CHAPTER –I

INTRODUCTION

1.0 INTRODUCTION

Twenty first century is the age of Information and Communication Technology (ICT). “The illiterate of the 21st century”, according to futurist Alvin Tofler, “will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.” All over the globe, there is a trend to use ICT in the teaching-learning process. The teacher and learner must gain access to technology for improving learning outcomes. Educational reform includes successful designing and implementation of ICT in the teaching-learning process, which is the key to success. There is a rapid shift of educational technologies, so as to shape the structure of the system of education across the globe. Efforts must be made by the educationists to change the process of teaching-learning in order to prepare the students to adjust themselves to the society which is rich in information and technology (Desh, 2007).

Not only this, the information is growing exponentially today. According to the faculty of Emory University, “In the Nineteenth Century, it took about fifty years to double the world’s knowledge. Today, the base of knowledge doubles in less than a year” (Emory University, 2006). Without question learning must be understood as a lifelong endeavour. Teachers as well as administrators must foster a collaborative environment to become role model of continuous learning. And to cope with the explosion in information, ICT is the only way out.

ICTs stand for Information and Communication Technologies and are defined as a diverse set of technological tools and resources used to communicate and to create, disseminate, store, and manage information. These technologies include computers, internet, broadcasting technologies and telephony. They also refer to a range of technologies including computers, computer work stations, display facilities, hardware, software, recording and processing system for sound, still & moving

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pictures, graphic calculator and wide range of communication facilities present in world. It has been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by making teaching and learning process into an engaging, active process connected to real life.

ICT can be defined as a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economical and cultural matters. It may be defined as the use of hardware and software for efficient management i.e. storage, retrieval, processing, communication and sharing information for social, economical and cultural upliftment (Chidnandappa & Dharmendra 2006) 3. ICT is an important instrument, which can transfer the present isolated, teacher-centred, book-centered learning environment into a rich student-centered environment. This new learning environment developed by the ICT is called Interactive Learning Environment. ICT is a new paradigm of the teaching-learning process; we must accept the new technology and use ICT as a tool of teaching-learning process. ICT aims at transferring the old traditional paradigm of learning to the new paradigm of learning (Desh, 2007).4

Communication technology and networking is a great liberalization force. The new processes of liberalization and globalization have led to new ways of learning, living and working together and, new ways of organizing educational institutions & creating products and services that would empower people in many ways, such as the Wikipedia or blogging. With the advent of these processes, new education is visualized to be technology mediated, learner and learning centric, innovation centric, promoting curiosity with diversity and excellence, promoting cooperative learning, developing and nurturing universal human values in A3 (anyone, anytime, anywhere) and L3 (life-long-learning) scenario (Takwale, 2007).5

However, the experience of introducing different ICTs in the classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICTs is not automatic. The effective integration of ICT into the educational system is a complex, multifaceted process that involves not just technology—indeed, given enough initial capital, getting the technology is the easiest part!—but also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing etc.

The use of ICTs can make substantial change for education and training mainly in two ways. Firstly, the rich representation of information changes learner’s perception and understanding of the context. Secondly the vast distribution and easy access to information can change relationships between educators and student-teachers. ICT can also provide powerful support for educational innovations.

1.1 HISTORICAL BACKGROUND & PROGRESSION OF MULTIMEDIA

Multimedia has come a long way from its humble roots to today's cutting-edge modern animation and interactivity

The term "multimedia" was coined by Bob Goldstein (later 'Bobb Goldsteinn') to promote the July 1966 opening of his "Light Works at L'Oursin" show at Southampton, Long Island. On August 10, 1966, Richard Albarino of Variety borrowed the terminology, reporting: “Brainchild of song scribe-comic Bob (‘Washington Square’) Goldstein, the ‘Light works’ is the latest multi-media music-cum-visuals to debut as discothèque fare.” Two years later, in 1968, the term “multimedia” was re-appropriated to describe the work of a political consultant, David Sawyer, the husband of Iris Sawyer—one of Goldstein’s producers at L’Oursin.

Where did it all begin?

That is hard to say, but one of the earliest and best-known examples of multimedia was the video game Pong. Developed in 1972 by Nolan Bushnell (the founder of a then-

new company called Atari), the game consisted of two simple paddles that batted a square "ball" back and forth across the screen, like tennis. It started as an arcade game, and eventually ended up in many homes (Vaughan, 2001). Multimedia, as defined in computer terms, has been around for only seven or eight years in any form that we now recognize. Early research developed a software system called Hypertext. This allowed sections of texts held on computer to be linked extremely to other text on an associated topic. Hypertext was developed into early form of Hypermedia in the late 1980s by the Media lab at Massachusetts Institute of technology (MIT), which partly funded by Apple Computers, led to the development of HyperCard and the beginning of Multimedia. This software system allowed users of early Macintosh computers to produce a set or stack of computer based index cards containing text and black and white images that could be linked to each other. This led to innovative uses of HyperCard in producing a wide range of teaching resources or ways of viewing the world. Instead of having separate texts images and sound these could now be combined into one presentation medium, now known as Hypermedia. In 1976, another revolution was about to start as friends Steve Jobs and Steve Wozniak founded a start-up company called Apple Computer. A year later they unveiled the Apple II, the first computer to use colour graphics. (Coorough, 2001) The computer revolution moved quickly: 1981 saw IBM's first PC, and in 1984 Apple released the Macintosh, the first computer system to use a graphical user interface (GUI). The Macintosh also bore the first mouse, which would forever change the way people interact with computers. (Shuman, 2002) In 1985, Microsoft released the first version of its Windows operating system. That same year, Commodore released the Amiga, a machine which many experts consider to be the first multimedia computer due to its advanced graphics processing power and innovative user interface. The Amiga did not fare well over the years, though, and Windows has become the standard for desktop computing.

