
In education, feedback implies the role alteration of the teacher and the student. And this role alteration, in the words of Rowntree (1974), "The educational terms would imply that students act not simply as receivers and processors of teacher-messages but also as generators and senders of message (about themselves, their ideas, their perceptions, their experiences) which the teacher values and allows to change his personal perspective on the student, the subject under discussion, his own feelings, or some other feature of the situation".

In education, teacher cannot transmit knowledge directly to students. It has to be induced in the student. The teacher communicates his personal knowledge and this personal knowledge of the source becomes information when communicated. It has to be induced in the student to become the student’s personal knowledge and the two way communication, that is, the teacher to student and the student to teacher, is complete. Therefore knowledge is induced through voluntary participation of the student. “Knowledge depends upon what one does with study materials and how it is integrated into existing cognitive structure through interaction with others. As Naisbitt (1985) observed, “We are drowning in information but starved for knowledge”. According to Garrison (1987), “To help individuals acquire knowledge for awareness, educators must be more beyond the promise of communication and information technology and begin to harness the power of technology to induce knowledge”.

Finally, what is education? Education is a good planning and correct application of basic principles of information and instruction in simple way. It facilitates understanding. What we require in education is not simply information but an integrative process of information and instruction.

EDUCATIONAL TECHNOLOGY

Educational technology refers to the application of scientific knowledge for learning, and utilization of the products of technology to improve and facilitate efficient learning situations, adopting scientific principles to evolve efficient and objective evaluation procedures, are therefore the resultants of having a systems approach to education.
A common fallacy that may be committed in the understanding of educational technology is the application of a new body of knowledge to make the academic process efficient and effective, ignoring the other aspects of the process of education such as the administration, management and finance. Infact, the modern principles of management by objectives which are being adopted in the administration and management of educational instruction are also the outcome of educational technology.

There is some disagreement within the educational profession as to what is meant by the expression, 'Education or Instructional Technology'. It is sometimes too narrowly thought of as confined to hardware.

For example, telemedia, recording media, computers, teaching machines represent to many educators the sum total of instructional technology. Thus discussion of educational technology inevitably centers around the so called hardware.

No doubt, educational technology means the presentation of hardware such as Closed Circuit Television (CCTV), language laboratories, projection equipments and computers which are of great significance as far as they make a limited combination for improving the effectiveness and efficiency of learning and teaching.

Educational technologies are meant to the attainment of educational objectives and the knowledge of correct usage of these hardware will bring about a change in the quality of learning to a significant extent. It is also, the integration of hardware materials, system of organisation and new roles for teachers and administrators.

In India, the term educational technology began to be used during 1960. The Indian Association for Educational Technology, formerly, called the Indian Association for Programmed Learning had organised the first All India Conference in 1968 on the theme “Towards Educational Technology”. The decade 1970 may be called the educational technology decade because during this period, the research and practice in educational technology began to prosper. The centre for educational technology in the National Council of Educational Research
and Training (NCERT) was established in 1973. Sometimes after, educational technology cells began to be formed.

These educational technologies have shifted their emphasis from the use of individual media and focussed more on a problem-oriented approach to design the learning experiences. In this approach, the media are selected on the basis of their appropriateness for the achievement of educational objectives specified for the course/study. Also, there are sub-technologies like psychological testing, the development of new hardware and creation of whole system of materials. The general emphasis, however, is on the sub-technologies most closely related to instruction.

**Concept of Educational Technology**

There are two views about the concept of educational technology. According to the first school of thought, educational technology means the media born of the communication revolution which can be used for instructional purposes alone or in combination with the teacher, textbook and blackboard. These media may include radio, television, films, overhead projectors, programmed instruction, computers, multimedia, multimedia projector and other items of hardware and software.

According to the second school of thought, educational technology goes beyond any particular machine, medium or device in this sense. Educational Technology means a systematic way of designing, implementation and evaluating the total system of learning and teaching of specific objectives, based on research in human learning and communication and employing a combination of human and non-human media to make the instructional system optionally effective.

Thus the educational technology, produces revolution in education in and out of school. When applied properly, it can make education more sensitive in various ways through which people learn. It can also help in adopting instruction to the individual and encourage designing of learning materials which are suited to different learning groups in terms of styles, levels, and purposes.
Educationists' View

National Council for Educational Technology (1967) defined Educational Technology as the development, application and evaluation of systems, techniques and aids to improve the process of learning.

Glenn Seaborg (1969), “Let the teachers make the universities of the world the workshops of human ingenuity and let the tools fashioned there serve the highest purpose of man”.

