**UNIT 5 INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)**

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**5.1 INTRODUCTION**

This unit seeks to develop an understanding about the various issues relating to Information and Communication Technologies (ICT) in education. It places emphasis on how distance education and open learning can be supported by ICT, such that the objectives of education as expressed in the New Education Policy (1986) might become achievable for the majority of people in India, many of whom are excluded from educational opportunities of any form. The unit highlights the broader educational context within which any efforts to make use of ICT and/or distance education must function. The purpose is to present the possible impact of Information Communication Technologies (ICT) to elementary school education. The term ‘ICT’ is used here in a relatively broader sense that includes its aspects, applications, problems and prospects. As the concern is to apply ICT to teaching learning, the hardware related aspects have been excluded.
Attempt has also been made to illustrate the potential of ICT in our schools in its changing form. It records 'what ICT can provide' aimed at showing how teaching at the elementary level has to change according to the changing times. The discussion on various ICT concepts should give you an insight about the importance of their introduction and use in schools. And the details about its rationale should help you assess the requisite infrastructure and enable you to make appropriate choices while expanding your teaching techniques to include ICT.

5.2 OBJECTIVES

After going through this unit, you should be able to:

- understand the meaning of ICT;
- understand the various concepts of ICT;
- appreciate the role of ICT in education;
- explain the changing role for teachers; and
- identify the various characteristics of different media.

5.3 ICT AND EDUCATION

In today's ever changing world of learning, educators, policy makers and researchers seem to agree that ICT can play a crucial and positive impact on education. What is still being debated, however, is the precise role ICT should play in educational reform and how best to ensure that this potential is fulfilled.

5.3.1 ICT Defined

In order to understand the term ‘Information Communication Technologies’ (ICT), we need to begin with the various definitions associated with it. It has been defined as the electronic technologies for collecting, storing, processing, and communicating information. ICT can be separated into two main categories:

i) Those that process information, such as computer systems,

ii) Those that disseminate information, such as telecommunications systems.

Education Communication Technology has also been defined as the convergence of three major technologies. They are: computers to gather store and analyze information, telecommunication infrastructure to transfer information, and media to present information. ICT constitutes the body of information and knowledge, designs and patents. ICT means the study of developing and using technology to process information and aid educational communications.

The term (ICT) involves the application of two or more disparate disciplines or technologies. For example, the Internet revolution was produced by a convergence of telephone, computer, and modem technologies. ICT is therefore combination of personal computers, telecommunication, and television into a user experience that is accessible to everyone regardless of physical and human barriers.

5.3.2 Education Defined

The term education has two broader connotations. In the first meaning, education can be seen as a stage or a process of gaining knowledge. In this aspect we can talk of
"a person who is well educated". The second meaning of education can be seen as a field of study that deals mainly with methods of teaching and learning in schools. In this aspect we can talk of the professional requirements for those studying Certificate in Elementary Teacher Education, which obviously is different from that of those studying Certificate in Computing.

5.3.3 ICT Concepts

ICT is a term that comprises of two concepts, media and technologies. These terms have been used interchangeably, though technically, they connote different aspects. Communication technologies are the means of delivering media messages. Simply stated, technology might be considered to be the type of pipe used, while the medium (or media) is the form of the substance flowing down this pipe. It is important to determine the potential educational value of a particular technology in order to understand the right medium - or combination of media which can travel down the 'pipe' under evaluation. Educationists who wish to use technologies to support education need to understand the nature of communication between educators and learners. Teaching and learning processes involve different modes of communication, which in turn support the teaching and learning strategies and activities of a particular course. Communication can either be one-way or two-way, and can take place in any of the following ways:

- **Face-to-face** for example, in classroom, tutorial class, or practical sessions;
- **Via correspondence**: involving post, courier, fax, or electronic mail;
- **Using print media** of various kinds, which can be distributed either via correspondence or in face-to-face sessions;
- **Using audio** such as radio, audiocassettes, telephone calls, or audio conferencing;
- **Using video**: for example, one-way broadcasting, video, or video-conferencing;
- **Using computers** and computer-based multimedia, whether they are stand-alone or part of a network.

