CHAPTER 1
CHAPTER – I

INTRODUCTION

"Education as the reconstruction or reorganization of experience which adds to the meaning of experience and which increases ability to direct the course of subsequent experiences."

- John Dewey

RATIONALE

Education is a dynamic and living process. Education aims at modification of behaviour, sublimation of character and development of wholesome personality of an individual. Education proceeds from birth to death.

The main aim of education should be the awakening of curiosity, the stimulation of creativity, the development of proper interests, attitudes and values and the building of essential skills such as independent study and capacity to think and judge for oneself.

AIMS OF EDUCATION

Education today aims at elevating itself to the level of a complete and comprehensive science with broader objectives. The entire world of education has experienced four revolutions namely, the 1st revolution occurred when societies began to differentiate adult role of task of educating the young was shifted in part from parents to teachers and from home to school.

The 2nd was the adaptation of the written word as a tool of education. Prior to that time, oral instruction prevailed. It was with reluctance that “Writing was permitted to co exist with the spoken word in the class room”
The 3rd revolution came to the invention of printing and the subsequent wide availability of books and the 4th revolution in field of education is the development in electronics, notably those involving the radio, television, tape recorder, computer and internet. To the electronics world of education, the behavioral Scientist also added their concepts of teaching-learning process creating the new world of educational technology. (Vanaja, 2006)

TEACHING-LEARNING PROCESS

Teaching is a skill. It can be acquired and refined with the help of various methods and techniques peculiar to it. One of the basic truths in education is that the quality of the teacher.

Learning is an active process whereby students assimilate the information and relate this new knowledge to a frame-work of prior knowledge. Due to the technological advancement, today's school age generations know more about technology than their elders, they require technology to be incorporated into their educational design. The computer can be used as effective tool in imparting knowledge to the students.

There are many means by which effective instruction can be imparted in the classroom. The use of computer assisted instruction in schools is gaining momentum. Nowadays, more and more schools are having computers, so use of technology enhances effectiveness of learning experience.

New technologies like web-based learning portals, satellites and wireless technologies, internet etc. are helping the teachers and the students to gather and disseminate information which is normally not possible through any other means. Unlike the previous society the present information society has accepted the new technologies for faster growth and development due to the global competition.
Today higher education is considered an important form of investment in human resource development. Youth with high and scientific and technological specializations is considered the first rate human capital for economic growth of the nation and proved as the new engine of the world economy. Multimedia technology supports communication and interaction that transcends traditional language – based and culture – based communication. So, several universities, colleges, schools, educational institutions and even corporate training centers are increasingly utilizing the distributed networks and multimedia to supplement or enhance classroom instruction and to provide open/distance learning.

The recent researches in biological science education focus on instruction (i.e.) specific biological science content, specific instructional strategies and how they are related to biological science learning contexts and instructional outcomes. In the present scientific and technological age, the conventional teaching methods are not sufficient to arouse interest among the students and do not meet up to the intellectual, psychological and emotional needs of the students in the new millennium; the methods of teaching biological science need to be changed.

In India, computers are now being increasingly used for educational and scientific purposes. Computers are used not only in numeric applications but also in non-numeric applications such as computer assisted instruction. The present study tries to find out the effect of the computer assisted science teaching at higher secondary level.

In a vast country like India, enormous work is now being done in the field of education, but it is still not possible to equip each and every secondary and higher secondary school with all the facilities for teaching science in the near feature. Most of the higher secondary schools, both in
rural area as well as in urban area, are suffering from lack of modern science laboratories. They need equally advanced gadgets to support their education.

**INSTRUCTIONAL MEDIA**

Instructional media are the electromechanical devices that act as mediatory between student and what he has to learn. An instructional medium is simply a means of transmitting instruction. A distinction can be made between traditional and more recently developed media. Both types make vital contribution to the instructional process. Television can also make use of traditional media like demonstration with slides, models, transparencies and teaching machines including computerized assisted instruction, from the new media.

**IMPORTANCE OF BIOLOGY**

Biology is the study of living organisms. Study of biology enables one to attain a higher degree of intellectual freedom (Das, 1985). Biology brings the pupils into intimate contact with living organisms and therefore the child is greatly interested. Like science as a whole, Biology has significance for education. It offers knowledge of direct value to the growing individuals contributing to the development of acceptable attitudes and providing deep interest.

