CHAPTER -I

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1.1 Background of the Study

There has been a phenomenal expansion of technician Education since independence. In 1947, when our country got freedom there were only 53 Polytechnics. Today the number of polytechnics is 2000, and there are about 200 polytechnics in Karnataka. The polytechnics of yester years offered 3 years diploma programmes primarily in civil, electrical and mechanical engineering. Over the years the number of diploma courses offered by polytechnics increased to 100. In late 1960s there was a shift in emphasis from expansion to consolidation and quality improvement. As a result, efforts were directed to embark upon qualitative changes in technician education. One such a scheme was the establishment of four TTTI'S one in each region. The main purpose of establishing TTTI'S was to revamp the technician education at the diploma level qualitatively by introducing long term and short term training programmes. The purpose was to train teachers of polytechnics as well as their administrators. According to Malothra commission (1990) polytechnic education suffers from identity crisis.
The revised education policy attached more importance to All India Council for Technical Education (AICTE) in the development of technical education. The council mandate included programmes on education, research and training in engineering and technology, planning, management and allied fields.

Multimedia technology emerged as a second wave in the application of media use in Educational technology advantage of technology developments in computers and communications. The first wave may be considered to be the technology developments in audio, video and TV media which occurred about 25 years ago. The first wave raised high hopes of new technologies revolutionizing the teaching-learning practices world-wide. It was even suggested that they would make teachers subservient to media use very soon, the over-enthusiasm disappeared. The teacher regained his pre-eminent position. He emerged with a changed perception of his role and responsibilities and of the student needs. Thus the role of the teacher is not view as threatened by media. The new technologies are viewed today as adjuncts to complement the classroom processes. The second wave a better chance of success, not only because the computers are swift and accurate means of information management and therefore manage media channels together and
better. Studies on the theories of learning have demonstrated that more than one sensory channel dramatically improves comprehension and learning. (Natarajan, 2001)

1.2 Need for Developing Multimedia Learning Package

Past surveys (Malhotra, 1989) indicate that most of the instruction in polytechnic is mostly teacher-centered. The teacher uses verbal mode of passing information. The urgent need is to utilize the available infrastructure facilities and human resources for improving teaching effectiveness in polytechnic system.

Introducing new technology to this system can bring changes in the education system. The multimedia has the power to change the process of learning. The word multimedia refers to the integration of multiple media such as text, sound, video, graphics and animation, which together can multiply, the impact of the message. It can also be defined as a class of computer-driven interactive communication system that creates stores, transmits and retrieves textual graphic and auditory composite of information. The multimedia notion marks an improvement over the earlier traditional notion of “audio visual” media. Further, interactive multimedia refers to ability of the computer based media to control these components and interact with the user as needed. Multimedia
or any other computer based information technology cannot be substituted for a presenter. It provides the presenter with a powerful tool that can greatly enhance communication by delivering multisensory experience.

1.2.1 Middle Level Technicians Training

In our country, Industrial Training Institutes (I.T.I), Polytechnics and Engineering colleges are the three kinds of technical institutions which train people to acquire technical skills. The I.T. I’s train the persons to acquire skill in certain basic technical areas which include jobs such as wiremen, fitters, turners, linemen, tracers etc. The person acquiring such skill is called a craftsman (Tapas, 1997).

Polytechnics are also technical institutions but they are of a higher level than the I.T.I’s. They may be called middle-level technical institutions. They offer courses of three year duration. Polytechnics train the students in graded manner and impart knowledge of principles of basic subjects like communication, science, mathematics, mechanics etc. to begin with. The students are also introduced to workshop, drawing room and laboratory. An elementary knowledge is provided of the specific branch of technology which the student has chosen. All these are done in the
first year of the course. In the second and third years, advanced knowledge of the selected field is imparted together with necessary supplementary knowledge from relevant fields of study. The students are trained in practical skills also. Thus a diploma indicates that the student has acquired just essential theoretical knowledge combined with practical skill. This skill is of higher level than that provided by an I.T.I. The products of polytechnics are called technicians.