According to Kenneth Richmond (1970), Educational Technology has another aspect beyond a wholesale extensive usage of audiovisual aids – push button classrooms, language laboratories, CCTV, overhead projectors, concept films and programmed learning material.

The term “technology” was defined by Erickson (1970) as the tools of one’s work which can be conceived of in the very narrow sense of hardware and machine or in the broad sense of theory and knowledge.

The Commission on Definition and Terminology of the Department of Audiovisual Instruction of the NEA (Erickson, 1970) defined technology as systematic body of facts and principles related to a comprehensive, practical and useful end.

Freeman (1979), defined the term “Educational Technology” as a systematic approach to the solution of problems in education.

Levie (1975), defined the Educational Technology as the tools and techniques used in general learning situations.

According to Saka noto (1980), “Educational Technology is the creation of learning environments which are flexible, dynamic and capable of responding to a wide variety of needs and learning styles through the combination of human and non-human Media” and also defined as “The art of using tools and machines, or the new media and technological systems employed for instructional purpose”.

“When we consider the notion of educational technology, we are confronted with the astonishing fact that even though the problem of teaching is as old as humankind itself, instructional design is a relatively new field of study in comparison to others.” (Schoot, 1992).
"Educational Technology is a systematic way of designing, implementing and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication and employing a combination of human and non-human resources to bring about more effective instruction". (The Commission on Instructional Technology, USA, 1982)

"Educational Technology is the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training. In the absence of scientifically established principles, educational technology implements techniques of empirical testing to improve learning situations". (The National Centre For Programmed Learning, UK, 1971).

The Fontanal Dictionary of Modern Thought, UK (1978) explains, "The use of apparatus and machines like films, televisions, etc. extend the teacher's range of effectiveness. In addition, computers have provided a powerful aid over a wide range. Its supporters argue that it is intended as an aid and not a substitute for teaching, and that in any case children are going to grow up in a technological techniques".

The Educational Technology Division of OECD (1976) defines Educational Technology as "it has to be seen as part of a persistent and complex endeavour of bringing pupils, teachers and technical means together in an effective way. Educational Technology is not a bag of mechanical tricks, but the organised design and implementation of learning systems, taking advantages of but not expecting miracles from modern communication methods, visual-aids, classroom organisation and teaching methods."

The Terminology Committee of the Association for Educational Communication and Technology (1972) defined the Educational Technology as a field involved in the facilitation of human learning through the systematic identification, development, organization and utilization of a full range of learning resources and through the management of these process. It includes, but is not limited to the development of instructional systems, the identification of existing resources, the delivery of resources to learners and the management of these processes and the people who perform them."
The Technical Working Group for Educational Technology in Asia under APEID (1975) defines Educational Technology as, “a means as well as service to effect and facilitate better and more productive learning systems. It is an integral part of both formal and non-formal education”.

The UNESCO (1969) defines Educational Technology as, “a communication process resulting from the adoption of the scientific method to the behavioural science of teaching. It is a communication process which may or may not require the use of extending media (i.e. broadcasting, television, film and other audio – visual media).

Leith (1982) has given a comprehensive definition for educational technology as, “Educational Technology is the systematic application of scientific knowledge about teaching, learning and conditions of learning to improve the efficiency of teaching and learning. In the absence of scientifically established principles, educational technology implements techniques of empirical testing to improve learning situations.”

Hadden’s (1990) functional definition explains it as, “that branch of educational theory and practice which is concerned primarily with the design and use of message which control the learning process.”

According to Mathis (1985), “Educational Technology as an applied or practical study which aims at maximizing educational effect by controlling such relevant facts as educational purpose, educational content, teaching material, methods, educational environment, conduct of students, behaviour of instructors and interrelations between students and instructors”.

According to Mitra (1976), “Educational Technology can be conceived as a science of techniques and methods by which educational goals could be realized.”

Kulkarni (1966) defines, “Educational Technology as the application of laws as well as recent discoveries of science and technology to the process of education.”
Davis (1976) defines that Educational Technology is concerned with the problems of education and training context, and it is characterized by the disciplined and systematic approach to the organization of resources for learning.

According to Gagne (1979), "Educational Technology can be understood as meaning the development of a set of systematic techniques and accompanying practical knowledge for designing, testing and operating schools as educational systems."

From the definitions mentioned above, the vital role of Educational Technology is to enhance both efficiency and effectiveness of teaching-learning process. This is achieved by the employment of a systems approach. The systems approach is a sub-concept of technology of education because it is interrelated with educational technology.