The importance of Biology is

- To bring qualitative improvement in every walk of students life.
- To inculcate a spirit of inquiry, creativity, objectivity, the courage to question, aesthetic sensibility and an abiding environmental consciousness.
- To provide a broad based biological knowledge, stimulate a deep interest.
INSTRUCTIONAL SYSTEM IN BIOLOGY

The innovations in the field of technology and media usage have resulted in imparting new approaches to instruction. The approaches are scientifically developed to provide optimum learning to the learners with a routine personal involvement by the teacher. The teacher-planned system, consisting of subject matter and procedures, coordinated in a programme unit design, is directed towards specific behavioural objectives.

The instructional system is concerned with the application of modern skills and techniques for the requirement of Computer Assisted Instruction and Co-operative Learning. This includes facilitation of learning by manipulation of media and methods.

EDUCATIONAL TECHNOLOGY

The conventional pattern of education is undergoing radical revisions. In the present context, the basic process of learning is slowly being altered by new ideas about how students acquire knowledge and special techniques have been designed to improve the teaching-learning process.

The technical advancements are also affecting the social structure of developed and under developed societies, ensuring to effect the teaching and learning process by providing valuable help in improving the task of teacher, as viable tool by using different types of technical gadget to improve the quality of instruction.

The most striking innovation in the field of educational technology is the use of computers. The main objective of computer assisted instruction is to provide the needed flexibility for individualizing the educational process. It meets the specific needs of the students in a way in which it is almost impossible to do so in a face-to-face teacher relationship.
Educational technology reforms education by contributing to:

1. Student learning through involvement with challenging tasks.
2. Professionalization of teachers.
3. Creation culture that supports learning both in the classroom and beyond it.
4. Redefining the role of teachers and learners.

Educational technology implies the use of all modern methods and materials for maximizing of learning; of all educational resources men, materials, methods and techniques, means and media need to be utilized in an integrated manner for ensuring optimization of learning. These include various methods of teaching, audio-visual aids and materials for the effective and efficient teaching and learning process.

Educational technology has emerged as a new discipline in the field of education. It facilitates learning by control of environment, media and method. In student centered approach, the strategies are designed to provide the students with a highly flexible system of learning, which is geared to individual's life and learning styles. Under the individualized learning methods, a variety of different media such as slides, audiotapes, models, practical exercises, computer-based materials etc. can readily be incorporated.

**APPLICATION OF EDUCATIONAL TECHNOLOGY**

Educational technology aids to improve the process of human learning. It helps to develop interest of the learner to know, and to produce software to facilitate teaching and learning. It assists to evaluate the level of comprehension of the learner to learn. It functions to adopt remedial measures to enhance learning, speed, capacity and ability of the teacher.
CONTRIBUTION OF EDUCATIONAL TECHNOLOGY

1. Individualized instruction
2. Improvement in the quality of teaching
3. Meeting the problem of mass education
4. Equalizing educational opportunities
5. Providing continuing education

Media is used to enable the students to progress at their own speed and make provision for review and revision; it may also provide the student with an on-going check for progressing and to support the learning process. The role of teaching materials in individualized learning is depicted in figure 1.

Figure 1 shows the front-line role of teaching materials in individualized learning
EDUCATIONAL TECHNOLOGY FOR BIOLOGY INSTRUCTION

“Science is not only expanding at an accelerated pace but is also changing the fundamental tools and the ways of solving problems. To account for the rapid expansion, science education has to undergo a revolutionary transformation based on the application of science technology in instruction. But the field of science teaching is not experiencing revolution but rather a paradigm shift” (Kulik and Bangert, 1984).

Biology is a science devoted to the study of living organisms. Science has progressed by breaking down complex subjects of study into their component parts, so that today there are numerous branches of biology. This principle is often called the ‘reductionist’ principle and carried to its logical conclusions; it has focused attention on the most elementary forms of matter in living and non-living systems. This approach to study seeks fundamental understanding by looking at parts rather than the whole.

The aim of biology must ultimately be to explain the living world in terms of scientific principles, although appreciating that organisms behave in ways which often seem beyond the capabilities of their component parts (Taylor, 2002)

Biology is a branch of the natural sciences concerned with the study of living organisms and their interaction with each other and their environment. The science of biology examines the structure, function, growth, origin, evolution, distribution and classification of living things. Five unifying principles form the foundation of modern biology: cell theory, evolution, gene theory, energy, and homeostasis. Biology as a separate science was developed in the nineteenth century, as scientists discovered that organisms shared fundamental characteristics.
Traditionally, the specialized disciplines of biology are grouped by the type of organism being studied: botany, the study of plants; zoology, the study of animals; and microbiology, the study of microorganisms. These fields are further divided based on the scale at which organisms are studied and the methods used to study them.