1.2.2 Multimedia and Theory Teaching

In the third semester curriculum of Diploma programme for technicians in Electrical and Electronics Engineering a subject “communication Electronics” is included. The curriculum contains a very important topic namely “fiber optic communication”. Students are required to study the concepts, principles, rules, and laws in this topic which lays theoretical foundation for other subjects the students will be studying during the rest of the diploma programme.

The topic of fiber optic communication includes a number of concepts such as electromagnetic radiation, laws of reflection, refraction, refractive index, conditions for total internal reflection, propagation of radio waves, etc. They have to be taught by providing
practical demonstrations wherever possible in order to understand the concepts clearly.

1.2.3 Multimedia and Learner Numbers

In the polytechnics in India, there are many constraints in providing practical experience for individual students. For every teacher, there are around 30 students to be taught and guided amidst limited laboratory resources for practical work. Individual interaction is a causality in theory as well as practical classes. In view of the above, there is a felt need for the development and use of multimedia learning package for facilitating students learning of concepts in electrical and electronics engineering. In general the fiber optic communication is not an exception to this situation.

1.2.4 Education System- Preferred Destination

The above considerations show that the educational institutions are the neediest destination for multimedia. Multimedia provokes radical changes in the entire teaching-learning process. Teachers can become facilitators, counselor in the process of learning instead of being primary providers of information; thereby the teacher will become secondary in the core learning process. Multimedia learning packages are becoming substitutes for traditional teacher-centered methods.
1.3 Current Uses of Computers in Education

Arthur C. Clarke wrote "Development in the field of computers have been so swift that yesterday's miracle is today's obsolescent junk". With increasing versatility of powerful computers, flawless software suites, and improved inter-connectivity, computers have enabled new creative applications in the management of information and communication.

A decade ago, computers in education primarily meant the use of the computers to assist and manage instruction, to conduct research, and to administer the school. Today, computers in education mean much more. Computers are interactive story tellers; excellent means to produce and present multimedia programme; vehicles for interactive communication among people; gateways to the information world 'electronic publishing medium; tools for managing and assessing instruction; resources for teaching and learning; virtual reality; and the private multimedia tutor.

1.3.1 Multimedia Kits and Package

Multimedia Learning Kits: Multimedia kits which incorporated a variety of media focusing on one topic became popular. However, with the advent of computers, the kits recorded to the background. There is growing interest in microcomputers.
The multimedia concept involves using multiple media for a given instructional purpose. It involves synthesizing different media into a structured systematic and wholesome presentation. Each medium in a multimedia system is designed to complement the others so that, ideally, the whole multimedia system becomes greater than the sum of its parts. MM system is multisensory and stimulates learning. The mm kit may include film strips, slides, auto tapes, records, still pictures, study prints, over head transparencies, maps, works sheets, charts, graphs, booklets, real object and models (Mann, 2007).

The multimedia kit clearly states the objectives and supported with suggested teaching strategies for using the materials. MM kits can even be prepared by teachers. It is important that the components of the kit be integrated that is, each component contributes to attainment of the lesson objectives. MM kit should be designed to teach specific knowledge and skills, they should involve the student in the learning process as he handles and manipulates the resource materials. It is used in making learning enjoyable as they are multisensory.
Multimedia Learning Package (MMLP)

“A multimedia learning package is self-instructional and contains a set of learning materials presented through suitable media organized in proper sequence to help a learner to achieve certain specific learning objectives”. A multimedia learning package uses more than one medium in presenting information. (Sivakumar, 2005)

Essential characteristics of multimedia learning package

Multimedia learning packages is a self-contained interactive instructional delivering of system consisting many channels of communication designed to fulfill explicitly stated objectives. The learner should be able to asses for himself the extent to which he has achieved the stated objectives through a self administered post test. The self tests within the lesson are not in the usual sense. These tests are learner scored progressive tests and tell the learner whether he is ready to go ahead or need to repeat.

In order to keep the learner active during the learning process, worksheets, instruments, kits, equipments operate as part of the package.

Multimedia Learning Package Contains step-by-step instructions, purposeful learner activity, provision for self
assessment and feedback invariably built in as the learner passes through the course of interaction.