Both Windows and the Macintosh operating systems paved the way for the lightning-fast developments in multimedia that were to come. Since both Windows

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and Mac OS handle graphics and sound – something that was previously handled by individual software applications – developers are able to create programs that use multimedia to more powerful effect. One company that has played an important role in multimedia from its very inception is Macromedia (formerly called Macromind). In 1988, Macromedia released its landmark Director program, which allowed everyday computer users to create stunning, interactive multimedia presentations. Today, Macromedia Flash drives most of the animation and multimedia you see on the Internet, while Director is still used to craft high-end interactive productions. Each new development of each passing year is absorbed into next year's technology, making the multimedia experience, better, faster, and more interesting. (Solomon, 2004)

The BBC TV programme produced by Douglas Adams in 1995, Hyper land dealt well with the history of Hypermedia and is still essential viewing for everyone developing multimedia today. Over the last few years, colour, better quality images and videos, animation have combined to produce what is now known as Multimedia. The beginning of use of multimedia in British schools can be traced back to the seminal Horizon project suggested by Graham Bevis and run by Mortyn Wilson in early 1990s. The most common form of multimedia today is CD-Rom, but the Internet is fast becoming the most common multimedia format. The initials CD-ROM stands for the Compact disk read only memory. A CD-ROM can store large amounts of information in the form of text, pictures, graphics, sound, animated & video images in high quality digital format. New forms of media storage such as DVD promise more capacity. It could be argued that CD-ROM was introduced as an ‘edutainment’ medium in 1994 by Microsoft and also Internet goes interactive; shopping, banking, live concerts, radio broadcasting, spamming get started. In 1995 Private ISP becomes big business Netscape goes public.

1.2 ICT RELATED INNOVATIONS IN TEACHER EDUCATION

By 1990, the choice of technologies for education was limited because these were expensive and required skilled technicians to create and use them. At that time radio, television, overhead projectors, slide projector etc. were the best examples of technology for use in teaching-learning process as well as in teacher education

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programmes. Recently the scenario has changed. Technology applications in education no longer are limited by convenience, cost and their potential. Rather, it is only by our insight and imagination about the ways technology can be applied. Through integration, convergence and miniaturization, technologies are becoming user-friendly. It has been established that technologies are useful in the teaching and learning environment. However, it is important to know which technologies are best suited for a particular purpose in classroom teaching and hence, the need for training of teachers in technologies and their use in teaching-learning situations. Digitisation of many ICTs has made it possible to design, develop, deliver, manage and assess the learning and training process. It increases the efficiency of the system and makes it more powerful, etc. The new digital technologies are not single technologies. They are a combination of hardware and software, media and delivery systems. Latest digital technologies such as PC with Multimedia graphics, Laptop, Notebook, Digital Video, Still camera, WWW(World Wide Web), CD-ROM, E-mail, Digital Libraries and Video Conferencing are evolving and conveying rapidly.

The latest technologies also have a capacity to integrate with older analogue technologies and retrieve information stored in older technologies and to develop link between the old and the new. So, the choice of technology is important for a particular purpose of teacher education activities. Some of the latest innovations of ICT in the field of teacher education are discussed as under:

**Web Based Instruction**

Web Based Instruction (WBI) is an innovative approach to distance learning in which computer based training (CBT) is transformed by the technologies and methodologies of the World Wide Web (www), the Internet and Intranets (Sahoo, Yadav & Das, 2010)\(^\text{11}\).

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\(^{11}\) Sahoo, Yadav & Das (2010). *Professionalism in Teacher Education* (First Edi.) New Delhi: Concept Publishing Company Pvt. Ltd.
WBI presents content in a structure format that allowing self-directed, self-paced instruction on any topic. WBI is "a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (Khan, 1997). WBI is media rich learning fully capable of platform. Web Based Instruction is a hypermedia-based instructional programme that utilizes the attributes and resources of the WWW to create a meaningful learning environment, where learning is fostered and supported. The comparison between traditional instruction and web based instruction is given in table 1.1 as under:

**Table 1.1**  
Comparison Between Traditional and Web Based Instruction

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Traditional Instruction</th>
<th>Web-Based Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional philosophy</td>
<td>Intuitivist</td>
<td>Constructivist</td>
</tr>
<tr>
<td>Teacher’s role</td>
<td>Didactic lecturer</td>
<td>Facilitator</td>
</tr>
<tr>
<td>Student’s role</td>
<td>Passive learner</td>
<td>Active learner</td>
</tr>
<tr>
<td>View of collaboration</td>
<td>Cheating</td>
<td>Constructing knowledge</td>
</tr>
<tr>
<td>Learning paradigm</td>
<td>Content-driven</td>
<td>Concept-driven</td>
</tr>
<tr>
<td>Problem solving</td>
<td>Algorithmic</td>
<td>Situated and relevant</td>
</tr>
<tr>
<td>Time on task</td>
<td>Limited by class period</td>
<td>Asynchronous and Synchronous</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>Abstract to concrete</td>
<td>Concrete to abstract</td>
</tr>
<tr>
<td>Sequence and duration</td>
<td>Bounded by college term points</td>
<td>Flexible entry and exit</td>
</tr>
<tr>
<td>Communication</td>
<td>Teacher-directed</td>
<td>Student-initiated</td>
</tr>
<tr>
<td>Adaptively</td>
<td>Not-individualized</td>
<td>Individualized for learner</td>
</tr>
</tbody>
</table>