**COMPUTER ASSISTED INSTRUCTION IN TEACHING SCIENCE**

Computer use by any teacher is a function of his or her computer experience and expertise, availability of hardware and software and perceived need. An excellent science course may be taught without the use of a computer. However, the careful incorporation of computers into a science course can and adds an important level of enhancement. Although not as conclusive as one might hope that studies do indicate that computer use in science education can improve learning and positively influence student's attitudes and self esteem.

Computer assisted instruction proves better than all other aids in several respects. There is not only saving of time in learning but it also performs miracles in processing the performance data. This latter characteristic helps to determine subsequent activities in the learning situations. The large amount of information stored in the computer is made available to the learner more rapidly than by any other medium. The dynamic interaction between the student and instructional programme is not possible to be secured in any other medium. With CAI, we would completely individualize materials.

Importance of using computers in science class may not be limited to the ability of computer assisted instruction to improve learning rather, using computer adds another dimension to the teacher's repertoire of strategies which may improve overall learning. Another important reason to include student computer use in a science course in most students, especially those planning a career in science, will be required to be
computer literate. As students interact with computers in a variety of ways within their science courses, their degree of computer awareness and literacy increase correspondingly.

**COOPERATIVE LEARNING**

Traditionally, educational settings have taken a competitive approach to learning, and many of those who have succeeded in school and pursued careers in science excel in these environments. Competitive learning environments are beneficial in that they prepare students for life experiences such as applying for jobs or competing for grants. In addition, these situations can develop self-reliance and self-confidence in students. However, when students are placed in competitive academic situations, learning may be viewed as a commodity to be competed for, and students can be entrained to view other students as opponents because a students' success is measured against the performance of their peers. In individualistic learning situations, the role of peers is absent. Learning is individualized and sometimes isolated, and success is generally measured against the individual's own learning goals. Individualistic learning can be seen as a rehearsal for what learning may be like for an individual after their formal schooling is complete. In contrast, cooperative learning situations are unique in that students experience learning as a collaborative process. Other students become resources and partners in learning, and the success of a student is, in part, dependent on the involvement of their peers. Given the variety of student learning styles, no one of these approaches can meet the needs of all students all the time, and there is room in any course or classroom for students to engage in each of these types of learning. Indeed, these three approaches can be integrated within a course, even used simultaneously, for example, by engaging cooperative teams in a competitive exercise, not unlike competitive sports do. However, because traditional learning environments have focused almost exclusively on
competitive and individualistic approaches, cooperative learning is relatively unfamiliar to most instructors, as well as their students.

According to Salvin and Cohen (1995), “Co-operative learning is a set of teaching strategies used to help learners to meet the specific learning and interpersonal goals in highly structured groups”.

Co-operative learning is a teaching strategy involving students’ participation in group learning that emphasizes constructive interaction. It is a strategy by which small teams, each with students of different levels of ability, are engaged in learning activities to improve their understanding of a subject. The participation of every student in the group and cooperation among group members is considered important.

**FIVE ELEMENTS OF COOPERATIVE LEARNING**

It is only under certain conditions that cooperative efforts may be expected to be more productive than competitive and individualistic efforts. Those conditions are:

1. **Positive-inter-dependence** (sink or swim together)

   Each group member's efforts are required and indispensable for group success, each group member has a unique contribution to make to the joint effort because of his or her resources and/or role and task responsibilities.

2. **Face-to-Face Interaction** (promote each other's success)

   Orally explaining how to solve the problems and teaching one's knowledge to other. Checking for understanding, discussing the concepts being learned and connecting present with past learning.

3. **Individual Group Accountability**

   Keeping the size of the group small, giving an individual test to each student, randomly examining the students learning orally or by
calling on one student to present his or her group’s work to the teacher 
or to the entire class.

4. **Interpersonal and Small-Group Skills**

   Social skills must be taught as leadership, decision-making, trust 
building, communication and conflict-management skills.

5. **Group Processing**

   Group members discuss how well they are achieving their goals 
and maintaining effective working relationships, make decisions about 
what behaviours to continue or change (Sharma, 2006).

**SPECIFIC APPROACHES TO CO-OPERATIVE LEARNING.**

There are two approaches to co-operative learning namely 
conceptual and direct approach. The conceptual application provides a 
conceptual frame work consisting of general procedures and principles to 
the nature of co-operative learning and how it may be useful. The direct 
approach involves providing teacher with specific curriculum packages 
on specific strategies for use in detailed and structured ways.