From the above definitions, we can sum up the characteristics of Educational Technology in the following statements:

- It decreases the time needed to achieve particular objectives.
- It augments the capacity of individual teacher as well as learner.
- It facilitates learning by control of environment.
- It makes the process effective with reference to the attainment of educational objectives i.e., degree of mastery and quality of learning.
- It emphasizes designing and measuring instruments for testing learning outcomes.
- It stresses upon developing methods and techniques for effective learning.
- It is an application of scientific knowledge for education and training, and
- It effects the economics in financial cost.

In conclusion, we can say that, Educational Technology is the development, application and evaluation of systems, techniques and aids in the filed of learning as well as teaching."
COMPUTERS IN EDUCATION

Bernard Shaw once said, “The reasonable man adapts himself to the world, the unreasonable man attempts to adapt the world to himself. Therefore all progress depends on the unreasonable man”, Science and Technology, like the unreasonable man, frequently and often violently, move to change the world. The next great disturbance we expect from science relates to mind and behaviour and it will come from the application of behavioural science, mainly in education, more than from theoretical advance in it.

Actually, mass development of technologies of communication and, so, of education led to the loosening of centralized control of men’s minds. When the great computer systems, data banks, and networks are in operation, there should be greater freedom of local content choice and even production than in the present case with packaged books or tapes or movies. Teacher will continue to prepare the messages, however complex or universal the medium for their presentation.

Dickelman (1991) and Sharples (1987) described some aspects required of a system to be used easily by learners, including such features as a simple start-up procedure, menu driven options, system status, clarity, simple resetting to a default states, and an easily accessible help component.

When programmed instruction made a stumbling entry, even when the potential of computer programming appeared, the emphasis remained on the teacher-witness the terms teaching machines and computer aided instruction. But, of course, the learner, not the teacher, is the proper centre of focus, the teacher—except as he helps set the proper centre of focus; the teacher—except as he helps set the goals of education, which occurs essentially only at the highest reaches of the school or college or university is just a learning aid to the student. Education do prepare curriculum content and teachers do give their change more than policing and drill; they after important emotional interactions, especially at lower grades, and intellectual interactions, especially at higher levels. But the former duties tend to overwhelm the latter and, if technology could take over the lesser jobs, fewer and more gifted students would be able to do better the more creative jobs. Computer systems have reached a stage where rote drill, individualized tutoring,
even socratic dialogue is possible between machine and user; when such systems become widely used, the teacher will no longer be essential in most phases of the actual learning process—indeed, the organised school itself may undergo metamorphoses or disappear.

The present computer and new generations continue to arrive every 2.5 to 3 years can handle dozens of terminals simultaneously responding promptly and individually to the specific need and performance of each user.

**COMPUTER ASSISTED INSTRUCTION (CAI)**

Computer Assisted Instruction (CAI) is rapidly penetrating schools, exploring with special vocational and professional groups, and flirting with total communities. Although hardware must and will improve in performance and, even more, in cost characteristics, the real problems today are in software, in content material and to a lesser extent programmers for computer performance, and in organisation for effective use.

Robert (1988) prefers computers in instructional efforts over other technical forms: “The computer is active—unlike television which can only present to the student, the computer can only work with the student. It is individualized, interactive and diagnostic and through networking and conferencing the computer is out reaching”.

Subramanian (1991) states, “microcomputer’s applications are all pervading like hypothetical ether medium. One very important aspect of education at schools and colleges is to supply students with the skills which industry and the outside world requires. In recent years microcomputers have been installed in most of the educational institutions. The computer can provide learning enhancement in certain areas of physics teaching. The style of teaching is also bound to undergo radical changes with the advent of computer technology in the realm of education. The inclusion of computers in our curriculum is an inevitable progress towards our cherished objective of learner centered education.”

Brockett and Hiemstra (1991) note, “having access to such a system can add immensely to the power an educator has in meeting the needs of adult
learners. Self-directed learners may, in fact, benefit the most from access to increased information and improved retrieval systems, assuming that they have access to the systems and know how to use them.”

Laurence (1972) says that Computer Assisted Instruction (CAI) is a natural outgrowth of the applications of the principles of the programmed learning. We know that the main objective of programmed learning is to provide individualized instruction to meet the special needs of some individual learners. To accomplish this objective, it needs an efficient and flexible device that can store a massive amount of organized information and use a select portion to meet the needs of individual learners. The computer is one of such needs of individual learners.