Computer Based Diagnostic Testing

The common observation is that the quality of teaching in the classroom is on the decline. More and more students are depending on the private tuition and it also has become a business. The phenomenon is not only in India but in other countries too. This can be improved by introducing the diagnosis and remediation in the process of teaching – learning. This is not being done. The reasons might be large class size, non-availability of diagnostic tests in different subjects, lack of training, money and desire on the part of teacher etc. This is the age of technology. These difficulties can be easily overcome with the help of ICT. Sansanwal (2007)\textsuperscript{13} has developed and tried out Computer Based Diagnostic Testing in Mathematics in CBSE affiliated schools situated in Indore. It works well and has helped the teachers as well as students in identifying the gray area of each and every student. This can be put on the website of the school and the student can access it from home also.

Curriculum Development

At present some of the universities are able to improve and update their curriculum. Each university has its own procedure of developing curriculum. This is quite old and too narrow. In this digitalized world, the universities should change some of their procedures related to curriculum development, examination, evaluation of doctoral work etc. Each University must have its website. The curriculum can be put on the website and suggestions can be invited for its improvement. It broadens the scope of receiving the suggestions. At present in India, in spite of efforts made by

UGC as well as NCTE, many universities are still not in a position to update the teacher education syllabus. In many universities micro-teaching is just for name sake. Models of Teaching have not entered in the syllabus at all and ICT is just a formality in many universities. Even the schools that employ the trained teachers have felt this. Thus, there is a scope to use ICT in improving the curriculum of teacher education.

![Learning to Learn](Learning_to_Learn.png)

**Digitalized Instructional Material**

There is a shortage of qualified teacher educators. Not only is this even the instructional material available in the print form not of good quality. This is because many authors have written on those topics that they have never read and / or done research. Sometime the information given in the books is also wrong. The book reading is not very enjoyable and does not help students in understanding the concepts and retaining the information. There are many teacher educators who are well known for the specific subject. Their lectures should be digitalized and made available to all the users. It will enhance the quality of instruction in the classrooms. The teacher educator can use them in the classrooms and can organize discussion after it wherein the new points can be added both by the teacher as well as students. It will make the teaching effective, participatory and enjoyable. Sansanwal has developed digitalized lectures on Research Methodology and Statistics and has been using it for teaching this subject at master’s level. Other researchers are also using it.
E-Content

Another form of digitalized lectures is E-Content. The CIET is making efforts to develop E-Content material in different subjects for the benefit of diverse users. The teacher educators should also start using it for developing E-Content in their own areas of specialization. This has lots of potentiality to bring quality in teacher education. This is one of the important systems of communication of knowledge in recent time through web cast and its delivery through Internet. One is able to see on the website whatever is hosted by information/knowledge provider.

However, it is very difficult to ascertain the authenticity and correction of information. In case of print media, there is a system of review by the peer groups and publication of the same in journals and newspapers. But in the case of websites, no system seems to have been evolved so far. The system assumes greater significance when one is web casting of educational materials. The correction, authenticity and the
quality of the material have to be necessarily assumed so as to provide knowledge/information to students, teacher and general reader (Shiratuddin & Landoni, 2003).  

1.3 ROLE OF ICT IN EDUCATION

For developing countries, ICT has the potential for increasing access to and improving the relevance and quality of education. It thus represents a potentially equalizing strategy for developing countries. However, the reality of the Digital Divide-the gap between those who have access to and control of technology and those who do not-means that the introduction and integration of ICTs at different levels and in various types of education will be a most challenging undertaking. Failure to meet the challenge would mean a further widening of the knowledge gap and the deepening of existing economic and social inequalities. ICT is a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously underserved constituencies-scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons. Keong, Horani & Daniel (2005) found that the use of ICT can make the teaching process more effective as well as enhance the students’ capabilities in understanding basic concepts. Raninga (2010) revealed that CAI method is effective for teaching of Mathematics for the students of class VII as compared to the traditional method. Some of the important advantages of ICT in today’s world are discussed as under:

• **Anytime, anywhere.** One defining feature of ICTs is their ability to transcend time and space. ICTs make possible asynchronous learning, or learning characterized by a time lag between the delivery of instruction and its reception by learners. Online course materials, for example, may be accessed 24 hours a day, 7 days a week. ICT-based educational delivery (e.g., educational programming broadcast over radio or television) also dispenses with the need for all learners and

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the instructor to be in one physical location. Additionally, certain types of ICTs, such as teleconferencing technologies, enable instruction to be received simultaneously by multiple, geographically dispersed learners (i.e., synchronous learning). With the help of ICT, students can now browse through e-books, sample examination papers, previous year papers etc. and can also have an easy access to resource persons, mentors, experts, researchers, professionals, and peers—all over the world. This flexibility has heightened the availability of just-in-time learning and provided learning opportunities for many more learners who previously were constrained by other commitments (Young, 2002).17

- **Access to remote learning resources.** Teachers and learners no longer have to rely solely on printed books and other materials in physical media housed in libraries (and available in limited quantities) for their educational needs. With the Internet and the World Wide Web, a wealth of learning materials in almost every subject and in a variety of media can now be accessed from anywhere at anytime of the day and by an unlimited number of people. This is particularly significant for many schools in developing countries, and even some in developed countries, that have limited and outdated library resources. ICTs also facilitate access to resource persons—mentors, experts, researchers, professionals, business leaders, and peers—all over the world.

