CHAPTER I

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CHAPTER – I
INTRODUCTION

1.1. INTRODUCTION

Educational Technology is a broad field that encompasses both hard and soft technologies. Educational systems design is a soft educational technology that is grounded in systems philosophy, systems theory, and design theory and enhances the success of efforts to change the education system.

1.2. EDUCATION

Education, the act or process of acquiring and imparting knowledge is crucial to the development of a learner with a view to his/her participation in the transformation of the world for a better tomorrow. Learning and understanding are basic to the definition of education. Education is in any process, either formal or informal that shapes the potential of a mature human being (Mohammed Akram 2006). Education is the process of change in human behaviour, attitudes and potentials which consequently lifts an individual from animal level and places human level so as to pave the way for human welfare.

The Pennsylvania State Board of Education (2002), defines as: “A series of planned instruction that is coordinated and articulated in a manner designed to result in the achievement by students of specific knowledge and skills and the application of this knowledge”.

Oxford Advanced Learner's Dictionary of Current English (2005), defines as, “Education is a process of teaching, training and learning, especially in schools or colleges to improve knowledge and develop skills in education” (Hornby).
The Oxford English Dictionary (2006), defines that “Education as the systematic instruction, schooling or training given to the young in preparation for the work of life”


1.3. EDUCATIONAL TECHNOLOGY

Dictionary definitions of ‘technology’ are based on its etymological roots in two Greek words: techne means art or skill and logos means reason. Technology involves the practical and systematic application of knowledge. Technology involves the application of science to solve problems for individuals and organizations. The common view is that technology includes methods and techniques as well as tools and equipment. Computers, computer programs and algorithms go well beyond the integration of hardware and software to include both formal and informal methods and heuristics for use. A broad interpretation of technology is vital to the development of a scientifically sound and socially progressive perspective with regard to technology integration (Michael and Xuemei 2002).

Educational technology, also called learning technology, is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources. The term educational technology is often associated with, and encompasses, instructional theory and learning theory. While instructional technology covers the processes and systems of learning and instruction, educational technology includes other systems used in the process of developing human capability. Educational Technology includes, but is not limited to, software, hardware, as well as Internet applications and activities.
1.3.1. CONCEPT OF EDUCATIONAL TECHNOLOGY

According to Kumar (2004), Association for Educational Communications and Technology, USA, "Educational Technology is a complex, integrated, process involving people, procedures, ideas, devices and organization for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of learning".

According to Kumar (2004), Council for Educational Technology, U.K, "Educational Technology is the development, application and evaluation of systems, techniques and aids to improve the process of human learning". According to Henry Ellington et al (2003), 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.

1.4. TECHNOLOGY IN EDUCATION

Technology in education is obviously a very important part of Educational Technology. Historically, many of the college-based educational technology units are evolved from units which were previously called audiovisual aids units. By making appropriate use of hardware along with suitable software is the possible way to improve the efficiency or quality of learning in a given situation. In the development of educational technology many people are aware that there was much in education and training which could be improved by thinking more carefully about all aspects of the design of teaching / learning situations.

1.5. TECHNOLOGY OF EDUCATION

Educational Technology is to help improve the overall efficiency of the teaching/learning process by many ways like, (i) Increasing the quality of learning or the learner of mastery; (ii) Decreasing the time taken by the learners to a designed goal; (iii) Increasing the efficiency of teachers; (iv) Reducing costs, without affecting quality and (v)
Increasing the independence of learners and the flexibility of education and training provision.

1.6. THE ROLE OF TECHNOLOGY IN LEARNING

Technology-mediated learning refers to a learning experience that is significantly moderated through the use of information technology. Technology, in this context, may play a variety of roles including, redrawing the physical boundaries of the classroom, substantially enhancing access to learning content and resources, and enhancing the instructor’s access to feedback concerning absorption of material (Alavi and Gallupe 2000).

Educational Technology is the systematic and creative blending of idea and product technologies with subject content in order to improve teaching and learning processes. Educational technology is often associated with the terms instructional technology or learning technology. Product technologies are computer hardware or software. Idea technologies are cognitive frameworks of schemes. When products are thoughtfully blended with subject content such as science or mathematics concepts for a specific audience in a specific educational context like school, one is using educational technology.

The words educational and technology in the term educational technology have the general meaning. Educational technology is not restricted to the education of children or to the use of high technology. The meaningful use of high technology to enhance learning in classrooms and higher education is known as technology integration (Yadav and Mandal 2007).

According to Chandra (2005), in International Encyclopaedia of Education, technological advancement has changed the pattern of education all over the world. Science and Technology have advanced not only education but the entire human life has been revolutionized. India is far more behind in technological progress in comparison to
some of the countries of the west, and technological growth is rather a recent phenomenon in this country. Modern age is the age of scientific advancement and technological progress. Since the advent of science, the entire thinking, mode of living, working conditions and system of education have undergone a revolutionary change. As India is concerned, the educational pattern here could not remain unaffected as the knowledge of modern technology traveled eastward from the west. Technology gave rapid means of transport, as a result of which the radiance of education could be spread even to those areas which were so far inaccessible.

Technology tools expose children to this type of learning. Researchers have begun to understand more about the situations in which students learning is the best way. They have found that the structure and resources of traditional classrooms are often inadequate and that technology when used effectively can enable ways of teaching that are much better matched to how children learn (Roschelle et al 2000).

Technology refers to the technical contrivances, techniques are reckoned as the software and the equipment as the hardware of technology. Technology results in new designs and devices. The concept of technology of education i.e., techniques and methodologies of the teaching–learning process implies the software aspect of educational technology. The use of technology in training results in increased productivity through enhanced human capability.

The technological change and scientific advancement have improved the method of teaching also. Various modern devices of audio-visual aids and a large number of complicated instruments needed, in the process of training in different branches of knowledge, are all the results of modern technology. They have also facilitated the work of teachers. Technology has rendered an impact on education in
India. It has helped the development and spread of education. It has made the education more suited to life and its needs. The technological change has helped in the method of teaching. (Ramesh Chandra 2007).