CORRELATES OF ACHIEVEMENT

Today the world is competitive in all aspects especially in education more than other fields related to human beings. One’s personal/individual progress depends upon the quality and quantity of performance. Every parent in India and other part of the world desire that his child should achieve the high level of performance. For this achievement, today’s students, teachers, schools and the whole educational system are under pressure. The present system of education, therefore, pivots around the academic achievement of students and also various useful outcomes expected from the system. Thus the teachers and schools, in their scholastic endeavours, utilized a lot of time and effort of their students to achieve that high level of performance desired by their parents.

To children, teaching – learning process starts from their mother’s womb itself. Onwards achievements also start. This achievement is caused, promoted and affected by different personal and social variables arising out of the present or self or others or home or school or society or subject of study or system of education and so on. Formal stream of education, welcomes a child by around five or six years of age itself. This childhood or primary education probably be in the stream till it attains adulthood, i.e., higher secondary education. It is the most important period for students because in this period they are related to various development stages. These stages are filled with different barriers and they have
to overcome these barriers by their personality and other psychological factors like attitude, anxiety, etc.

The achievement of a student in each subject may not be uniform. A specific set of mental operations are required for each subject of study, sharing something common with other subjects. Memory power is one of the bases of the achievement. The achievement may vary according to one’s interest, learning ability and other psychological factors.

In education, researchers raised several questions about the influence of scholastic or academic achievement.

They are;

- What type(s) of personality and related factors promote achievement in students?
- How far do the different type(s) of personality and related factors contribute towards academic achievements?

But the researches hypothesised several factors in effective learning. Finally the researchers have come out with varied results but the research about this is a continuous one. All over the world, educational researches are still seeking a breakthrough in elucidating certain psychological variables/factors such as personality and their type(s), intelligence, achievement, motivation, attitude, anxiety, etc., which are some major correlates of academic achievement in different subjects.

**Personality**

Personality is the complex one to define. It is also defined as “a dynamic and integrating nucleus, which determines and directs the functioning of all phenomena like emotions, intelligence, memory, learning, etc. One of the common definitions of personality is that it is the “total quality of an individual”. It is defined as, “the inner organisation or integration of cognition, conation and affectivity”. Personality test / inventories are intended to measure the covert aspects and also to some extent the overt behaviour. The projective techniques are meant to reveal the covert and subtle aspects. The personality inventories are self rating questionnaires intended to assess the overt behaviours.
Some of the personality tests inventories are being used frequently. Myers-Briggs Types Indicator is one of the most commonly and frequently used personality tests.

**SCIENCE EDUCATION IN SCHOOL CURRICULUM**

Science is one of the curricular areas of the general education in secondary education. The aim of teaching science at this stage is primarily directed towards problem-solving and decision-making through the learning of key concepts which cut across all the disciplines of science. From this, science is defined as the acquiring of knowledge about the things that are in the universe and also defined as systematized knowledge. The content of science should be organized on the basis of two guideline viz. contemporary science and the learning ability of the pupil. It should reflect that science is a continuing human endeavor and that it is international in character and method.

The objectives of science education as laid down in the NPE 1986 are to develop in the child well-defined abilities and values such as spirit of inquiry, creativity, objectivity, course of question and aesthetic sensibility. Learning of science will be oriented to ensure that the learner discovers the relationship of science with health, agriculture, industry and other aspects of daily life.

After the +2 stage in school education, students become eligible to compete for professional courses. Therefore, it is at this stage that students are to be exposed to the structure of individual subject disciplines such as Physics, Chemistry, Biology, Mathematics, etc. the content of each subject has to be taken into account along with the recent developments in the subject, in as much as they are relevant to the +2 stage, providing all the needed foundation in each subject so that the needs of the different professional courses and the other areas of their further education can be meted out. The National Curricular Framework for Higher Secondary Education reflects the increasing importance of knowledge in various subjects like physics, as well as the essential competencies which cut across all subject areas.
Objectives of Teaching Physics at Higher Secondary Stage

The main objectives stated in the Gazette/Teacher's Handbook published by the Government of Tamilnadu are as follows:

- To develop critical thinking.
- To stimulate the pupils to acquire scientific knowledge.
- To develop abilities such as collecting data, limitations, classifying, etc.
- To spell out the uses, benefits, and limitations of science like physics, chemistry, biology.
- To develop an interest in modern technologies.
- To understand complicated topics in physics like modern physics and electronics.
- To acquire scientific knowledge in modern physics and electronics.
- To develop the habits of concentration, self-reliance and discovery.
- To develop the powers of thinking and reasoning.
- To develop the powers of logical thinking.
- To enable the students to solve the scientific problems of the day-to-day life.