- **Motivating to learn:** ICTs such as videos, television and multimedia computer software that combine text, sound, and colorful moving images can be used to provide challenging and authentic content that will engage the student in the learning process. Interactive radio likewise makes use of sound effects, songs, dramatizations, comic skits, and other performance conventions to compel the students to listen and become involved in the lessons being delivered. Stark, Gray and Payne (2000)18 found that ICT improved motivations, enhanced learning and teaching, improved communication and access to information, and improved efficiency and feelings of independence. Also Passey, Machell, McHugh and

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Allaway (2004) reported that ICT positively impacted on motivation, particularly in relation to engagement, research, writing and editing and presentation. More so than any other type of ICT, networked computers with Internet connectivity can increase learner motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with real people and to participate in real world events.

- **Facilitating the Acquisition of Basic Skills:** The transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by ICTs through drill and practice. Educational television programs such as Sesame Street use repetition and reinforcement to teach the alphabet, numbers, colors, shapes and other basic concepts. Most of the early uses of computers were for computer-based learning (also called computer-assisted instruction) that focused on mastery of skills and content through repetition and reinforcement. Panda and Chaudhary (2000) determined the degree of attainment of cognitive skills through computer assisted learning (CAL) and found that Computer Assisted learning (CAL) resulted in greater learning achievements in all hierarchies of cognitive domain and male students was found to be superior to female students in learning physics. It also improves the quality of education by facilitating learning by doing, real time conversation, delayed time conversation, directed instruction, self-learning, problem solving, information seeking and analysis, and critical thinking, as well as the ability to communicate, collaborate and learn (Yuen, 2003).

- **Enhancing Teacher Training:** ICTs have also been used to improve access to and the quality of teacher training. For example: In Indira Gandhi National Open University, satellite-based one-way video-and two-way audio-conferencing was held in 1996, supplemented by print-materials and recorded video, to train 910

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primary school teachers and facilitators from 20 district training institutes in Karnataka State. The teachers interacted with remote lecturers by telephone and fax.”\(^{22}\) Also contemporary ICTs are able to provide strong support for all the requirements of teachers and there are now many outstanding examples of world class settings for competency and performance-based curricula that make sound use of the affordances of these technologies (Oliver, 2000)\(^{23}\).

1.4 CONCEPT OF MULTIMEDIA

In simple terms, multimedia can be defined as the integration of multiple forms of media which includes text, graphics, audio & video etc. The use of Multimedia can make the idea or concept of something more interactive, catchier, so that maximum use of senses can be done to make the learning long lasting. Technologically, Multimedia refers to electronic products that include (or at least can include) the full range of visual and auditory elements—images, audio clips, video clips. Presentation software such as PowerPoint, Macromedia Flash and Swish meets that definition. There is lot of definitions of Multimedia available on Internet and in books in printed form. Some of them are as follows: (i) the use of several media, such as movies, slides, music, and lighting in combination normally for the purpose of education and entertainment. (www.publicspeakingcourse.com) (ii) Multimedia is a term used to describe a range of products that have some audio and visual basis; for example, encyclopaedia programmes are labelled as being “Multimedia”. (www.yougamers.com/dictionary/3/) (iii) Presenting data in more than one medium, such as combining text, graphics and sound. (www.m2ketch.com/hardware_glossary.html) (iv) Multimedia originally indicates a capability to work with and integrate various types of things together including audio, graphics and especially video (Ambron & Hooper, 1988).

From the above given definitions of multimedia, it can be easily interpreted that Multimedia encompasses a wide range of applications and technology, which is generally used in the field of education and entertainment. Multimedia presentations

\(^{22}\) http://www.ignou.ac.in. See also Asian Development Bank (1997), Distance Education for Primary School Teachers: Papers and Proceedings of the Regional Seminar on Distance Education (Manila: Asian Development Bank).

may be viewed in person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.

Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator. Enhanced levels of interactivity are made possible by combining multiple forms of media content depending on what multimedia content you have. Online multimedia is increasingly becoming object-oriented and data-driven, enabling applications with collaborative end-user innovation and personalization on multiple forms of content over time. Examples of these range from multiple forms of content on web sites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose co-efficient, events, illustrations, animations or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming.

Multimedia may be broadly divided into linear and non-linear categories. In linear multimedia, active content progresses without any navigation control for the viewer such as a cinema presentation. On the other hand, Non-linear multimedia, also known as hypermedia, content offers user interactivity to control progress as used with a computer game or used in self-paced computer based training. Multimedia presentations can be live or recorded. A recorded presentation may allow interactivity via a navigation system. A live multimedia presentation may allow interactivity via interaction with the presenter or performer.