Technologies in the classrooms have many benefits. Similar to learning a new task or trade, special training is vital to ensuring the effective integration of classroom technology. Since technology is not the end goal of education, but rather a means by which it can be accomplished, educators must have a good grasp of the technology being used and its advantages over more traditional methods.

1.7. SELF PACED LEARNING INSTRUCTION

The self-paced feature allows the student to regulate the speed at which he or she feels comfortable engaging the content. This means that a student may work through an extra problem to understand more fully a concept at issue. The self-mastery feature imposes an established standard to which the student will be held accountable. These objectives can even be chosen by the teacher prior to students’ use of the software. Self mastery and self-pacing puts the student’s focus more on the software than the teacher, thus encouraging the student’s cognitive autonomy.

1.7.1. PROGRAMMED LEARNING INSTRUCTION

Programmed Instruction: According to Sharma and Vohra (1998) in Encyclopaedia of Educational Technology Series, programmed instruction is a self tutoring paper-pen technique of moving by convenient and sequentially arranged steps from old knowledge to new knowledge. With programmed instruction, the individual can advance in the study of a subject at his own individual optimum rate by manual method.

Based on the concept of Sharma and Vohra (1998), the technique was originally developed in conjunction with the so called teaching machines, but the use of these devices is minimal. However,
the principles of programmed instruction have been adapted widely to printed texts.

Programmed learning is a self instructional technique for providing individualized instruction or learning experience to the learner. The learning experience is self-corrective. A programme takes the place of a tutor and leads the learner through a set of frames of specified behaviour designed and sequenced to make it more probable that he will behave in given derived way (Bukhari 2006).

In programmed learning, it is said that the most efficient, pleasant and permanent learning takes place when the student proceeds through a course by a large number of small, easy steps.

B.F. Skinner is the originator of linear programming. It is also called a single tract programme. According to Skinner, a creature, a bird or a human being can be led to a desired behavior by means of a carefully constructed programme consisting of small steps leading logically through the subject matter from topic to topic, provided each step is reinforced by some kind of favourable experience or reward. The increments in information which the learner is expected to absorb are small.

According to (Kumar 2004), National Centre for Programmed Learning, UK, “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”

In a linear programme, every student must go through each and every frame in the same sequence, but individual students complete the programme at different rates according to their respective abilities.
1.7.2. COMPUTER ASSISTED INSTRUCTION

Computer Assisted Instruction (CAI) occurs when an instructional program is delivered to a learner using a computer. CAI is sometimes considered a type of computer based instruction, which refers to any form of computer use in an educational setting, including instructional programs, tutorials, simulations, instructional management, supplementary exercises, programming and productivity software applications such as word processing and spreadsheets. It allows the learner to work at their own pace, controls the flow or sequence of instruction, and provides immediate feedback, more sophisticated forms of instruction to individual learner needs by varying lesson content, instructional sequence, and level of difficulty for each lesson as well as revising the types of feedback.

Computer-assisted instruction occurs when an instructional program is delivered to a learner using a computer. CAI is sometimes considered a type of Computer Based Instruction (CBI) which refers to any form of computer use in an educational setting, including instructional programs, tutorials, simulations, instructional management, supplementary exercises, programming and productivity software applications such as word processing and spreadsheets.

The primary advantages of CAI are that it allows learner to work at their own pace, controls the flow or sequence of instruction, and provides immediate feedback. More sophisticated forms of CAI adapt instruction to individual learner needs by varying lesson content, instructional sequence, and level of difficulty for each lesson as well as revising the types of feedback.

CAI had its beginnings in the 1950s when educational researchers attempted to solve learning problems by applying the techniques of behaviour analysis as theorized by B.F. Skinner through programmed instruction (PI). The concepts of PI were then applied to crude teaching
machines that appeared in the late 1950s and early 1960s, PI and teaching machines were used throughout the 1960s by colleges, public schools and the military. PI never achieved a high degree of popularity in schools, possibly because it was monotonous and did not fit well with group-oriented, fixed schedule school settings.

Another early CAI project originated at the University of Illinois in 1960. That project Programmed Logic for Automatic Teaching Operations (PLATO) designed computer hardware and software specifically to deliver instruction in variety of subjects to a large base of learners simultaneously.

The use of CAI became more feasible for classroom applications. The effects of CAI on academic achievement as well as specific academic areas are high level thinking skills, learning rates, learning retention, locus of control and motivation.

A body of largely qualitative research on CAI indicated that computer technology was of more educational benefit when its use was incorporated into classroom practices of teachers and integrated with, and essential to the curriculum. The primary value of CAI may be found in its potential to motivate students, increase access, and reduce the time needed to accomplish a given set of objectives.

The instructional use of computer technology is now better distinguished as learning from computer and learning with computers. Learning from computers occurs when the computer is the medium for the delivery of content through an instructional program. Learning from computer is associated with CAI, whereas learning with computers is associated with the use of computer and software resources that are not necessarily instructional (e-mail, web browsers word-processing software, presentation software, etc) as cognitive tools to support learning activities in active learning environments in contrast to learning from computers, learning about computers refers to the development of skills
required to operate and utilize computer hardware and software and is not considered to be CAI.

Computer is an electronic machine, operated under the control of instructions stored in its own memory, which can accept data as input, manipulate data according to specified rules, produce results as output and store the results for future use. Computer Literacy concerning the knowledge, skills and attitudes enable a person use computer technology.

Till recently, computers were used in India mainly for storage and processing to Data. Computer-Aided instruction has attracted many large groups of learners or teachers. The latest computer wizardry has represented information and developed computer enhanced learning materials. The instructional design of these systems should be based on a careful examination and analysis of many factors, both human and technical, relating to visual learning. Teachers are able to select appropriate multimedia tools and apply them to the learning task within the learning environment in order for effective learning to take place with the help of computers.

Computers also complicate the push in education to make students and teachers responsible for learning more content in less time. One must remember that the zeal to cover and know massive amounts of material greater emphasis should be placed on training teachers to use computer effectively. At the least, courses on basic word processing serials and computer vocabulary should be offered. These simple lessons would ease the fears of many teachers (Goyal 2007).