It needs to be noted that the use of ICT in education is lagging behind expectation and desire, as compared to other branches of life. ICT, as mentioned earlier, is a generic term that refers to the collection, storage, editing and passing on information in various terms. A personal computer (PC) is one of the best known examples of the use of ICT is education, besides radio and television. Another popular and useful technology frequently referred to and used is multimedia. Multimedia refers to a combination of data carriers-video, CD-ROM, floppy disc, Internet and other interactive electronic devices. There are three broad applications for technologies in education:

- Technologies to support the **educational provider**
- Technology to support **delivery of resources**
- Technology to support **teaching and learning**

Technologies that support the educational provider are mostly found in the day-to-day management and administration of educational institutions. Included here are telephones, filing cabinets, databases, information warehouses, and e-mail facilities that are proving to be very cost-effective means of communication for the educational provider. As a supporting tool, ICT is used while making assignments, collecting data and information, communicating and conducting research.
Technologies to support delivery of resources are mostly common in the dispatch of educational resources, particularly course materials. They include the printed book, printed materials, television, radio, multimedia computers and the Internet. They support delivery of resources by making learning resources available to students besides supporting course materials design and development processes. For example, the technologies required for printing books as well as the technology of the book itself are necessary to make these resources available to students.

Technology can also be used to support teaching-learning either in the face-to-face mode or through distance education mode education. These technologies include the media through which teachers can teach and learners can learn. We can observe this function in such forms as drill and practice exercises, in simulating classroom or school situations, whiteboards, overhead projectors, woodwork equipment, language laboratories, pen, paper, and computerized simulators.

In the next section we will study the rationale for the use of ICT, but before you can go through the section, check your progress below.

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<th>Check Your Progress</th>
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| **Notes:** a) Write your answers in the space given below.  
  b) Compare your answers with these great at the end of the Unit. |
| 1) Mention the two main categories of ICT. |
| 2) Mention any four ways of communication. |
| 3) Mention three broad applications for technologies in education. |

### 5.4 RATIONALE BEHIND ICT

The rationale draws mostly from the advancement in information and technologies and its possible application to the various branches of life. Moreover, it has been observed that the conventional system of imparting education through face-to-face mode besides having major strengths also had some drawbacks amongst which were inability to provide:
- Quantitative expansion of education
- Equality of opportunity, and
- Cost effective means of educational provision.

It was not until the Sixth Five Year Plan that incorporated the New Education Policy of 1986 when ICT was made a priority in solving the above weaknesses. However, in most parts of India, especially less developed regions where education is being provided mainly through lectures and printed materials. This type of educational provision has a disadvantage in that the teacher can only teach a handful of pupils at a given time and place. In remote areas of India however, there are children who, for a variety of reasons, cannot attend these lectures on a predestined timetable.

Such children who cannot attend the conventional lectures in classrooms are likely to remain illiterate due to conditions beyond their control, unless provided extra help. Different technologies that can cross-geographical barriers such as radios, television, phones, and videos have been instrumental in providing guide.

ICT has been suitably used in other branches of life such as Medicine, Law, Industry and Engineering to the benefit of mankind. It is increasingly being applied to education, examples being in radio/TV broadcasts, programmed learning and audio-visual learning aids that have meant that the best teachers can be accessed by a vast pupil population around the world.

Besides, the introduction of ICT aided learning in our classrooms by a wider audience is not up to the mark. ICT has made it possible for pupils who may not be bona-fide learners to access education - radio and T.V. programmes are often taken advantage of by non-registered learners.

The present age that ICT is ushering is complex and its future is wide open. The information being generated around the world is vast and no teacher can hope to comprehend the various developments in his/her area. Gone are the days when teachers could claim to be well trained for all times and situations. The ideal of a 'one time teacher training' is now but an illusion. No teacher can ever hope to introduce each child to the latest knowledge in the world. To claim that the teacher, after being trained at a particular period of time, can prepare the young children to cope with the vast range of relevant practices is sheer nonsense. Such one time teacher training can only inhibit the explorations and curiosities inherent in teachers and pupils. Our schools are also victims of an open and uncertain future. Schools are expected to control, tame and shape that future to make it agreeable to our culture, so teachers have the responsibility to pass to children that knowledge from the past. Teachers are moreover, expected to believe in both progress and change, due largely to competition and ideals from other institutions and nations. The challenge, therefore, before teachers is to be inventive, entrepreneurial, hardworking and patriotic. Through ICT, teachers can control learning and bring about the essential desired features of society thereby improving the undesired features. We can no longer, for example, confine some professions to some castes while at the same time confess 'equality of opportunity'. Quality education and training could be availed to all pupils through ICT that does not differentiate castes. It can help in situations when a child from some lower caste is denied education that the society preserves for the higher castes.