**Components of Multimedia:** Any multimedia application consists of five components as explained below and shown in fig. 1.1:

(i) **Text:** Text and symbols are very important for communication in any medium. With the recent explosion of the Internet and World Wide Web, text has become more important than ever. Web is HTML (Hyper text Mark-up language) originally designed to display simple text documents on computer screens, with occasional graphic images thrown in as illustrations. Words and symbols in any form, spoken or
written, are the most common system of communication. They deliver the most widely understood meaning to the greatest number of people. Most academic related text such as journals, e-magazines are available in the Web Browser readable form. The size of a text is usually measured in points. One point is approximately 1/72 of an inch i.e. 0.0138. The size of a font does not exactly describe the height or width of its characters. This is because the x-height (the height of lower case character x) of two fonts may differ. Typefaces of fonts can be described in many ways, but the most common characterization of a typeface is serif and sans serif. The serif is the little decoration at the end of a letter stroke. Times, Times New Roman, Bookman are some fonts which come under serif category. Arial, Optima, Verdana are some examples of sans serif font. Serif fonts are generally used for body of the text for better readability and sans serif fonts are generally used for headings.

(ii) **Audio**: Sound is perhaps the most important element of multimedia. It can provide the listening pleasure of music, the startling accent of special effects or the ambience of a mood-setting background. The multimedia application user can use sound right off the bat on both the Macintosh and on a multimedia PC running Windows because beeps and warning sounds are available as soon as the operating system is installed. On the Macintosh you can choose one of the several sounds for the system alert. In Windows system sounds are WAV files and they reside in the windows\Media subdirectory. There are still more choices of audio if Microsoft Office is installed. Windows makes use of WAV files as the default file format for audio and Macintosh systems use SND as default file format for audio.

(iii) **Video**: Digital video has supplemented analog video as the method of choice for making video for multimedia use. Video in multimedia are used to portray real time moving pictures in a multimedia project. To add full-screen, full-motion video to your multimedia project, you will need to invest in specialized hardware and software or purchase the services of a professional video production studio. In many cases, a professional studio will also provide editing tools and post-production capabilities that you cannot duplicate with your Macintosh or PC.
Fig. 1.1: Components of Multimedia
(iv) **Image**: Still images are the important element of a multimedia project or a website. In order to make a multimedia presentation look elegant and complete, it is necessary to spend ample amount of time to design the graphics and the layouts. Computer literate skills in graphic art and design are vital to the success of a multimedia project. There are different kinds of image formats in the literature. We shall consider the image format that comes out of an image frame grabber, i.e., the captured image format, and the format when images are stored, i.e., the stored image format. The image format is specified by two main parameters: spatial resolution, which is specified as pixels x pixels (e.g. 640×480) and colour encoding, which is specified by bits per pixel. Both parameter values depend on hardware and software for input/output of images.

(v) **Animation**: Animation makes static presentations come alive. It is visual change over time and can add great power to our multimedia projects. Carefully planned, well-executed video clips can make a dramatic difference in a multimedia project. Animation is created from drawn pictures and video is created using real time visuals. Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement. It is an optical illusion of motion due to the phenomenon of persistence of vision, and can be created and demonstrated in a number of ways. The most common method of presenting animation is as a motion picture or video program, although several other forms of presenting animation also exist. Animation is possible because of a biological phenomenon known as *persistence of vision* and a psychological phenomenon called *phi*. An object seen by the human eye remains chemically mapped on the eye’s retina for a brief time after viewing. Combined with the human mind’s need to conceptually complete a perceived action, this makes it possible for a series of images that are changed very slightly and very rapidly, one after the other, to seemingly blend together into a visual illusion of movement.

### 1.5 DEVELOPMENT OF MULTIMEDIA TEACHING PACKAGE

Interactive multimedia is becoming increasingly popular in education, entertainment, and business. Because of the capability of incorporating various media, and of supporting interactivity and learner control, multimedia is often used in
delivering instruction. Furthermore, the World Wide Web technology with its interactive multimedia capability has been perceived to be one of the most promising technologies in the future. While there is a general consensus among educators that interactive multimedia has the potential for enhancing learning, educators also agree that having well-designed multimedia software is critical in order for the technology to have any impact on learning. Literature on instructional design has detailed the process for developing instruction in general terms. The development of multimedia teaching package involves various phases as shown in fig. 1.2.

![Diagram of Phases of Development of Multimedia Teaching Package](image)

**Fig. 1.2: Phases of Development of Multimedia Teaching Package**

It is clear from Figure 1.2 that, first of all content for which multimedia teaching package is developed, has to be selected. In next phase, after selection of the content, it is divided in the form of sub-units and chapters, so that it should become simple, motivational and highly informative. After the completion of second phase, multimedia package is developed with the help of appropriate software by using text, picture, animation, sound and bright colours for simulation. The last phase of development of multimedia teaching package with its different steps have been explained below and shown in fig. 1.3.
Fig. 1.3: Steps of Development of Multimedia Teaching Package

I  Plan of ICT and Selection

In this step, plan about appropriate ICT is to be made for each media element such as graphics, text, audio, video, animation and interactivity for each learning experience. He has to select required hardware and software for making of each element of Multimedia Teaching Package. A flowchart is developed to outline the behind-the-screen logic and determined computer hardware and software requirements.

II  Script Writing

In this step, the script of all the necessary elements of Multimedia Teaching Package i.e. Text, Images, Audio, Video and Animation is written. The step of content analysis form the bases for script writing which is more worked out version.
In this phase we prefer to make a prototype. The outcome of this phase is a mixture of paperwork (text specifications, AV scripts, graphics, etc.) and prototype.

III Integration of Elements

Here the integration of different elements of Multimedia Teaching Package i.e. text, audio, video and animation has to be done. But if the investigator found any difficulty at any step, he/she may modify the script and implement it again.