1.7.3. MULTIMEDIA

According to Ann Kovalchick and Daeson (2005), in *Encyclopaedia of Education and Technology*, Multimedia creators integrated the individual instructional resources with their own original work in a meaningful way, providing compact educational tools that
allow great flexibility in teaching and learning. Multimedia material is stored so that it may be retrieved in a nonlinear fashion, depending on the needs of learners. Educators can use multimedia projects to respond spontaneously to students' questions by referring quickly to relevant portions. In addition, students can use multimedia projects to pursue independent study according to their capabilities.

Multimedia communication is the exchange of ideas, message or information. Multimedia is simply multiple forms of media integrated together. Media can be text, graphics, audio, animation, video, data and others.

According to Mohanty (2008), multimedia has been popular in this age of Science and Technology. It means an integration of sound, still images, animation, video and text along with computing technology. It helps learning, browsing through encyclopedia and reference materials starting from the circulatory system to an automatic explosion in commercial presentation and in creating 3D effects in many ways.

The term multimedia was originally used by distance learning organisations to describe their courses delivered via text, television, radio, telephone, etc (Laurillard 1993). Current recognition of the term multimedia refers to systems that support the use of text/numbers, audio, still images, animations, video and graphics.

According to Wallis (1995), the term "multimedia" is "the integration of two or more of: audio (speech/music), still images, video, text/numbers, graphics and animations to a coherent, manageable mix at the user interface".

Implementation of multimedia-rich computer-assisted instructional materials into curricula can enhance the learning experience. Well-developed, high-quality multimedia materials can stimulate different
learners based on their preferred learning styles, as well as expand distance learning opportunities.

According to Britannica Ready Reference Encyclopedia (2004), the most common multimedia machine consists of a personal computer with a sound card, modem, digital speaker unit and CD-ROM. Interactive multimedia systems under commercial development include cable television services with computer interfaces that enable viewers to interact with TV programs, high speed interactive audio visual communication systems and video games.

According to Mishra (2009), the term multimedia has not always designated computer based media, as it does now, but originally referred to combinations of audio, visual and print materials delivered by various media.

1.7.3.1. ELECTRONIC MEDIA

Mass media education is now largely dependent on electronic media. Electronic media has a good number of inherent advantages.

Electronic media facilitates diverse learning objectives. Electronic media through the variety and newness can motivate the learner, stimulus imagination, create and sustain interest. They can cater to individual needs. They reduce the burden of the teacher (Vanaja and Rajasekar 2006). In order to ensure efficiency as well as effectiveness in learning, teachers have to use their imagination, ingenuity and initiative. In this electronic era we have a variety of resources including multimedia materials (Mohanty 2008).

According to Ann Kovalchick and Daeson (2005), in Encyclopaedia of Education and Technology, different people learn at different rates. Based on Casey (1996), educational technology has been used to implement cognitive apprenticeship learning models. The use of multimedia to facilitate cognitive apprenticeships has also received attention.
Education, whatever are its goals and objectives, means and media ultimately has to result in some form of learning or the other. Learning is essentially a modification of behaviour due to interaction of past experiences and present stimuli. Learners tend to effectively retain more material with higher participation with high technology and retain less with low participation on course material. Hence strategies need to be developed to actively involve students in the classroom activity.

1.7.3.2. THE ROLE OF MULTIMEDIA IN EDUCATION

Multimedia in education has been extremely effective in teaching individuals a wide range of subjects. The human brain learns using many senses such as sight and hearing. While a lecture can be extremely informative, a lecture that integrates pictures or video images can help an individual learn and retain information much more effectively.

Since the mode of learning is interactive and not linear, a student or teacher can choose what to investigate next. For example, one does not start on the first page of linear document and read to the end. Interactive multimedia learning mode is more like constructing a spider's web, with one idea linked to another, allowing choices in the learner's path.

The interactive multimedia system presents, stores, retrieves and transmits audio, video, graphics and textual information. These kinds of systems can have a powerful impact on the learner's problem solving abilities and can generate a positive effect. The interactive multimedia enhances effective self learning among students.

Gloughlin (1998), defines multimedia as the presentation of information through multiple forms of media. A program organizes and directs media such as pictures, sound effects, music, animation and video to produce a specific experience for the user. Interactive multimedia enables the user to control the pace of presentation and to
respond to the applications in a predetermined way. Multimedia actually differs in two major characteristic features that are the delivery format and the user interface. Different selection procedure may result in different media being selected for the same purpose. Even a single selection procedure may result in two or more alternative media for the same task. Some media have overlapping capabilities. Media mix relates to the sequential use of different audio visual media. Sometimes multi-image technique is followed. The choice of the final medium is left to the teacher or the learner.

The world is changing and the field of education is experiencing these changes in particular as it applies to media services. Teachers primarily require access to learning resources, which can support concept development by learners in a variety of ways to meet individual learning needs. The development of multimedia technologies for learning offers new ways in which learning can take place in schools and home.

According to Haseen Taj (2006), media combinations are generally referred to as multimedia system. Multimedia means many media. The term multimedia instructional system refers to the user of appropriate and carefully selected variety of learning experiences which are presented to the learner to selected teaching strategies which reinforce and strengthen one another. Thus the learner will achieve predetermined and desirable behavioural objectives.

1.7.3.3. MULTIMEDIA ENVIRONMENT IN LEARNING

Learning in work related contexts is a collaborative process leading to highly context specific forms of reasoning and skills.

A multimedia learning environment involves a number of components or elements in order to enable learning to take place. Apart from the hardware and software, multimedia learning integrates five types of media such as audio, video, Text, animation and graphics to
provide flexibility, usability, visibility and affordance in expressing the creativity of a student and in exchanging ideas.

According to Shackel (1991), the usability of a system can be defined as: "...capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfill the specified range of tasks, with the specified range of environmental scenarios."

Well-designed multimedia programs are easy to interpret, understand, and contain visible clues to their functions, while poorly designed multimedia software can be difficult and frustrating to use without proper clues. Norman (1990), identifies two key principles that help to ensure user-centered design: visibility and affordance. The correct parts should be visible and convey the correct message.

Multimedia ensures flexible learning. Flexibility is recognized in the level access to courses, the place of entry to, exit from the course, the place, time and place of study, the form and pattern of interaction among learners, teachers and resources of the educating process leads to success and achievement.