1.3.2 Computer Aided Instruction (CAI)

In computer assisted instruction the student interacts directly with the computer which stores the instructional materials and control its sequence. Computer can facilitate most effectively the methods such as drill and practice, tutorial, gaming, simulation, enquiry and dialogue, discovery and problem solving, intelligent tutoring etc, computers can be used on time shared basis to perform any instructional function presenting materials or problem solving situation guiding a student's thinking by answering his questions, assessing his performance, managing his path through a course by selecting the material to be presented.

1.3.3 Computer Managed Instruction (CMI)

Computer managed instruction (CMI) refers to use of a computer system to manage information about learner performance and learning resource options in order to prescribe and control individualized learning. It is a known fact that each student has different learning styles; with the help of computer one can solve this management problem by administering diagnostic tests, scoring it, prescribing appropriate next steps, monitoring the progress of
student all the way along the learning steps, and maintaining records about student’s progress.

1.3.4 Computer Based Instruction (CBI)

Computer based instruction includes a broad range of application that can be divided into the two general categories of direct instruction and instructional management. The computer is not in itself a technology of instruction. It is a tool that can be used to present programmed instruction, programmed tutoring and other instructional formats on demand of individual learners. Computers have extensive capacity to store and manipulate information, and its unmatched ability to serve many individual students simultaneously is widely used in instruction. The computer can also record, analyses, and react to student responses that are typed on a keyboard. There are two orientations of computer base instruction: computer assisted instruction (CAI) and computer managed instruction (CMI). Both the types together make computer based instruction (Kumar, 2003).
1.4  Content and Context for Multimedia Use

1.4.1  Nature of Content and Multimedia Use

Nature of content matters when we develop material for multimedia application. Teaching content where multimedia may be a suitable technology to use are:

1. Content which is difficult to visualize, such as microscopic processes, abstract concepts and events which cannot be repeated.

2. Content which is three dimensional, which is difficult to visualize using traditional two dimensional media such as books, black board and overhead projector.

3. Content which have dynamic processes, which require understanding of the relationship between moving objects. Content which covers broad contexts, where a number of ideas need to be linked to form an understanding of the whole, not just the parts.

4. Content which require simulation of expressive or complex processes, where understanding may be hindered by the mechanical details of performing the process. or where there is no possibility of using the real equipment is called virtual

5. Content which has the random access capabilities of new technology are needed in order to give students control over the sequence of audio-visual content.

6. Content which involves concepts or skills that are difficult to teach by other means

7. Content which has storage and random access capabilities of new technology are needed in order to give students control over a large volume of text.

8. Content where interactive capability of new technology is needed for students to be able to control the sequence of their learning activities.

9. Content which require interactive capability of new technology can be utilized to give students feedback on their actions in such a way that their knowledge or understanding is likely to be improved.

10. Content which require adaptive capability of the computer can be utilized to adjust the teaching to students learning needs. (Drewry, 1999).
1.4.2 Some Contexts for Multimedia Use

Some teaching contexts where multimedia may be a suitable technology to opt are:

1. Context where students need repeated and adaptive practice in processing in their responses events or tasks to enable them to acquire a degree of automaticity in a skill or their access.

2. Context where students need to be motivated to focus an adequate amount of attention, high level of concentration on subject matter content.

3. Context which improves access to instruction.

4. Context which complements a wide variety of learning styles.

5. Context that require non-threatening, allowing participants with varying knowledge and skills to obtain instruction in a more comfortable manner.

6. Context that enables individuals to choose a convenient time and place for learning.

7. Context that increases instructional effectiveness, because learners can review each topic as much as they need to, and do not have to progress to the next topic until they feel
ready; that requires individual monitoring, assessment and immediate feedback to participants.

8. Context that results in increased retention because each learner has the same level of participation in the learning process.

9. Context that allows consistent, standardized presentation of material easy updating of materials and reduces training time and costs.

10. Context where there is increased access to education in subject areas a shortage of specialist staff.

11. Context where students have low prior domain knowledge or spatial learning aptitude.

12. Context where multimedia learning package can be used as supplement to existing or traditional methods of instruction.