IV Assessment of Multimedia Teaching Package

Special emphasis is given on this step. After making the rough format, the Package is shown to the Subject as well as Technical experts for getting valuable suggestions so that necessary changes could be made in the package before finalization. For this, an opinion scale can be developed by the programmer to check the effectiveness of Multimedia Teaching Package. Views of various subject experts regarding validity of Package is taken through this scale.

V Finalization of Multimedia Teaching Package (MMTP)

After assessment of Multimedia Teaching Package by experts, the finalization of Multimedia Teaching Package is done by incorporating suggested changes.

1.6 PROMISES OF MULTIMEDIA BASED TEACHING

Besides being a powerful tool for making presentations, multimedia offers unique advantages in the field of education. For instance, text alone simply does not allow students to get a feel of any of Shakespeare's plays. In teaching biology, an instructor cannot make a killer whale come alive in a classroom. Multimedia enables us to provide a way by which learners can experience their subject in a vicarious manner. Jayaraman (2006) determined the relative effectiveness of computer based Multimedia Learning Packages on performance and behavioural outcomes of students of different age groups. The key to providing this experience is having simultaneous graphic, video and audio, rather than in a sequential manner. The appeal of multimedia learning is best illustrated by the popularity of the video games currently available in the market. These are multimedia programmes combining text, audio,

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video, and animated graphics in an easy-to-use fashion. Meenu (2009)\textsuperscript{25} revealed that the students who were taught English through Multimedia Teaching Programme have shown significant improvement in their achievement in English. Moreover, under conditions of chronic under-funding, multimedia can provide an enhanced or augmented learning experience at a low cost per unit. It is here that the power of multimedia can be unleashed to provide long-term benefit to all. Multimedia enables learning through exploration, discovery, and experience. Technology does not necessarily drive education. That role belongs to the learning needs of students. With multimedia, the process of learning can become more goals oriented, more participatory, flexible in time & space, unaffected by distances and tailored to individual learning styles, and increase collaboration between teachers and students. Nimavathi & Gnanadevan (2009)\textsuperscript{26} revealed that the students learning through multimedia fared better in their study habits than the students learning through the conventional method. Multimedia enables learning to become fun and friendly, without fear of inadequacies or failure.

The pedagogical strength of multimedia is that it uses the natural information processing abilities that we already possess as humans. Our eyes and ears, in conjunction with our brain, form a formidable system for transforming meaningless sense data into information. The old saying that "a picture is worth a thousand words" often understates the case especially with regard to moving images, as our eyes are highly adapted by evolution to detecting and interpreting movement. For the student, one advantage of multimedia courseware over the text-based variety is that the application looks better. Öğuz Serin (2011)\textsuperscript{27} found a positive effect of Computer based Instruction on the Achievement & Problem Solving Skills of Science & Technology Students. Some of valuable benefits of Multimedia for learners as well as teachers are discussed below:

\textsuperscript{25} Madan, M (2009). Effectiveness of Multimedia Teaching Programme For Teaching of English, Ph.D. Education, Maharshi Dayanand University, Rohtak.
\textsuperscript{26} Nimavathi, V. & Gnanadevan, R. (2009). Developing Study Habits through Multimedia Programme Edutracks, 9(3), 33-35.
\textsuperscript{27} Serin (2011). The Effects of Computer based Instruction on the Achievement & Problem Solving Skills of Science & Technology Students, TOJET, 10(1), 45-50.
(a) For the learners

The development of multimedia help to make learning more differentiated and customized to individual needs, and deliver a more engaging, exciting and enjoyable learning process that encourages better learning outcomes, including greater autonomy and emotional resilience, as well as:

- broadened horizons with more opportunities for creative expression;
- flexibility to study where, when and in ways best suited to individual needs and preferences, with smoother transitions between different phases of education;
- increased motivation through learning that stimulates, stretches and takes into account prior and concurrent experiences in and out of school;
- personalized feedback on progress based on the use of assessment tools, and the ability to record and share achievements with others; wider access to learning and participation, particularly for learners with special educational needs and disabilities, and those unable to attend school due to illness or disaffection with traditional learning methods. Jyothi (2007) 28 revealed that the self-instructional module prepared by a teacher through simple power point presentation could show immense impact on learning of chemistry. Since the preparation of this module is very easy and simple; it has opened a new way and is very much helpful to teachers in their physical science instruction.
- better informed choices through greater access to information, guidance and support services; and
- the ability to make sensible choices about when, when not, and how to use new technologies to enhance, extend and enrich their learning, reflecting the increasingly ICT-rich environment in which they live and learn.

b) For the teachers

The development of Multimedia contribute to improved professional status, help to increase capacity and provide opportunities for career development and

progression that build on the recognition and reward of effective e-learning practice. Ludwig and Daniel (2004) ²⁹ found that multimedia content organized with a slideware tool can generate productive and stimulating presentations that lead to greater retention, application to new situations, and performance on assessments. It should also mean:

- Access to a comprehensive range of advice, guidance and support for teachers of all subjects at all levels on how ICT can be used effectively in classroom practice to embed ICT in teaching and learning across the curriculum;
- Opportunities to access a wide range of resources that simplify the preparation and enrich the delivery of lessons;
- more sophisticated use of pupil data, including the matching of teaching and learning styles and the setting and tracking of individual learning goals;
- revitalized professional networks supporting communication and collaboration, including the sharing of resources and best practice, within and between schools;
- support for workforce remodelling through the automation of routine administrative tasks and the availability of technical support; increased opportunities to develop innovative and creative ways of supporting students' learning, enabling seamless links with experiences beyond the conventional classroom and timetable.