Flexibility refers to variations in task-completion strategies supported by a multimedia system. The freedom to use a range of different commands with which to achieve similar goals adds to the system flexibility although not necessarily to the learnability for new users (Lindgaard 1994).

1.7.3.4. IMPORTANCE OF MULTIMEDIA EDUCATION

Mohanty (2003), has rightly pointed out that multimedia has been popular in the age of science and technology. It helps learning, browsing through encyclopedia and reference materials starting from the circulatory system to an automatic explosion in commercial presentation, official exposition, and in creating 3D effects in many
ways. “If science is poorly taught and badly learnt, it is little more than burdening the mind with dead information and it could degenerate even into a new superstition.”- Kothari commission. This shows the need and significance of learning science to the present Technological scenario.

Everybody lives in a world of media. It is a visual culture. Living in an environment is influenced by media message of every kind. In recent years media assume an increasingly important role in every aspect of instructional planning and design. Learning is a steady and gradual process. Media implies an agency or carrier of messages or use of technology to transmit intended message to the receiver. It is helpful for placing the relationship of teacher-medium-student in proper perspective and enables the learner to acquire the learning objectives (Haseen Taj 2006).

Multimedia is a powerful new tool with interactivity especially in the hands of teachers and students. The multimedia technologies that have had the greatest impact in education are those that augment the existing curriculum, allowing both immediate enhancement and encouraging further curriculum development.

According to Vanaja and Rajasekar (2006), multimedia approach aims at providing meaningful learning experiences via a mix of media in order to achieve predetermined objectives. The choice of the media has to be done carefully so that one does not hamper or reduce the effect of the other i.e., each media must complement the other. Each multimedia package or program can be described at some level of effectiveness and efficiency. Computer-based multimedia package learning systems are effective if they have been empirically and scientifically shown to provide students a rich learning experience.

Specific features of such learning systems can be identified that promote fruitful learning. Less effective computer-based multimedia package systems produce average results, and are comparable to
traditional teacher-led instruction. They could be used simply to reorient
the locus of instruction from teacher to the computer without a drastic
change in student achievement.

Concepts are presented with a high “degree of transparency” so
that learners encounter the Botany in an illustrative representation, thus
maximizing time on task. For example, in many cases, more than one
representation more fully illustrates a particular concept. This second or
even a third representation is also incorporated or weaved into the unit,
and not approached separately or disconnected from the primary
representation of use.

Efficient multimedia package systems provide learners with an
encounter with a particular concept so that the students learn the concept
effectively and in a proportionally short amount of time (depending on
complexity). The student must carefully monitor his or her own
learning, and judge his or her progress.

Self-pacing becomes an important aspect of student interactions
with multimedia package. Self-pacing supports individual needs for
timely assessment. That is, the self mastery feature allows the user to
test himself or herself when needed or desired. The program’s capacity
for automatic scoring enables the student to reflect on the assessment of
his or her work, providing both quantitative and qualitative feedback.

1.7.3.5. STRUCTURE OF MULTIMEDIA AND ITS TYPES

As technology progresses, so will multimedia. Today, there are
plenty of new media technologies being used to create the complete
multimedia experience. In addition to computers increase their power
new ways of integrating media will make the multimedia experience
extremely intricate and exciting. Therefore, using multimedia in the
teaching and learning environment enables students to become critical
thinkers, problem-solvers, more apt to seek information, and more
motivated in their learning processes. Multimedia is slowly gaining ground as a way for students to represent the knowledge that they acquire in class and to construct their own interpretation of the information acquired. It also fosters collaborative and cooperative learning between and among students.

Based on the view of Damien stella (2004), there are three types of multimedia—Linear multimedia, Hypermedia and interactive multimedia. Linear multimedia is a kind of slide presentation in which the involvement of the user is restricted, whereas other programs are interactive and let the user control the flow of action.

i) Linear Multimedia

Linear multimedia was used in the early period. This type of multimedia was limited for advancing forward to the next screen or moving back to the previous page. The presentation can follow only a singly fixed path. The user can either speed up the path or pause the path but cannot change the sequence of pictures. This type of multimedia is called Passive Multimedia or Linear Multimedia. This multimedia is suited for making presentations and demonstrations that do not involve user’s interference.

ii) Hypermedia

Hypermedia is the recent form of multimedia that allows information access by a system. If you want any information about a topic available on the screen of hypermedia, you can just click on the topic with the mouse. These phrases are highlighted so that they stand out from the normal text. Hypermedia is useful in areas where vast information is required. Hypermedia is now used extensively to browse through the internet.
iii) Interactive Multimedia

Interactive multimedia enables one to steer freely through the labyrinth of sound, images and video clips of program. When you click on a predefined area namely hot spot, another file in the program the linked file consisting of an image, a sound file, a video clip, or a window filled with new information will get displayed on the screen.

1.7.3.6. ELEMENTS OF MULTIMEDIA

The elements of multimedia are,

- Graphics
- Text
- Animation
- Sound
- Video

Fig. 1.1. Constituents of Multimedia (Vaughan, 1998)

Interactivity is at the heart of multimedia applications Therefore, interactivity and interactive features in a multimedia application facilitate interaction between the computer and the user. A key feature in interactivity is that "It empowers the end-users of the application by
letting them control the content and flow of information" (Vaughan, 1998).

i) Text

Out of the entire element, text has the most impact on the quality of the multimedia interaction. Generally text provides the important information and text is the keystone tying all of the other media elements together. It is well written text that makes a multimedia communication better with multimedia technology, sound and pictures complement textual information to enhance the user’s understanding and retention of the presented information.

ii) Sound

Sound is used to provide emphasis or highlight a transition from one page to another. Sound synchronized to screen display, enables teachers present lots of information at once. Sound used creatively, become a stimulus to the imagination. Still images and a sound track allow the learner to utilize their own power of imagination without being biased.