The prevailing 'study-play' divides among elementary school children can be transcended by the use of ICT. Schooling can, therefore, be used to canalize thoughts, feelings, and actions through prescribed activities that directs attention towards the possible and less towards the given. Schooling must not only be seen as a tool for
Technology and Social Control, Socialization and a Reproducer of Social Order but as a Way of Breaking into the Structures of Schooling. Children by Law or Custom May Be Acquainted with Specific Caste Principles, but Through Radios May Come into Contact with Other Forms of Knowing about the Weakness of That Specific Caste Principles and Ways of Criticizing that Weakness Inherent in Casteism.

The Government of India initiated the ‘New Education Policy - Challenges of Education’ nearly two decades ago with the aim of providing elementary education, according to the formula of two rooms, two teachers, one toilet, open space for recreation, free reading materials, blackboards, chalks, pencils and other related stationery. It was observed that 38 percent of elementary schools had no blackboards while 28 percent were single-teacher schools. It was estimated that the number of elementary schools were 519,000 in 1984-85 and that 200,000 schools were needed. These figures placed a higher than normal budgetary constraints that limited the implementation of the program. It is in such circumstances, that ICT gets a crucial role to play in balancing the disparities between regions, communities and sexes. In Andhra Pradesh for example, the government introduced video education programme in about 600 elementary schools in June 1987. This innovative programme covered over 60,000 children initially and was expected to cross 100,000 children by 1990. The instruction through films was made available to pupils in the first two lower classes and helped the pupils to understand better. The video lessons created an environment for pupil participation and a more effective communication between teachers and pupils.

5.4.1 Dropout

It is estimated that the overall dropout rate (inclusive of stagnation) for classes I to V is around 65 percent while for class I to VIII is 75 percent. Simply put, it means of the 100 children who join class 1, only 35 may complete class V and only 25 will proceed to complete class VIII. The task, therefore, is to take education to those 75 pupils who joined class 1 but did not proceed beyond class VIII. Pupils’ dropout due to a variety of reasons, amongst which are poverty and the conditions in schools. The school conditions can be made more suitable to the pupils through ICT, which should leave an everlasting impression in the minds of young pupils. Audio-Video technologies can create an everlasting impression on the children because they bring the real world into their classrooms, sparing teachers of ‘talk and chalk’ aspects of teaching.

5.4.2 Use of Technologies in Education and Training

ICT has been used in various parts of the world to improve the quality of educational provision. It can however reduce the quality of education if it is not well planned and accustomed to the needs of learners. ICT can redress the imbalances of the old system of classroom mode of education and help in developing new teaching and learning strategies to empower learners for participation in the democratic process.

The intelligent and appropriate use of technology adds to the available choices of learning strategies. In India, old and new technologies have the potential to help tackle critical problems of access, redress, flexibility, and relevance. Indeed, they are sometimes a necessary feature of solutions to problems that traditional approaches cannot solve.

5.4.3 A Changing Role for Educators

Educational discussions about the use of technology often raise a justified fear that the intention is to replace educators with automated, technological solutions. Experience from India and around the world however indicates that attempts to replace educators with technology are neither educationally nor financially advisable. There is therefore
a commitment to an education and training system that places emphasis on learners and educators in an open and technology-enhanced learning environment. The changing role for teachers will require that teachers:

- become facilitators and managers of learning in situations where they are no longer the source of all knowledge.
- plan, negotiate for, and manage the integration of learning in formal institutions, in the workplace, and in communities.
- spend a considerable proportion of their workloads contributing to the preparation of courseware.
- interact with learners at a distance through any one or combinations of a variety of media (of which real-time face to face interaction is only one of many possibilities).

It will be essential for teachers to design and administer complicated computer based record keeping systems that keep track of learners' progress. Increasing proportions of educators' work will involve them as members of teams to which they will contribute only some of the required expertise, and of which they will not necessarily be the leaders, managers, or coordinators.