Panda and Chaudhary (2000) ³⁰ revealed that Computer Assisted learning (CAL) resulted in greater learning achievements in all hierarchies of cognitive domain and male students was found to be superior to female students in learning physics. Stark, Gray and Payne (2000)³¹ studied the impact of information and communication technology initiatives on pupils' skills and knowledge and found that ICT improved motivations, enhanced learning and teaching, improved communication and access to information, and improved efficiency and feelings of independence.

Shinde (2002)\textsuperscript{32} that HCAI was effective in terms of achievement; LCAI can also bring significant increase in the achievement scores and the interactivity plays major role in enhancing the achievement of the learners learning through CAI. Vekaria (2002)\textsuperscript{33} explored the effectiveness of video instructional programme in teaching of science for class VII and revealed that video instructional programme was effective in the urban as well as rural areas of Saurashtra, Central Gujarat and South Gujarat. Vasanthi and Hema (2003)\textsuperscript{34} showed that there is significant difference between the mean gain score of the control group taught through TTM and the experimental group administered by the CAI in all unit put together and there is significant difference between the mean scores of post-test of control group taught through TTM and experimental group administered by CAI in all units put together. Jones and Scrimshaw (2004)\textsuperscript{35} identified the factors that prevent and facilitate the uptake of ICT by teachers. The study has found that the uptake of ICT is most commonly prevented by lack of confidence, recurring technical faults, and resistance to change; the uptake of ICT is most frequently facilitated by leadership and planning, sharing of resources, technical support, and schools working with each other and with the local community. Keong, Horani & Daniel (2005)\textsuperscript{36} found that the use of ICT in teaching mathematics can make the teaching process more effective as well as enhance the students’ capabilities in understanding basic concepts. Pardeshi (2005)\textsuperscript{37} determined the relative effectiveness of CAI in learning Trigonometry and revealed no significant difference in the mean achievement scores of the experimental group and control groups, respectively and significant difference have been found in the mean achievement scores of the experimental group in triad and control group.

\textsuperscript{32}Shinde, J. (2002). Effectiveness of Multimedia CAI Package with Reference to Levels of Interactivity and Learning Style, \textit{Ph.D. (Education)}, SNDT Women’s University.
Jayaraman (2006) depicted that the Computer based Multimedia Learning Package prepared specifically for the particular concepts are significantly effective for all the age group of students. Alodiedat, Ahmad Sulieman and Yousef (2008) found that experiment group used the intranet and internet more often than the traditional group. Anil (2009) revealed that Computer-Assisted Instruction Programme in remediation task was successful as the students were able to overcome the difficulty points in the content. So, utilization of computer technology in remedial instruction was found effective. Suman (2009) determined the relative effectiveness of E-Content strategy and conventional strategy of teaching of science and findings of the study revealed that E-content improve achievement in science significantly higher in comparison to Conventional strategy when groups were matched on pre-achievement in science. Ponraj & Sivakumar (2010) examined the effect of CAI software on the achievement in zoology. The study has shown that teaching the zoology by using CAI is more effective than conventional strategy. Steve (2010) determined the effect of interactive multimedia simulations and virtual dissection software on depth of learning among students participating in biology and chemistry laboratories. The results indicated that participants changed their depth of learning after completing simulation and virtual dissection software. Oğuz Serin (2011) revealed that there is a statistically significant increase in the achievements and problem solving skills of the students in the experimental group that received the computer-based science and technology instruction. Philip, Jackson & Dave (2011) studied the effect of Computer-Assisted Instruction on Student’s Attitudes and Achievement in Matrices

and Transformations in Secondary Schools and indicated that computer-assisted instruction (CAI) enhances student achievement, promote positive attitudes towards Mathematics and instruction, and improve interpersonal relations also. Ada, Faith & Victoria (2012)\textsuperscript{46} indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Koorosh & Soori (2012)\textsuperscript{47} revealed that Computer Assisted Language Learning (CALL) users’ achievement in EFL were significantly higher than nonusers. Semra (2012)\textsuperscript{48} demonstrated that teaching mathematics with a computer assisted instruction method increased student success significantly in mathematics lesson. However, the experimental and control groups did not differ between students’ attitudes towards mathematics. Telima and Aderonmu (2012)\textsuperscript{49} revealed that unavailability of CAI equipments and low level of teachers’ competency in computer usage affects the use of CAI-PS for content delivery.

1.7 RATIONALE OF THE STUDY

Today’s world is empowered by information technology. There is nothing which is untouched with the use of technology. It plays a vital role in all spheres of human activities. Education sector is also not an exception. ICT empowers students by engaging students in the learning process. The nature of the task shifts from teacher-centred to student-centred. Research indicates that challenging and engaging academic tasks that build upon students’ prior knowledge and enable students to construct their own understanding of the content are more apt to enhance student motivation and increase student self-confidence in the cognitive abilities (Miller &


Research also identifies the benefits of technology integration as the technical aspects enhance the quality of work, promote access of resources, positively impact students’ learning, and promote their meta-cognitive skills (Scheidet, 2003). ICT is doing a commendable job in almost all subjects, especially in sciences. Students can have access for all the necessary information in the form of text, pictures and videos on Internet. It is supposed to be used as a tool where and when considered useful. In the realm of mathematics education, there has been a strong link between computer and mathematics. ICT could be a potent tool in teaching-learning process of mathematics. As mathematics class needs lots of interaction, reasoning & observation, it is not always for a mathematics teacher to impart the principles, facts & formulae of mathematics effectively to his students and make them understand the concepts completely. Failure of so many students to learn mathematics is largely due to a lack of mathematics culture in adults and the scarcity of adults within mathematics who know how to ‘speak mathematics’ (Papert 1993). For qualitative improvement in mathematics training and to remove the fear of mathematics from students, multimedia can prove as a boon, as it is capable of sustaining the interest of the students through audio-visual effects.