According to Oxford Advanced Learner's Dictionary of Current English, a sound that is made artificially for example the sound of the wind or a battle, and used in a film/movie, play, computer game etc to make it more realistic (Hornby 2005).

iii) Video

The visualization capabilities of video can be immediate and powerful. The content of digital video provides new and exciting possibilities in education. Video can stimulate interest, if it is relevant to the rest of the information on the page. Video can be used to give examples of phenomena on issues referred to in the text.

Digital video files store moving picture information in a format that learner computer screen can play back under the control of learner is application (Gloughlin 1998).
iv) Animation

Animation is used to show changes to present information slowly to students so they have time to assimilate it in smaller chunks.Animations, when combined with user input, enable students view different versions of change over time depending on different variables.

Video microscopy has long been used as a valuable teaching tool, the use of computer animation in teaching has recently expanded. Animations can have advantages over video microscopy including simplification, unlimited resolution and magnification, ability to highlight certain symbols within a complex background, control of motion, shape, colour changes and the stepwise fading in and out of symbols (Goyal 2007). He has stressed in his study that the teaching of cell biology through animation is readily applicable to the teaching of all fields of science.

v) Graphics

Graphics provide the most creative possibilities for a learning session. They can be photographs, drawings, and graphs from a spreadsheet, pictures from CD-ROM or something pulled from the internet.

1.8. EFFECTIVENESS OF MULTIMEDIA EDUCATION

Each Multimedia package or program can be described at some levels of effectiveness and efficiency. Computer-based multimedia package learning systems are effective if they have been empirically and scientifically shown to provide students a rich learning experience. Specific features of such learning systems can be identified that promote fruitful learning.

Less effective computer-based multimedia package systems produce average results, and are comparable to traditional teacher-led instruction. They could be used simply to reorient the locus of instruction from teacher to the computer without a drastic change in
student achievement. An efficient computer-based multimedia package learning system will do all that an effective system can do, but in less time. A program is efficient that structures its lessons in such a way that students who have actually mastered a concept are moved on to the next concept quickly, naturally and meaningfully.

Efficient multimedia package systems provide learners with an encounter for a particular concept so that the students learn the concept effectively and in a proportionally short amount of time depending on complexity. The student must carefully monitor his or her own learning, and judge his or her progress. Self-pacing becomes an important aspect of student interactions with multimedia package. Self-pacing supports individual needs for timely assessment. The self mastery feature allows the user to test him or her when needed or desired. The program’s capacity for automatic scoring enables the student to reflect on the assessment of his or her work, providing both quantitative and qualitative feedback.

Multimedia learning represents one of the effective innovations in teaching-learning process. Classrooms are providing with individual attention which is an impossible task due to the strength. In order to cater to individual differences multimedia package learning serves the purpose of individualization. Multimedia package learning is used by the learner in improving the efficiency of his/her achievement level. According to Gaskell and Hepburn (1997), the present day schools do not prepare students appropriately for the changing technological requirements and increased effectiveness.

With multimedia the communication of the information can be done in a more effective manner and it can be an effective instructional medium for delivering information. A multi sensory experience can be created for the audience which in turn elicits positive attitudes towards the application. Multimedia has also been shown to elicit the highest rate
of information retention and result in shorter learning time (Ng and Komiya 2000).

Multimedia activities encourage students to work in groups, express their knowledge in multiple ways, solve problems, revise their own work, and construct knowledge. Through participation in multimedia activities, students can learn the tools; manipulate the way information is presented. Based on the view of Agnew et al (1996), on the part of the creator, designing a multimedia application that is interactive and multi-sensory can be both a challenge and a thrill, multimedia application design offers new insights into the learning process of the designer and forces him or her to represent information and knowledge in a new and innovative way.

The role of students and teacher is changed. It increases motivation and self-esteem. It gives effective collaborative techniques. A related technology effect stressed by many teachers has been the enhancement of student self-esteem.

1.9. NEED OF SCIENCE EDUCATION

In an increasingly complex world, it is critical that all students have extensive practice in what it means to think like a scientist. The skills essential in science education are "not only needed by scientists, but by every citizen in order to become a scientifically literate person able to function in a society where science has a major role and impact on daily life (Huppert et al 2002). According to Dalton et al (1997), educationists and researchers have begun to look carefully at science education and how students learn best. It is generally accepted that students learn best by doing-particularly in science courses.

Science education is to play an effective role in helping science to human needs. The science educator will need to pay attention not only to those needs as survival, development and perceived, but also to the satisfaction of human needs in the affective domain.
Right from the time a child is born, he comes in contact with the forces of nature. There is a natural curiosity in him to know about all of them. Consequently, he asks endless questions and tries to investigate and explore all objects and events happening around him (Promila 2009). The facts gathered through nature study are subjected to verification through more systematic observation and experimentation of the objects and processes of nature. In this way science teaching proves a potent source for the learning, understanding and applying science throughout one’s life.

Life sciences and biological sciences help one to understand life in all aspects. Now-a-days a lot of effort is being made by scientists in improving certain species of plants useful to man. Agricultural scientists are developing good varieties of seeds which will yield not only a large quantity of food products but also of much better quality by cross pollination. The knowledge of hereditary laws also helps one to understand that healthy parents beget healthy children.

The goal of biology education is to teach students a framework of basic principles and approaches that can later be used to solve biology-based problems. Teaching in biology-based education is to understand the basic principles of the content material in a meaningful way. The aim of the study is to present biological education material through interactive method via computer based packages. It gives much effect now, and to what depth, principles and content are available to students. For an effective programme of science in the category of botany adequate teaching materials are also essential. The learning of botany should extend beyond the classroom usage. Students know a great deal about the world and they learn best when their learning connects with the world they know. Therefore the redesigned learning environment includes different strategies with much interactivity.
The work of several scientists in the nineteenth and twentieth centuries helped people to recognize that any living organisms is alive by virtue of its ability to move, feed, breathe, reproduce and respond to external stimuli. The living organisms are made up of cells. Hence in the subject of botany, among the other units, learning of cellular organization and genes gets its own importance because of further learning in biotechnology, recombinant technology and tissue culture.

1.10. THE PLACE OF BOTANY IN LIFE

The area of flora, fauna and biodiversity are quite interrelated. In the present context many varieties of flora and fauna are in the list of endangered and extinct. Plants are the essential one which problems oxygen controls global warming. So conservation of flora and fauna is of paramount importance to the world. Thus biodiversity conservation serves as a bank for the future.