The instructional objectives of physics as stated by Srivastava, and Shovrie (1989) are as follows:

- To acquire the knowledge of terms, facts, concepts, definitions, fundamental laws, principles and processes in the field of Physics.
- To develop an understanding of terms, facts, concepts, definitions, fundamental laws, principles and processes in the field of Physics.
- To apply the knowledge and understanding Physics to unfamiliar situations.
- To develop skill in the practical aspects of handling apparatus, recording observations and drawing diagrams, graphs etc.
- To appreciate the contributions of Physics to Scientific and technological developments and human happiness.
- To develop interest in the world of Physical Science.
- To develop scientific attitude through the study of Physical Sciences.
Physics in Education

Education Commission (1964-66) stated that science education, especially physics education, must become an integral part of school education and ultimately some study of physics should become a part of all courses in the humanities and social science. The quality of physics teaching is to be developed considerably so as to achieve its proper objectives and purposes viz. to understand basic principles and to develop problem-solving. The commission observed that the pursuit of mere material affluence and power would be subordinated to that of higher values and fulfilment of the need of individual.

Educational philosophy and psychology are sciences and teaching is an art as William James observed long ago, “Sciences never generate arts directly out of themselves, an intermediary inventive mind must make the application by use of its originality”.

According to NPE point of view, the objectives of science, like physics, teaching itself should be inculcation of a scientific temper. Emphasis should be not on mere acquisition of scientific knowledge but use of scientific method as a tool of acquiring knowledge. “HOW” is as important as “WHAT”.

The aim of teaching science, especially physics, at +2 stage is primarily directed towards facts, principles, problem-solving and decision-making through the learning of key concepts which cut across all the disciplines of Physics. The content of Physics should be organised on the basis of two guidelines, namely, contemporary Physics is a continuing human endeavour and that is international in character and method.

The root of the objectives of the Physics is to develop in the student well-defined abilities and values such as spirit of inquiry, creativity, courage to question and aesthetic sensibility. Learning of Physics will be oriented to ensure that the learners to discover the relationship of Physics with health, agriculture, industry and other aspects of daily life.

In Physics education, over the last fifty years so many changes have taken place in teaching, learning, teaching-aids, media, etc., particularly in the role and responsibility of the teacher vis-à-vis learners through media and learners vis-à-vis media. The shift in emphasis in the arena from “teaching” to
"learning" through media has known varying shades of combinations of the activities that go simultaneously to achieve the goals of enterprise. It is now very clear that one cannot achieve the ends and hence, a mix appears to be the answer. The research is on for the mix. The growing concern for evolving appropriate strategies has become all the more, in the light of the expanding frontiers of knowledge coupled with the changing needs and competencies of student power; the mere ability to absorb information will not get the students anywhere.

During the last two decades many new approaches of teaching and learning through media have been developed, tested, modified and adapted to different kinds of learning modes. Thus the new approach of learning as well as teaching of Physics becomes more interesting by the use of media, particularly computer as multimedia.

**TAXONOMY OF EDUCATIONAL OBJECTIVES**

Teaching seems to stem from the capacity to teach differing learners and to create rich and multi-dimensional environment for them. (Singh, 1990).

Taneja (1989) in his paper, "Romance of Teaching" has rightly stated that the wearer only knows where the shoe pinches.

NPE (1986) envisaged teachers to devise appropriate methods of communication and activities relevant to the needs and capacities of the concern of the community.

National Society for the Study of Education in its year book (1947) published the objectives under these categories as follows:-

1. Functional information of habits.
2. Functional Concepts
3. Functional understanding of Principles
4. Instrumental Skills
5. Problem Solving Skills
6. Attitudes
7. Appreciations and
8. Interest
Bloom et. al. (1959) classified the educational objectives under three domains, Viz. the cognitive, the affective, and the psychomotor.

Rai (1975) in his report on school science teaching stated that the main objectives for teaching science should be-

1. To arouse the curiosity of the student about the world we live in and to encourage him the understand the various natural phenomena.
2. To train to acquire the habit of making observation in a planned way.
3. To develop in him science attitude.
4. To give him an idea how a scientist works.

The teachers need to collect information what they perceive as essential from multifarious resources, collect them and then utilize in a gainful manner, as per their expectations like software and teaching strategies as hardware. A teacher with moral fibre and intellectual caliber can metamorphosis the rising generations only if he uses the appropriate strategies. It indicates that the effective teaching is the outcome of adapting appropriate teaching techniques and follows that instructional objectives, teaching strategies and evaluation to help students achieve educational objectives.

Smith (1961) comments that teaching cannot be treated as mirror image of learning and the teaching is a different process from learning. Teaching and learning are two sides of a coin; both being interdependent on each other and this process must be both effective and efficient. The concept of teaching effectiveness is related to the student achievement. Optimization of effectiveness with respect to the factors, such as time, cost and effort, leads to the concept of efficiency.