Integration of multimedia in mathematics is still far from desired. The use of multimedia in teaching of mathematics & its integration in the classroom and in the teaching training institutes have remained almost unexplored. A very few studies have been conducted in this direction. Many linked queries and issues have remained unfold. Thus a lot of work needs to be done in this direction. Therefore it has been considered significant to conduct a study to evaluate the effectiveness of multimedia teaching package in mathematics at primary stage. Hence, the investigator decided to develop multimedia teaching package in Mathematics for the students of class V and assess its effectiveness in teaching of mathematics.

1.8 STATEMENT OF THE PROBLEM

DEVELOPMENT OF MULTIMEDIA TEACHING PACKAGE IN MATHEMATICS FOR CLASS V AND ITS EFFECTIVENESS

1.9 OPERATIONAL DEFINITIONS OF KEY TERMS

The terms used in the statement are defined as under:

Development: In the context of the present study, development of multimedia includes selection of content, content analysis, script writing and production of multimedia teaching package. It also includes validation of programme by subject teacher & subject expert. Changes suggested by them were incorporated in the Computer-Assisted Instructional programmes.

Effectiveness: In the context of current study, effectiveness refers to the empirical usefulness with respect to achievement of students in mathematics. The difference of achievement scores obtained by the students in pre and post test measures the effectiveness of package.

Multimedia Teaching Package: In the present study, the multimedia teaching package refers to the package which provides integrated form of text, graphics, animation, audio and video with interactivity on the same screen. The slide presentation through multimedia teaching package includes text, animations, pictures & figures prepared using software such as Swish 2.0, Adobe Photoshop and recorded sounds/narration.

1.10 OBJECTIVES OF THE STUDY

The present study is designed to realize following objectives:

1. To develop Multimedia Teaching Package in Mathematics for students of class V.
2. To develop Mathematics Achievement Test for students of class V.
3. To develop Opinion towards Effectiveness of Multimedia Teaching Package Scale.
4. To analyze the opinions of subject experts towards the Multimedia Teaching Package.
To compare the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of Multimedia Teaching Package before experimental treatment.

To compare the mean achievement scores in mathematics of Boys of two groups (E & C) taught with and without use of Multimedia Teaching Package before the experimental treatment.

To compare the mean achievement scores in mathematics of Girls of two groups (E & C) taught with and without use of Multimedia Teaching Package before the experimental treatment.

To compare the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of Multimedia Teaching Package after experimental treatment.

To compare the mean achievement scores in mathematics of Boys of two groups (E & C) taught with and without use of Multimedia Teaching Package after the experimental treatment.

To compare the mean achievement scores in mathematics of Girls of two groups (E & C) taught with and without use of Multimedia Teaching Package after the experimental treatment.

To compare the mean gain achievement scores in mathematics of two groups (E & C) taught with and without use of Multimedia Teaching Package.

To compare the mean gain achievement scores in mathematics of Boys of two groups (E & C) taught with and without use of Multimedia Teaching Package.

To compare the mean gain achievement scores in mathematics of Girls of two groups (E & C) taught with and without use of Multimedia Teaching Package.

**1.11 HYPOTHESES OF THE STUDY**

On the basis of objectives given above following hypotheses have been framed:

1. There exists no significant difference between the mean achievement scores in mathematics of two groups (E & C) of students taught mathematics with and without use of multimedia teaching package before experimental treatment.

2. There exists no significant difference between the mean achievement scores in mathematics of boys of two groups (E & C) taught mathematics with and without use of multimedia teaching package before experimental treatment.
There exists no significant difference between the mean achievement scores in mathematics of girls of two groups (E & C) taught mathematics with and without use of multimedia teaching package before experimental treatment.

After experimental treatment, the group of students taught mathematics with use of multimedia teaching package would have high mean achievement scores than group of students taught mathematics without use of multimedia teaching package.

After experimental treatment, the boys taught mathematics with use of multimedia teaching package would have high mean achievement scores than boys taught mathematics without use of multimedia teaching package.

After experimental treatment, the girls taught mathematics with use of multimedia teaching package would have high mean achievement scores than girls taught mathematics without use of multimedia teaching package.

The group of students taught mathematics with use of multimedia teaching package would have high mean gain achievement scores than group of students taught mathematics without use of multimedia teaching package.

The boys taught mathematics with use of multimedia teaching package would have high mean gain achievement scores than boys taught mathematics without use of multimedia teaching package.

The girls taught mathematics with use of multimedia teaching package would have high mean gain achievement scores than girls taught mathematics without use of multimedia teaching package.

1.12 DELIMITATIONS OF THE STUDY

Keeping in view the constraints of the time and available resources, the study is delimited to the:

1. students of class V studying in private schools of urban area.
2. English medium schools affiliated to CBSE Board of Rohtak city.
3. content of the multimedia teaching package having three units (Factors & Multiples, Money & Geometry) of mathematics of class V.

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