**Teacher's role in cooperative learning**

While adopting the co-operative learning strategy the teacher is 
expected to:

- ✓ Train students in collaborative skills necessary to co-operate in 
  small groups and develop the feeling of positive interdependence in 
  students.

- ✓ Specify academic and co-operative objectives before transacting the 
  lesson.

- ✓ Decide on group size depending on the number of students in the 
  class.
✓ Plan and organize materials and distribution of materials meant for performing activities.

✓ Assign roles to each group member which may be rotated by lesson so that each student has an opportunity to practice all skills. It may help teachers focus on students’ individual needs.

✓ Explain task to students by using example and modeling, they should be clear about the assignment, the procedure, objective of the lesson and what is expected of them – both academically and behaviorally.

✓ Define relevant terms and concepts, question the students for understanding of the expectations.

✓ Structure individual accountability to make sure that all students are on the right track; structure inter-group cooperation.

✓ Explain criteria for success at the beginning of the lesson; specify desired behaviour, monitor student’s behaviour, provide task assistance when needed.

✓ Intervene to teach collaborative skills if necessary.

✓ Provide closure to the lesson; make modification in lesson if required.

✓ Assess how each group functioned, provide feedback and make adjustments needed.

**THE CONVENTIONAL APPROACH**

The conventional approach, learning and teaching were not analyzed and no effort was made to improve teaching as such. The teacher often attempted to coerce pupils into reading texts, listening to lectures which were often insipid and recalling as much as possible of what they heard or read. This may perhaps be a valuable achievement;
but along with it, certain undesirable educational and psychological byproducts have also appeared.

TEACHING

*Good Teaching is One-fourth Preparation and Three-fourths Theater* – Gail Godwin

The word 'teaching' is used loosely in many different contexts. The term ‘teaching’ is defined as the process wherein conditions are deliberately created to enable specified learner or group of learners to behave in a specified manner to perform or to experience certain desirable objectives (Kulkarni, 1988).

Teaching is the transferring of covering knowledge, attitudes and skills. Teaching usually refers to instruction provided through classroom activities and is often associated with pre service education programmes. (Dictionary of Education, 2005).

In this study, the investigator has used the term ‘teaching’ in the context of teaching root, stem, and leaves concepts to the students using computer assisted instruction, co-operative learning and conventional methods.

STATEMENT OF THE PROBLEM

The title of this experimental study is "EFFECTIVENESS OF THE COMPUTER ASSISTED INSTRUCTION AND COOPERATIVE LEARNING IN BIOLOGY FOR STANDARD XI STUDENTS”.

NEED FOR THE STUDY

The present educational system does not have enough provision for the growth of children to meet the demands of 21st century.

The most important criticism about the present curriculum is that there is too little relation between what is learned in school and what is taking
place outside. Our present teaching to a great extent is general to the role of passing examination. "An ounce of experience is better than a ton of theory". Kothari Commission report has given top priority to scientific and technological education. In short, the ultimate aim of science education is to understand the concepts meaningfully and apply them in the right context. For achieving this role of technology in classroom, practice is inevitable. Therefore the investigator was interested in carrying out a study to examine effectiveness of computer assisted instruction and cooperative learning in biology for standard XI students.

Teaching of biology is done in nature’s laboratory which makes the students participate more and more enthusiastically. It kindles their desire for the ‘esthetic appreciation’. Hence it is obvious that most of the students take interest in biology.

The interest of students towards biology is needed for the students who can go for higher studies like medicine, agriculture, horticulture etc., therefore the present study has been undertaken with a view to find out how these interests can be developed in higher secondary students.

Co-operative learning provides improved academic achievement, improved behaviour and attendance, increased self confidence and motivation. Co-operative learning is relatively easy to implement and is inexpensive. So the investigator was interested to find out the effectiveness of co-operative learning along with computer assisted instruction.

The heart of education is the student learning and the value of any technology used in education must therefore be measured by its effectiveness to improve learning. But today it is observed that learning in our schools is increasingly impeded by hurdles such as the educational environment and shortage of good teachers and lack of knowledge about the modern instructional strategies.
The resistance of many teachers to accept a new technology in teaching too is a stumbling block in experimenting innovations. Therefore the general premise of the researcher is whether or not computer assisted instruction and co-operative learning approach works in Indian classrooms. Focusing the research problem further leads to the validation of the nature of influence of external variable on the effectiveness of co-operative learning and computer assisted instruction.