Biology is the study of living organisms. Biology is divided into three major subjects mainly botany, zoology and human biology or physiology. Botany is the study of plants. Zoology is the study of animals and human biology or physiology is the study of human beings.

The word botany is derived from a Greek word, Botane which means plants. Botany is one of the fundamental sciences and knowledge of plants is essential for the life of man. People are indebted to plants for their very existence. They provide one with food, clothing, shelter, drugs, oils, dyes, gums, resins, rubber and many other necessities of life. The study of plants contributes to a liberal and balanced education. Plants are the most conspicuous of living organism that cover the land and water. Beautiful green world which surrounds the people inspires, uplifts their spirit and adds immensely to their enjoyment. So botany is studied under different branches. Here the researcher has chosen the branch of plant cytology and genetics that is the study of the internal (microscopic) structure of plant cells.
In the earliest times interest in plants was confined to their useful properties. The instrument microscopes only brought a standard which permitted any real progress in plant anatomy.

After the Napoleonic wars there was very active scientific and industrial development in Germany and about 1840 German optical factories began to produce achromatic lenses. With the new lenses it was possible to study effectively the growth and division of cells and within a period of about thirty years, the state of botanical knowledge was completely transformed.

In the early years of the twentieth century the progress of the botany was greatly influenced by the theory of inheritance due to Mendel in 1900. Mendel’s work gave a great impetus to studies of inheritance called genetics and to investigations on the chromosomes called cytology (Singh 2009).

1.11. IMPORTANCE OF TEACHING AND LEARNING BOTANY IN CLASSROOMS

According to Sidhu (2006), the greatest discovery ever made in human thinking was to look and see for determining the presence of a thing. The scientists cannot construct or confirm any theory without the aid of facts. The history of science is full of instances of simple observation of facts that have led to the formulation of important theories. Theories must be tailored to fit the facts and remodelled whenever new facts reveal the need for such action.

In the comprehension of complex phenomena, science employs the method of analysis. The most difficult problems of life can be better comprehended by breaking them into parts and by attending to each part separately. Teaching is an important step in classroom learning. It proceeds by resolving gross total situation into elements in order that the teacher may give each part with her separate and undivided attention.
Learning botany is a combination of understanding, conceptualization and practical experience. These experiments are the most effective ways to simplify and clarify the comprehension of complex theory by using teaching strategy. However, there are inconveniences with these traditional educational methods due to the constraints of geography, time schedule, supervision, materials and cost. Multimedia learning environments open new realms in the teaching, learning and practice of the life sciences especially in the subject of Botany. Multimedia learning environments provide students with the opportunity to achieve learning goals. Computer based software’s are the successful tools to supplement traditional teaching methods.

In teaching, instructional design refers to the strategic design and development of instruction for the desired objectives. It incorporates the theories of learning, principles of communication and hypotheses for interest, motivation and participation of learners. Instructional technology implies the techniques and methodologies of instruction which are linked with the effectiveness and efficiency of the teaching learning process. Teaching competency is the skill, ability and capabilities possessed by the teacher so as to make the teaching learning environment effective and productive thereby realizing the full potential of teacher as well as students and in turn achieving the goals of education.

Teaching of biology is very important because it explains human beings and their interaction within the globe. Effective teaching learning process of biology enhances clear understanding of the content. Better understanding of the content leads to creativity and new innovations in biology. So biology mixes with technology in classroom teaching can create the learner interest. As long as technology is balanced with the teaching of social and traditional academic skills it has the potential to
revitalise a classroom by appealing to different intelligences in students so that learning is more effective.

1.12. STATEMENT OF THE PROBLEM

This study is an attempt to develop a package for effective learning in school environment. Conventional teaching is a normal method of teaching process / strategy in the normal school curriculum. If the conventional strategy is modified using technology then the level of understanding and learning of the students is much easier, knowledge of the subject was transformed from one generation to the next generation without commendable change, unless deliberately tries to bring forth transformations. The main focus of knowledge transmission in this study has been teaching of Botany through multimedia package. In the higher secondary school curriculum, among science subjects, botany predominates and occupies its major position.

The topic for the research is "EFFECTIVENESS OF MULTIMEDIA STRATEGIES IN LEARNING BOTANY AT HIGHER SECONDARY LEVEL".

1.13. NEED FOR THE STUDY

In the present system of school education, the primary source of teaching is the text book. Sometimes supplementary reading material is available for certain subjects and some reference books. However students have to rely upon textbooks and depending on their interest as well as the availability of material, they try to acquire more information through supplementary material and reference books. The teaching and learning system follows only the text book. The need of the hour is, basic content of the subject or theme in the teaching and learning process, must be structured in a linear manner with the help of computers in the form of technological package.
Traditional education approaches have resulted in a mismatch between what is taught to the students and what the industry needs. Many institutions are moving towards technology based learning as a solution to producing students who are creative, can think critically and analytically. So the need of using multimedia technology as an innovative teaching and learning strategy by giving the students a multimedia project to train them. One can see many signs of this paradigm for learning, as it affects the minds of the students, Lectures, textbooks and textual websites are the typical non interactive media for affecting the transfer of learning.

During the second half of the 20th century, science and technology have received a lot of outstanding results. However, many millions of children throughout the world encounter huge difficulties in studying various school disciplines: from mathematics and science to literature and foreign languages. The inability to master school disciplines is a very essential cause of numerous conflicts between children, adults, teachers and parents. The shortcomings of school education are the cause of difficulties encountered by many college students in mastering the learned disciplines.

Everyone needs to use scientific information to make choices that arise everyday. Everyone deserves to share the excitement and personal fulfillment that come from the understanding of science and the process of science contributes to think creatively, make decisions and solve problems.

Scientific knowledge has an important role to play in this modern technological world. There are a number of avenues where the knowledge of biological science finds an application. The study of science not only gives knowledge but also prepares the students for their higher studies and future vocations, knowledge of biological science
should identify the students and provide them additional training and guide them to pursue further studies in biological science.