During recent years, there has been a shift from teacher – centred methods to learner – centred methods. Teaching methods are sub-classified as monologue, dialogue, action and self-study techniques. Selection of a method of teaching/instruction depends upon the objectives, intended learning experiences, resources and teacher preferences. The learners would have to struggle to seek information, to learn the concepts and principles, to apply to analyse and to evaluate themselves. Such a shift requires the development of appropriate learning resources. Where as a teacher should proceed by way of conceiving strategies
appropriate to the instructional objectives to be stressed and the objectives are intended to be achieved through the process of instruction.

These objectives, which decide what teaching strategies and resources should be employed to match the learning style of the students. In fact, the entire cycle of events in the teaching/instruction-learning-evaluation cycle begins with objective and end with objectives. They are often classified as general and specific objectives. Thus the subject-matter is composed of objectives related to the subject of a course, a unit or topic and it is possible to analyze the different syllabi at different levels to instructional objectives.

According to the theory of learning, an element of subject-matter may belong to one of the three domains or be composed of them. These three domains are stated, by Benjamin, S. Bloom and his associates (1966) as:-

1. Cognitive Domain (Thinking Process)
2. Affective Domain (Feeling) and
3. Psychomotor Domain (Acting or Doing)

"The educational goals have been divided into cognitive, affective and psychomotor domains. Cognitive goals address the development of the students' intellect; affective goals are concerned with emotional and social growth; the psychomotor goals are aimed at acquisition of manipulative and movement skills. Cognitive goals in development of attitudes while psychomotor goals in development of mental processes. Thus, all the three needs to be taken into account while deciding strategies of teaching" (Eggan, 1979).

"The lowest stage of cognition is called 'Knowing' which really implies memorizing or acquisition of facts and principles. At that stage, a person can merely recall and recognize the material learnt by him. At the comprehension level, one understands the implications of the subject matter and one can interpolate or extrapolate information. At the next higher level, i.e., application, one can generalize and apply the principles for problem solving. The analysis and synthesis stages of learning enable a person to analyze a given situation and to integrate the facts and principles with the knowledge of other things respectively. The highest stage enables a person to evaluate by constructing instruments of evaluation and by applying the criteria: one may judge and take decisions."
According to Joyce and others (1991), “To provide all round development, one needs to design suitable instructional strategies which help our students grow emotional, physically, socially and intellectually. We need to know how to modify their behaviour so that they function effectively in the changing society. We need to engage ourselves in changing professional roles”.

A teacher having selected appropriate teaching strategy (ies) based on the objectives, is related to three aspects viz., needs of students, level of entry behaviour of students and the structure of the content of subject – matter. He states these in terms of learning outcomes of the students. Hence, the teaching objectives i.e., instructional objectives, based on cognitive domain, in which he would be interested in developing precepts and concepts, problem solving and creativity, delve into the mental processes.

NEED FOR THE STUDY

A substantial body of empirical studies show that computer mediation as significant advantages in achieving traditional goals of instruction. Evaluations of CAI applications report consistently positive and on the whole moderately high achievement gains at all educational levels. Instructional management applications appear to be effective only at the secondary school and college levels. But computer programming and illustrative simulation software do not appear to have any effect on examination achievement except at the college level. Research designs, however, have not been sufficiently elaborate to allow robust multivariate examination of the mechanisms. Computer mediation has been found to improve student attention and computer mediation allows the same materials to be presented and learned in a shorter time-span. The impact of CAI on achievement outcomes varies with certain implementation contingencies. CAI applications in lower educational levels and with lower achieving students are more effective than in counter-part population sub-groups. At lower educational levels, CAI Drill & Practice applications which reinforce instruction are much more effective than tutorial applications which substitute for human instruction. The course content in CAI implementation also makes a difference. At lower educational levels, CAI
applications in mathematics appears most successful. In contrast, at the college level applications in more open-ended, fields of study are more effective. There is a strong presumption that technology improvements result in more effective applications. This receives some support from a moderate correlation between the data of implementations and magnitude of discovered effects. Hence, it is imperative to find out the relative effectiveness among different modes of computer-based instruction. It is also equally imperative to establish whether the personality of the learner has any influence in determining the media effectiveness in realising the instructional objectives.