**Check Your Progress**

**Notes:** a) Write your answers in the space given below.

b) Compare your answers with these great at the end of the Unit.

4) Mention any four serious drawbacks of the conventional system of imparting education through face-to-face contacts.

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5.5 CHARACTERISTICS OF DIFFERENT MEDIA

### 5.5.1 Face-to-Face Contact

This is one of the most common media for imparting learning. Face-to-face contact enables interaction between the educator and the learner and amongst the learners themselves. Learning through face-to-face contacts is influenced by:

- the educational purpose
- the way in which it is designed
- and the number of learners and educators involved
- the personalities of the individuals involved.

A major advantage of face-to-face contacts is that it allows learners to be taken to different locations where the learning experience is designed around the immediate environment of the group. Field trips and excursions are examples of such educational experiences. It has a further advantage of social interaction, which is often beyond the scope of study material, which is possible during face-to-face contact. It allows monitoring of social interactions and learning experiences while sessions are in
progress. Instructional design can therefore be adopted immediately if necessary. Learners and educators can study the progress of a learning situation; intervene during the session and monitor moods, participation, attendance, and levels of engagements.

Face-to-face contact is however very expensive to maintain as compared to distance education and other resource-based learning methods which uses a using combinations of media and technologies to replace some of the traditional functions of face-to-face contact.

5.5.2 Text

The term ‘text’ is defined as scripted words and other related signs like numbers, pictures, charts, diagrams, and maps. Various technologies can be used to facilitate textual media communication between learners and educators. For example, an educator may write notes on a chalkboard, course design teams may develop printed study guides for learners to read, learners may type or write assignments, and both educators and learners might participate in e-mail discussion lists. Text has many applications such as in:

- recording of activity
- as a source for detailed explanation
- as a reference for a summary of key concepts
- supporting correspondence (including post, facsimile, courier, and electronic mail).

5.5.3 Technologies for Delivering Text

The major technologies for delivering text are print, facsimile and computer technologies.

Print

Print could be said to be the foundation of all educational technologies. It is the most common in distance education where it is either the main delivery technology for courseware or is used in conjunction with other media and technologies. Its importance has increased due to emergence of relatively low-cost desktop publishing and on-demand printing technology. These have eased the tasks of preparing, updating, and revising textual and graphic materials. Printed materials are found in various forms such as newspaper supplements, one-page letters, circulars, posters, booklets, workbooks and textbooks. Special supplements in national newspapers, sometimes in conjunction with radio have been used in large-scale education systems to spread awareness about such subjects as health care and rural development or in national in-service teacher training programmes. Newspaper distribution networks are one of the most cost-effective ways of getting educational material to large numbers of readers. Newspapers are also used provide general information on an institution’s courses. Educational newspaper supplements are common in India, with most large national and regional newspapers carrying an educational supplement on a regular basis i.e. the Hindustan Times has an educational supplement every Monday. Schools and tertiary education institutions also make use of textbooks in classrooms as well as for independent study and reference purposes. Some textbooks are written in a personal style, including self-assessment questions and review tests or questions at the end of each main section/chapter or Unit.

Computer Applications

Text is widely used in Computer applications for instructions, entering data and presenting information. The most widely used text-based applications are online services and databases. Online services has an important part in education, including subject
related databases and library services, online access to information about courses, and links to administrative services such as registration and fee payment. Hyper text protocols are also used for Web-sites. Hyper text is a protocol for linking parts of documents to other documents or to parts of other documents. Clicking on a 'hot spot' in a Hyper Text document activates a hypertext link in the underlying software, taking the reader to the linked item. These items may be text, audio, graphics, or video documents. Electronic mail (E-Mail) also makes extensive use of text. It enables a user to send text messages from a personal computer over a data network (such as the Internet) to one or more recipients. Recipients collect messages from their 'mailbox' on a central server, using their own personal computer or workstation. For example, a teacher can use e-mail to pass the same information to the students and to receive assignment responses from the students.

5.6 COMMUNICATION TECHNOLOGIES

Having studied the distribution of text based materials involving interaction between the recipient and the sender of the information; we shall now study the communications technologies used to support interaction. These communication technologies can be divided into two broad categories of:

i) Asynchronous technologies i.e. these technologies do not require participants to be present simultaneously. Examples include postal correspondence, electronic mail, and computer conferencing. They can be ‘stored’ and used at the convenience of the user.

ii) Synchronous technologies i.e. these technologies require participants to interact at the same time. These technologies include telephony, audio/video conferencing, and audio-graphics conferencing.