Research studies in the past emphasized the need for inventing specific teaching methods that contribute to development of such values and skills besides academic instruction. Therefore the investigator attempted to study about the effectiveness of the co-operative learning and computer assisted instruction in biology for XI standard students.

Educational technology offers solutions to tackle the problems of modern educational system. The paucity of challenging educational material, which will not stifle the creativity of the learner, is better met within learning material scheduling. While the slow learners can attain improvement in learning, the high achievers can develop competency through this approach. While the educational wastage could be eliminated, the productivity and accountability of educational system could be maximized through this scheduling. This learning material helps in developing the ability of self-learning in a particular subject. Yet the use of this packages have not found their place in the present day schooling, especially in teaching biology for higher secondary students. So, with the intention of developing this material and testing their efficiency, the investigator conducted a study on the “Effectiveness of computer assisted instruction and co-operative learning in biology for standard XI students”.

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OBJECTIVES OF THE STUDY

The major objectives of the study were:

To

1. develop a learning module in Biology for standard XI.

2. find out the effectiveness of computer assisted instruction on achievement in Biology among XI standard students.

3. find out effectiveness of co-operative learning method on achievement in Biology among XI standard students.

4. find out the impact of gender, locality and type of school on the effectiveness of computer assisted instruction method and co-operative learning method.

5. compare the effectiveness of using computer assisted instruction and co-operative learning with conventional classroom method of teaching on achievement in Biology.

SCOPE OF THE STUDY

Education is not just the preparation for life but life itself. Real education goes beyond academic achievement. Development of values, formation of attitudes, interpersonal relationship etc., contribute to the personality development of the individual besides academic achievement. This study aims to enable teachers change the method of teaching according to the dynamic trends in teaching. It can help to overcome the limitations in the conventional method of teaching in biology. It can direct the biology teachers to prepare software package for individual and group learning. This type of innovative approach will bring desirable learning outcome from the learner as they are very much motivated. It creates real learning environment. The process of teaching learning becomes less laborious and more rewarding. Thus the present study would be a boon to the learners as information would explore the
possibilities of making biology teaching-learning more interesting and beneficial.

Since the present study attempts to explore the relationship between the methods of teaching biology and number of variables associated with it, the result of the study will be of immense use to the teachers in the classroom. The results will also be useful to the teachers to know how a teaching method in science is linked to the formation of certain scientific attitudes. The results also will have some impact on teacher preparation centers in reorganizing their curriculum thereby emphasizing more relevant topics that are likely to contribute to optimum learning experiences.

**LIMITATIONS OF THE STUDY**

Research studies in general and experimental studies in particular, have limitations due to many factors. It is the responsibility of the researcher to see that the study is conducted with maximum care in order to be reliable. However, the following limitations were unavoidable while conducting the present study.

1) The present study, being of an experimental nature, was confined to selected schools in Salem city

2) Two aided schools, two government schools from urban area and two government schools from rural areas were selected for the study

3) Large class sizes and the many demands placed on instructors make it difficult to devote even small amounts of time to single students. The reality is that many science classes are taught almost exclusively using a lecture format even though lectures by themselves are relatively ineffective at engaging students and promoting learning.
4) One of the principal challenges for teachers, then, is to learn how to juggle a host of new responsibilities -- from carving out the time needed for extended inquiry to developing new classroom-management techniques. They must also be able to illuminate key concepts, balance direct instruction with inquiry teaching, facilitate learning among groups, and develop assessments to guide the learning process. That's a tall order for even the most experienced teacher.

5) The researcher noted that the teacher missed many opportunities to advance learning because she could not listen to all small-group discussions and decided not to have whole-group discussions. They also noted that the students needed more specific prompts for justifying design decisions.

In spite of the above cited limitations, sufficient care was taken in selecting and constructing the tools, gathering reliable data and applying appropriate procedures and analysis.

**RESEARCH REPORTING**

The research study is reported in five chapters as per details given below

**Chapter I** highlights the statement of the problem, rationale of the study and definition of the important terms. This chapter also presents the need for the study, its objectives, scope and limitations of the study.

**Chapter II** consists of review of related literature in the area of concept development.

**Chapter III** discusses the methodology employed in the study. It covers the sample selection, instrumentation, data gathering and hypotheses.
Chapter IV presents the quantitative as well as descriptive analysis of the data. In the light of the findings, appropriate interpretations have been made.

Chapter V contains a summary of the findings of the study and the recommendations of the investigator for the furtherance.