STATEMENT OF THE PROBLEM

The instructional process includes the instructor presenting the information to students, the instructor guiding the student's first interaction with the material, the student practicing the material to enhance fluency and retention and the instructor testing students to determine what they should do next. The same principles apply to computer-based instruction also. That is not to say that the computer must always fulfil all the phases of instruction. Computers are but one element of instructional environment, along with the teachers and other media. Thus the computer may serve any combination of the four phases. It may present initial information, after which the student receives guidance from an instructor and practices using a work-book. The student may learn initial information from a lecture, after which the computer is used to practice some parts of the material to fluency. The computer may be used for the first three phases, with testing being done in the traditional way by the instructor. In all cases, the four parts of the instruction should be present, although they may be embodied in any combination of different media.

When the computer is responsible for total instruction, it is important that all four phases included. It is not typical for computer programs intended for drill & practice to be expected to carry the load of total instruction. When this is done, students may fail to learn what is desired.
Tutorial are programs that engage in the first two phases of instruction. They take the role of the instructor by presenting information and guiding the learner in initial acquisition.

Drill & Practice engages in the third phase, requiring the student to practice for fluency and retention tests almost always present the last phase, assessing the level of learning.

Simulations are more complicated, for they are frequently used to provide any combination of four phases of instruction in the same lesson. A simulation may be used to present information and guide the learner, to guide and give drill, to do all three, or to test the student's knowledge. However, it is rare for a single lesson of any methodology to provide all the four phases of instruction. This implies that most instructional computer-programs must be used in conjunction with other programs or media to provide complete and successful instruction.

Though CAI has been proved effective in realising the instructional objectives, there is dearth of studies in establishing the relative effectiveness among different modes of computer-based instruction. Studies have also proved that the effectiveness of different media changes with respect to individual differences among learners. Under these circumstances, it is imperative to establish whether the personality of learners has any influence in determining the media effectiveness. Hence, an attempt was made to take up a study on “RELATIVE EFFECTIVENESS AMONG SELECTED MODES OF CAI IN PHYSICS IN RELATION TO LEARNERS’ PERSONALITY”.

SCOPE OF THE STUDY

Research on computer assisted instruction would help the decision-makers in the field of Education to face the new challenges arising from the increasing use of computers in educational institutions. The present study besides establishing the relative effectiveness among different modes of computer-based instruction in realising the instructional objectives in Physics at Std. XII, compares the effectiveness of instruction between conventional lecture method and different modes of computer-based instruction. In conjunction with other process-product studies, this study also contributes to the knowledge of instructional media
particularly to CAI. Moreover, the software packages developed in different modes of CAI in Physics particularly the areas which poses difficulty to students would be immensely helpful to the practicing teacher in realising the instructional objectives among the learners. The knowledge with respect to personality influence on media effectiveness would be immensely helpful to the designers of CAI packages meant for the learners with varied learning abilities.

OBJECTIVES OF THE STUDY

The objectives of the study are stated as follows:-

1. To find out whether there is any significant difference between the lecture method and computer-based instructions in terms of their effectiveness in realising the instructional objectives.

2. To establish the relative effectiveness among different modes of computer-based instruction viz. Tutorial, Drill & Practice and Simulation in realising the instructional objectives.

3. To find out whether there is any significant difference between the lecture method and computer-based instructions in terms of their effectiveness in enhancing the retention of what have already learnt as revealed by the learners' performance in the retention test.

4. To find out the relative effectiveness among different modes of computer-based instruction in terms of their effectiveness in enhancing the retention of what have already learnt as revealed by the learners' performance in the retention test.

5. To establish whether the effectiveness of different instructional strategies viz. Lecture Method and Computer Assisted Instruction in different modes, viz. Tutorial, Drill & Practice and Simulation in realising the instructional objectives is influenced by the learners' personality types.

6. To find out the relative effectiveness among different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation is realising the instructional objectives in the context of the learners with various levels of personality types.
7. To develop and validate computer-based instructional packages in three different modes viz. Tutorial, Drill & Practice and Simulation for the selected content areas in the prescribed Physics syllabus at Std XII.

8. To develop a Criterion Referenced Test (CRT) in the content areas planned to instruct the subjects of control and experimental groups.

9. To assess the personality of the subjects of the control and experimental groups using Myers-Briggs Type Indicator.

HYPOTHESES OF THE STUDY

The hypotheses of the study are stated as follows:

1. There is significant difference between the Lecture Method and different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in terms of their effectiveness in realising the instructional objectives in Physics at Std. XII.

2. There is significant difference among different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in realising the instructional objectives in Physics at Std. XII.

3. The effectiveness of different instructional strategies, viz. Lecture Method and computer-based instruction in different modes, viz. Tutorial, Drill & Practice and Simulation in realising the instructional objectives is not influenced by the learners' personality types.