5.6.1 Audio

Audio is commonly used in many educational initiatives such as in conversation, debates, counseling, and lectures. It has the potential of voice modulation i.e. the voice can be made to vary in pitch, pace, volume, and emphasis. Audio resources are capable of making extensive use of music and sound effects as well as human voices. They are also cheap, easy to use, accessible and educationally effective. It has been used to support communication skills and to explain specific concepts. Audio can also be used in combination with other media (such as text, graphics, or video) to provide multi-sensory input, and are important for teaching appreciation of music or identification of sounds. Audio can also be used to create a specific mood or atmosphere. Pronunciation and language skills can be supported. Audio resources are however, not relevant if the learners are not a homogeneous group of listeners. Audio resources have differing abilities to support interactive learning. In India, audio resources have been used to assist children with developing communication and language skills through practice.

Technologies for Delivering Audio

The major technologies for delivering audio are:

- radio,
- audio cassette,
- music/audio compact discs
- Computer applications.
We shall now focus on the radio and audiocassette. Music/audio compact discs and computer applications have been discussed under integrated multimedia.

**Radio**

This is the most accessible technology in terms of cost and outreach. It has been used for educational purposes such as school broadcasts, in-service teacher support and training, and adult literacy and basic education campaigns. A single teacher can reach a wider pupil population irrespective of their location in their world. Some institutions are even evolving radio-tutorials and radio conferences to overcome the snag of ‘one-way communication’ in radio broadcasts. It can also be combined with tutorials, print materials, local listening groups, and face-to-face meetings, to teach a wide range of subjects. The Indira Gandhi National Open University (IGNOU), for example, has a special radio station devoted to education (Gyan Vani). The wide availability of audiocassette recorders can now be used to record and store radio broadcasts i.e. transforming it from synchronous to asynchronous technologies. A major disadvantage of the radio is that it is mostly one way of communication from the teacher to the learner. It does not allow for interaction. A lot of imagination is therefore needed if the radio broadcasts is to be an effective tool for education because a simple straight talk over the radio often fails to sustain pupils’ interests. As far as possible, the teacher should present dramatization, radio symposia, discussions, educational quiz and other forms of pupil involvement during broadcasts to make the radio broadcasts more effective.

**Phone Services**

Some institutions have adopted the use of telephones in education. The invasion of the mobile phone service of the present age is sure to bring about a revolution in the use of phones for education. Phone service has a great potential in the provision of two-day interaction between the pupil and the teacher and also among the learners themselves. Phone services are crucial in remote areas where teachers and pupils are scattered over a wider geographical region and also in seeking on the spot assistance to learning outside the scheduled face-to-face contacts. Tele tutoring and teleconferencing are also gaining importance as educational tools.

**Audio Cassettes**

Radio broadcasts can be recorded in audio cassettes for future broadcasts making them a more potential educational technology compared to radio. As a technology, audio cassette recorders give educators and learners the power to record audio resources for asynchronous use. Teachers and students can also purchase audio cassettes containing complete sets of programmes. Use of recorded audio resources allows learners greater control over the duration of the listening-learning process, as well as its frequency or quantity. The replay and pause facilities are effective for analysis or revision. It can be used in combination with print materials to allow for simultaneous audio and visual simulation, while students can move between media at their own pace.

5.6.2 **Video – Technologies for Delivering**

**Television**

With the cost of television sets coming down over the last decade, televisions are becoming easily accessible and are providing a very attractive and useful audio-visual medium for education. The installation of satellites, introduction cable systems
and the disc tops, television broadcasts are reaching larger and larger student population than ever before. It has an advantage over radio when it comes to demonstrating laboratory experiments and presenting the picture versions of items to be learnt. Some institutions are developing electronic blackboards, fibre optics and telephones that convert a simple television set into a more powerful educational tool called telidon. Television programmes are however far more costly to produce and to transmit than radio programmes, especially if they are broadcast over public net works and expected to meet production standards of other channels such as news, documentary, and entertainment programmes The television broadcasts can further be stored on video-tapes and video discs to remove the constraints of viewing TV programmes at set times. The television broadcasts, however, suffers from the following limitations:

- Learners are required to gather at a specific place with a television set
- Learners do not have control over the pacing of the broadcast
- Television broadcasts tend to encourage passivity amongst learners
- It is difficult to integrate other media during television broadcasts
- Broadcasts tend to be organized in time packages that are much longer than the time an average student is able to concentrate fully on the television screen. It is rarely granted sufficient autonomy to telecast educational programmes
- Special channels and frequencies devoted to educational programmes are limited
- Lack of trained teachers to produce good educational programmes through television
- Lack of expert group to monitor, evaluate and co-ordinate television programmes to ensure regular improvements.

Video

Video is a medium for providing students with an opportunity to view that which they would not usually experience. It can be used to show text and graphics, lecture or presentation. A teacher can be shown lecturing a subject, and this lecture could either be broadcast live, pre-recorded, or combine live and pre-recorded material. This enables the presenter to show lecture aids, such as notes, diagrams, charts, or photographs. Video can also show what is being explained, as it happens in the ‘real world’. Video can be particularly useful educationally for showing movement or procedures. When used on videocassette or computer, video can be interrupted and reviewed at will. Nevertheless, it can be viewed continuously, presenting a set sequence of events in an appealing and entertaining manner.

Integrated Multimedia

Integrated Multimedia in education means the use of a number of different media to support teaching and learning. An economics teacher might explain (face-to-face contact) the concept of Demand and Supply while drawing a graph (text) onto a chalkboard. Learners might then watch (video), a television programme before completing a worksheet (text), and discussing (face-to-face contact) their responses in a group. You will notice in the above examples that separate ICT components such as chalkboard and chalk, television, and printed material were necessary to support teaching/learning. Computer technology allows text, audio, and video material to be accessed via a single platform (computer). Computer technologies also allows
for the storage of digital files which can later be downloaded directly from electronic databases, accessed via the Worldwide Web, distributed on CD-ROM, or broadcast and accessed using televisions and set-top boxes.

**Check Your Progress**

**Notes:**

a) Write your answers in the space given below.

b) Compare your answers with these great at the end of the Unit.

5) What are the changing roles for teachers in a technology-enhanced learning environment? (Mention three)

6) Differentiate between asynchronous and synchronous technologies.

7) Mention the three broader technologies for delivering audio.

8) What is the meaning of Integrated Multimedia?

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**5.7 LET US SUM UP**

In this unit, we studied the broad definition of ICT and its two main categories. We also studied the meaning of education and the concept of ICT. Accordingly, we related the ICT to education before examining the rationale for using ICT to solve the problems facing education today. We also argued that in the light of the immense potential of ICT to solve the educational challenges facing education system today, the role of teachers has to change.
5.8 ANSWERS TO CHECK YOUR PROGRESS

1) ICT which process information, such as computer systems, and (2) those which disseminate information, such as telecommunications systems.

2) • Face-to-face
   • Via correspondence
   • Using printed media
   • Using audio
   • Using video
   • Using computers

3) • Technologies to Support the Educational Provider
   • Technology to Support Delivery of Resources
   • Technology to Support Teaching and Learning

4) The major drawbacks include inability to provide:
   • qualitative improvement of education
   • quantitative expansion of education
   • equality of opportunity, and
   • cost effective means of educational provision.

5) The changing role for teachers requires teachers to:
   • become facilitators and managers of learning in situations where they are no longer the source of all knowledge.
   • plan, negotiate for, and manage the integration of learning in formal institutions, in the workplace, and in communities
   • spend a considerable proportion of their workloads contributing to the preparation of courseware.
   • interact with learners at a distance through any one or any combinations, of a variety of media (of which real-time face to face interaction is only one of many possibilities).

6) Asynchronous technologies are those technologies that do not require participants to be present simultaneously i.e. postal correspondence, electronic mail, and computer conferencing as they can be ‘stored’ and used at the convenience of the user. Synchronous technologies however, are technologies that require participants to interact at the same time such as telephony, audio/video conferencing, and audio-graphic conferencing.

7) The major technologies for delivering audio include:
   • Radio,
   • Audio cassette,
   • Music/audio compact discs
   • Computer applications.

8) Integrated Multimedia in education means the use of a number of different media to support teaching and learning.