1.5 Statement of the Problem

A Study on the Effectiveness of Multimedia Learning Package on Fiber Optic Communication in Technician Education
1.6 Objectives of the Study

1. To develop a Self Instructional Program Book version on fiber optic communication for the second year diploma students and to evaluate the effectiveness of textual presentation.

2. To package the self instructional program (SIP) with multimedia features such as synchronized voice, contextual visuals and reading supports, and computer based features such as controls, feedback, and self-test to get CBML Basic Package.

3. To get Multimedia Learning Package Remedial Adjunct material (RAM) branch version by building into CBML Basic Package with adequate remedial adjunct materials as branches at error prone points.

4. To get Multimedia Learning package Remedial Program Chunk (RPC) branch version by building into CBML Basic Package adequate remedial program chunks as branches at error prone points.

5. To evaluate and judge the relative effectiveness of above three versions CBMLP – Basic, CBMLP – RAM branch, CBMLP – RPC branch presentations.
1.7 Hypothesis

Given the essential entering behaviors and self manageable controls such as pacing, feedback and remediation, the multimedia presentations do not differ significantly in terms of learning gain percentage. The preference is in terms contextual and individual advantages and disadvantages.

1.8 Limitation of the Study

1 The multimedia learning package developed is for second year Diploma in Electrical and Electronics Engineering students of Karnataka State.

2 The multimedia-learning package covers only on fiber optics communication unit in communication electronics subject for second year Diploma in Electrical and Electronics Engineering Students of Karnataka State.

1.9 Terms and Definitions

Achievement test: A test that is designed or administered in order to assess a person’s achievement in a particular area.

Branching programme: A programmed learning sequence that incorporates branches i.e. points at which the learner is directed to alternative items depending on his/her response to the item just tackled of linear programme.
Content analysis: A detailed study of the contents of a course carried out in order to check that the course covers all the president subject matter content. The results are often precedent in diagrammatic or quantitative form.

Frame: In programmed instruction, one unit in a series of prompt-response reinforcement units, a block of verbal/visual information.

Fiber Optics: Communication infrastructure that uses optical fibers for transmission. Optical fibers transmit large amounts of complex and varied information such as text, sound, pictures, and graphics more quickly and efficiently than traditional copper wires.

Feedback: A technique used in programmed learning to give the learner immediate knowledge about the correctness of the response made by the learner.

Instructional program development: The process of analyzing needs, determining what content must be mastered, establishing educational goals, designing materials to help reach the objectives and trying out revising the program in terms of learner achievement.

Interactive multimedia (IMM): The use of multiple media such as sound, video, text, graphics, animations, photographs on a single
desktop computer which enables the user to interact with the media in some way.

**Module:** An organized collection of learning experiences assembled in order to achieve a specified group of related objectives.

**Multimedia (MM):** Multimedia can be defined as an integration of multiple media elements such as audio, video, text, graphics, animation into one synergetic and symbiotic whole that results in more benefits for end users than any one of the media elements can provide individually.

**Multimedia Learning Package (MMLP)**

A multimedia learning package is self-instructional and contains a set of learning materials presented through suitable media organized in proper sequence to help a learner to achieve certain specific learning objectives.

**Pre test:** A test administered prior to course or program of instruction in order to determine the entry behavior of the learner.

**Post test:** Test administered after the completion of course or program of instruction in order to determine the extent to which the learner has achieved specified objectives.
Programmed Instruction: It is a process of arranging material to be learnt in a series of small steps designed to lead a learner through self instruction from what he knows to the unknown having new and more complex knowledge and principles.

Remedial frame: A frame programmed instruction sequence that forms part of a remedial branch. A specified unit of instruction designed to overcome a particular learning deficiency in a learner.

Remedial branch: In a programmed instruction a branch, a loop, or sequence in a branching programme that causes the learner to be exposed to remedial material.

Remedial material: Instructional material designed to help a learner master matter, skills, etc. with which difficulty has been experienced.

Student gain: Improvement in student or learner performance or knowledge attributed to a particular course.

Technician: Technician is a link between the technologist and the craftsman. He understands the new technology developed by the technologist and after explaining the same, makes the craftsman to follow it.