4. There is significant difference between the Lecture Method and different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in terms of their effectiveness in realising the instructional objectives in relation to learners' personality types and also in the context of the varying levels of learners' personality types.

5. There is significant difference among different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in terms of their effectiveness realising the instructional objectives in relation to learners' personality types and also in the context of varying levels of learners' personality types.
6. There is significant difference between the Lecture Method and different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in terms of their effectiveness in enhancing the retention of what have already learnt as measured by the learners' performance in the retention test.

7. There is significant difference among different modes of computer-based instruction, viz. Tutorial, Drill & Practice and Simulation in terms of their effectiveness in enhancing the retention of what have already learnt as measured by the learners' performance in the retention test.

TOOLS USED IN THE STUDY

The tools used for the study are as follows:-

1. Syllabus-based software packages were developed in selected modes of CAI viz. Tutorial, Drill & Practice and Simulation, for five prescribed topics in Std. XII Physics which included 1. Discharge Tube, 2. Properties of Cathode Rays, 3. Properties of Canal Rays, 4. Radio Broadcasting and 5. Radio Reception. In toto there were fifteen instructional packages comprising five in each mode. All these packages were validated using three different standardized evaluation pro forma.

2. Two syllabus-based Criterion Referenced Tests were developed as pretest in atomic physics and electronics prescribed at Std X and XI and posttest in five prescribed topics at Std. XII as stated earlier and

3. Myers-Briggs Type Indicator (MBTI) was developed and standarized by Jung (1971).

METHODOLOGY IN BRIEF

In order to test the formulated hypotheses, "the Pretest, Posttest Nonequivalent - Groups Design" was adopted in the study. Four identical groups each of 35 students studying at Std. XI in four different schools were formed. The homogeneity among these group in terms of their achievement in Physics as measured by the pretest was established using ANOVA. One of the groups was identified as control groups while the other three groups were treated as experimental groups. Lecture Method was adopted in the control group while
CAI in different modes, viz. Tutorial, Drill & Practice and Simulation were introduced as experimental intervention in the other three groups. Syllabus-based software packages were developed in selected modes of CAI viz. Tutorial, Drill & Practice and Simulation, for five prescribed topics in Std. XII Physics which included 1. Discharge Tube, 2. Properties of Cathode Rays, 3. Properties of Canal Rays, 4. Radio Broadcasting and 5. Radio Reception. In toto there were fifteen instructional packages comprising five in each mode. All these packages were validated using three different standardized evaluation pro forma.

Instruction in the said content areas was given to the control group adopting lecture method while the experimental groups were given instruction in the same five topics using the specially developed CAI packages in different modes viz. Tutorial, Drill & Practice and Simulation respectively. As soon as the instruction in the particular topic was over, the posttest in the said topic was administered to the control and experimental groups. The MBTI was administered to the control and experimental groups immediately after the posttest had been administered in order to assess the learners’ personality types. The same test administered as posttest was administered to the control and experimental groups as retention test one month after the experimentation was over.

The responses made by the learners to the posttest, retention test and the personality test were scored, tabulated and analysed using appropriate statistical techniques.

DELIMITATIONS OF THE STUDY

The delimitations of the study are as follows :-

1. The homogeneity among the control and experimental groups was established based on the scores of the pretest alone. But at the same time, the intervening variables such as anxiety, fatigue, motivation, attitude, personality and intelligence were not taken into consideration in doing so.

2. Only five selected topics in two content areas in Physics syllabus prescribed for Std. XII. were considered for the development of CAI packages in the study due to the vastness of the syllabus.
3. Considering financial and time constrains, it was decided to include only 140 students studying at Std. XI in four different schools situated in Erode in the present study.

ORGANISATION OF THE RESEARCH REPORT

The concepts of Education and Educational Technology, Computers in Education, CAI, Correlates of Achievements, Science Education in School Curriculum, Taxonomy of Educational Objectives, need for the study, statement of the problem, scope of the study, objectives of the study, hypotheses of the study, tools availed in the study, methodology of the study, delimitations of the study, a brief resume of the succeeding chapters are given in the Chapter I.

A conceptual frame work with respect to Computers in Education has been given in the Chapter II.

An account of some of the previous studies pertaining to the problem in hand has been given in the Chapter III.

The development and validation of the CAI packages availed in the study, the development of CRT in Physics and the conduct of the experiment have been reported in the Chapter IV.

A detailed analysis of data, testing of null hypotheses and the interpretations of the findings of different analyses have been given in the Chapter V.

An overview of the study along with main findings and conclusions, recommendations and suggestions for further research have been given in the Chapter VI.