After technologies are obtained, school district need to ensure that all students have technological equity and equal access to the learning tools of the 21st century. Obtaining the technology for schools serving at risk students is just the tip of iceberg. Larger issues concern staff development needs. Because students often receive computer based instruction in a separate computer lab, regular classroom teachers may have little contact with the technology (Jain 2005). Conventional method of teaching and learning is limited to text only. Using diagrams, charts, blackboard, models, aids, techniques and repeated drilling and others makes the students have rote memory to achieve more marks.

Nowadays a paradigm shift from conventional teaching and learning to media oriented teaching and learning has formed. For effective Botany teaching and learning, various diagrams, simulations, aids, drawing and graphical representations are needed in the classroom and these can be effectively used with the help of the computer. Advanced technology like computer and internet are being used at various levels to improve botany learning.

Some examples of correlation within biological science are structure and functioning of the eye which can be related with functioning of the camera, the photosynthetic activity is related to the bio-chemical reactions taking place in the plant body, various metabolic activities in the living organisms, formation of curds, softening of bread and structure of cells, atoms and molecules all form part of biology.

So the present study is an attempt in this direction. If the content of botany is delivered through the multimedia technology, learning botany is much easier in the understanding level of students. In the present scenario, multimedia dominates its position and the researcher feels that very few studies are on the topic cell biology and genetics.
Hence learning botany through multimedia package stresses the effectiveness.

In Botanical laboratories, one can use electron microscopes, radioisotopes, digital imaging analysis, polymerase chain reaction, cell and tissue culture, satellite imaging and telemetry. Botanists can grow entire plant from a single cell. This has exciting potential in biotechnology, horticulture, forestry, and plant pathology. Besides food, plants provide raw materials for paper, building materials, solvents and adhesives, fabrics, medicines, and many other products. They study the chemicals produced by different plants to find new uses for them.

Teaching botany is a challenging and rewarding career. A teaching botanist must understand a variety of sub-disciplines of the field and be able to explain them to students. This provides an opportunity to inspire new generations with an understanding of new facts in relation to plants. We are learning more and more about plant genes and what they do. Now botanists are turning their attention as to how genes work, or express themselves. One of the most exciting fields in Botany today is biotechnology and genetic engineering. Because of recent advances in genetics, plant scientists have tools to splice genes from one plant into another. The potential usefulness of this is staggering. Biological diversity also provides an important source of new genes to improve the plants.

In developing countries like India very recently e-learning occupies a major role in the field of education. In higher secondary level science has mainly concentrated into four divisions such as Physics, Chemistry, Botany and Zoology. Botany is taken for study for its nature and life oriented subject In Botany syllabus the chapters of Cell biology and genetics are taken by the researcher to develop software package and to enhance learning for the concept at higher secondary level. The researcher developed three different methods on Cell biology and
genetics in botany at higher secondary level. The three different methods are programmed learning method, Computer assisted instruction and multimedia packages.

There are many studies in abroad, using PLM (programmed learning method) and CAI (computer assisted instruction) methods to enhance science learning. In India less number of studies is available on multimedia. So the researcher has developed multimedia package method in ‘learning botany’. The multimedia provides much interactivity with animations, more pictures, sounds and videos to each and every part of the unit. At the end of each part of the content, it contains multiple choice questions to check the students’ understanding level then and there.

1.14. SCOPE OF THE STUDY

In India, the field of education is still in its developmental stage. The existing schools are not fully equipped in terms of human as well as material resources to meet the diversified needs of children. Identification and assessment procedures of teachers with better teaching competencies are of importance in educational system particularly at teacher education level. Teaching and training strategies, guidance and counselling activities should be planned, based on the assessed needs of these teachers. At the same time, the teachers from the school levels need the regular intervals of utilization of information communication technologies (ICT) devices and day-to-day modernization is important in this field.

Man has always been curious to find answers as to the mysteries posed by the reality he lives in. One of the deepest searches for the answers to how he came to be, how world originated, how and when he and all living beings emerged from the nature they live in. All these questions are answered by biological science.
The knowledge of biological science should prepare an individual to lead a complete life. It should prepare the individual to lead a happy and peaceful life. The student of biological science should develop the appropriate attitudes like open-mindedness, appreciation of nature, problem solving skills and non-belief in superstitions. These attributes will help an individual technically competent to face the challenges of the modern world.

Science and technology progress encourage the study of some subjects. Most of the effort in biological science teaching is directed, these days to improve the condition of life and in tackling the new problems that arise. The study of botany / biological science is quite useful and helpful in the eradication of certain problems. With the fast changing times more and more special emphasis on the departments like health, medicine, agriculture, animal husbandry and social problems like population education and female infanticide and others. Development of hybrids and transgenic plants resistance to diseases and pests are the most important contributions of science in the field of botany.

Botanists study many different facets of life from the molecules that makeup individual cells to the behaviour and ecology of plants. The knowledge of botany also helps in understanding the bio-chemical processes and the metabolic reactions occurring in the living cells. It throws light on the genetic material the DNA, RNA and their role in hereditary and reproduction. In depth understanding of cell biology and genetics leads to solve a lot of life problems especially in the case of chromosome which determine the sex and not the individual parental who decides.

According to Ameetha (2005), cell biology is the study of the physiological properties of cells and their interaction with one another and there environment on the microscopic and the macroscopic level. Genetics is the branch of science that relates to the study of genes and
biological inheritance by which a predisposition to parental traits is passed on to the offspring at conception.

Thus study of botany envisages critical thinking and scientific enquiry. So the individual does not make harm for the society and behave as responsible citizens of society. It also develops the field of agriculture by scientifically produced seeds, hybrid vigour and improves the country like India. The knowledge of botany has helped the green revolution. Even in the field of medicine, medicinal plants and its products improve the value and life span of human life.

Great advancement has occurred in the field of cytology and genetics, resulting in the development of many scientific techniques which is related to the basic chromosome structures, DNA and RNA. This has resulted in the exploration of biological principles pertaining to plants, animals and man. Gene pool preservation, chromosome mapping, genetic disorders, genome are the result of this explosion of knowledge. Therefore, the researcher has given much importance to the topic of cytology and genetics.

Other important aspects are the environmental degradation due to pollution, population explosion, deforestation, depletion of natural resources and ecological imbalance. Botany is the study of plants, its nature and the living environment. A botany student should be able to recognize the importance of the environment. The student community should understand the need for conserving nature and other living organisms.

Creating awareness about the interrelationship among the environment and life, study of plants is necessary. Afforestation, plant gene pool, cryo-preservation and tissue culture and others help in improving, maintaining and preserving the global environment pollution free.
As on today botany is not taught as a theoretical subject or as a research discipline but as a medium, which helps in developing the complete potentialities of the learner and in making him a useful and efficient citizen of the modern society. The teaching of science especially botany should prepare the individual to face the challenges of this modern technological world.

This study is of multimedia package learning in Botany at higher secondary level students conducted in the district of Salem which is located in state of Tamilnadu in India. The investigation was restricted to Salem Educational District of Tamilnadu State in India. Further, higher secondary school stage of education is a crucial one. The study may enable the endeavours that are being made to enhance the status of students, for the successful implementation of all botanical knowledge reforms.

This study helps to implement suitable measures for improving Botany learning in higher secondary schools. The country needs competent, contented and committed classroom software for teachers at higher secondary school stage of education to influence the students learning part. This type of study would highlight the need for effective utilization of the interactive software to botany teachers and mainly to the learners at the higher secondary school stage of education.

1.15. SIGNIFICANCE OF THE STUDY

Educators around the world have recently have begun to focus on the gap between what is taught and what is learned. Learning for life in the 21st century requires equipping children with basic education in literacy and skills for living. In this approach to learning, teachers and students need to relate in new ways so that the classroom experience, the very process of learning becomes a preparation for life. The learning environment must also be transformed to one that is active and child-centered, (Bellamy UNICEF 1999).
When students are using technology as a tool or a support for communicating with other, they are in an active role rather than the passive role of recipient of information transmitted by a teacher, textbook, or broadcast. The student in activity making choices about as to how to generate obtains, manipulates or displays information. Technology use allows many more students to be actively thinking about information, making choices, and executing skills than in typical in teacher-led lessons. Moreover, when technology is used as a tool to support students in performing authentic tasks, the students are in the position of defining their goals, making design decisions, and evaluating their progress. Effects of Technology on classrooms and students:

According to Mihkel Pilv (1998), the learners' expectations are related to: i). A mode of self-learning done at preferred time and place; ii). Easy access to more resources; iii). Following a personalized curriculum correlated with individual's background, goals and possibilities.

The teachers have the challenge of experimenting with new methods of teaching. They are realizing their role in changing and the accent is now shifted towards collaborative work and the interpretive role instructors play in discussion forums.

One can develop new ways of presenting age-old educational concepts to maintain and develop a system where learners can build up their very own understanding about the world and give them access to learning resources and information. Education will always continue to be a collaborative effort and dialogue between humans. Technology will never substitute for teachers and interaction with other learners. But one does not have to have face-to-face interaction. To have interaction; one can interact via technology.
Educational media are crucial to the individual learner because they represent an alternative mean of his accessing relevant information in the absence of the traditional teacher, education media serves as the carriers of messages. Many of the media messages are accessed by the individual learner in his classroom, others obtained in a school resource centre, and still others must be obtained from remote locations. Television, dial access systems, shared time computers and the telephone are all techniques for accessing remote educational material (Venkataiah 2000).

The involvement of varied physical senses may provide improved access to written material for deaf and hard of hearing students. Interactive videodisc systems provide a multimedia environment that combines television and computer based instruction. This technology integrates text, audio, graphics, still images and moving pictures into a single topic presentation. It offers students a chance to acquire information through both video and audio, and at the same time interact with the computer (Ritten house et al 1997).

In the present scenario rote learning occupies a major part, while learning the concept alone, among private government and government aided at higher secondary schools. Repetition gives rise to boredom. This leads to gradual loss of concentration and interest, restlessness, irritability and an increase in careless mistakes. Personal responsibility and enthusiasm for learning are fostered when students are provided with different learning methods at their own pace.

This is one of the reasons, why the researcher had taken this study to make the learner learn botany through multimedia package and improve the understanding level of science instead of rote learning. In the present era, due to the technological up gradations of science, the importance of the real understanding of science with technology gets its own importance.
1.17. OBJECTIVES OF THE STUDY

The objectives of the study are,

i) To prepare and validate programmed learning materials, computer assisted instruction and multimedia package for learning Botany at higher secondary level.

ii) To find out if there is any significant difference between their pre and post test achievement scores of students who learnt Botany through

   a) Conventional teaching.
   b) Programmed Learning Method (PLM).
   c) Computer Assisted Instruction (CAI).
   d) Multimedia package (MMP).

iii) To find out if there is any significant difference between and among the groups of various strategies

   a) Conventional teaching.
   b) Programmed Learning Method (PLM).
   c) Computer Assisted Instruction (CAI).
   d) Multimedia package (MMP).

iv) To find out if there is any significant difference in conventional teaching methods between

   a) Government aided and private school students
   b) Boys and girl students
   c) Rural and urban area students

v) To find out if there is any significant difference between the students who studied Botany through PLM among

   a) Government aided and private schools
   b) Boys and girls
   c) Rural and urban area

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vi) To find out if there is any significant difference between the students who studied Botany through CAI among

   a) Government aided and private schools
   b) Boys and girls
   c) Rural and urban area

vii) To find out if there is any significant difference between the students who studied Botany through MMP among

   a) Government aided and private schools
   b) Boys and girls
   c) Rural and urban area

1.18. CHAPTERISATION

Chapter – I include a clear picture of general introduction and Chapter – II presents with review of literature of studies related to this study. Chapter – III explains the plan and procedure of the study, the methods adopted for the study, sample selected, the tools and techniques with which the data are collected, the procedure employed for collecting the data and the statistical techniques applied for the analysis of the data. Chapter – IV describes the analysis and findings of the study and Chapter – V deals with the discussion of the results and the outcomes of the study, major findings of the study, implications of the study and suggestions for further research related to this area. List of tables and figures are given before Chapter – I. Appendices are given at the end of the thesis.