

**Block****1****UNDERSTANDING ICT**

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Communication Technology (ICT)** **31**

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# **BESE-135: Information and Communication Technology**

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## **Block 1 UNDERSTANDING ICT**

**Unit 1 Meaning, and Nature of Information and Communication Technology (ICT)**

**Unit 2 Scope and Evolution of Information and Communication Technology (ICT)**

**Unit 3 Learning Theories: Implications for ICT**

**Unit 4 Teaching-learning Systems**

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## **Block 2 TEACHING AND LEARNING RESOURCES**

**Unit 5 Non-digital Teaching-Learning Resources**

**Unit 6 Digital Teaching-Learning Resources**

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## **Block 3 ICT AND PEDAGOGY**

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**Unit 10 Selection and Integration of ICT Resources**

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**Unit 14 Learning Support Systems**

**Unit 16 ICT for Inclusive Classroom**

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# BESE-135 INFORMATION AND COMMUNICATION TECHNOLOGY

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## Introduction to the Course

The main objective of teaching-learning process is to optimize student learning. A teacher interacts with students to transact a given content. In order to transact a given content, a teacher makes use of different methods or techniques. Methods or techniques alone may not help a teacher to transact the given content. He/she has to take the help of a number of information and communication technologies (ICTs) to enhance student learning. Of late, ICTs are becoming an integral part of not only teaching-learning process, but also of other activities of a schooling system such as management and administration of a school. Therefore, there is a need to study and understand ICT in its entirety so that it is used optimally to enhance student learning as well as to increase the overall productivity of the schooling system. The Course BESE-135: Information and Communication Technology attempts to provide you with a broad overview of information and communication technology in education. It intends to explain the meaning, nature, scope and evolution of Educational Technology and ICT in education; integrate ICT into teaching-learning process, evaluation, administration and other learning support systems; help you to participate in collaborative networks for learning, sharing and co-creating knowledge; and use ICT for making classroom processes more inclusive and address multiple learning disabilities.

Block 1 deals with the concept of Educational Technology, differences between Technology in Education and Technology of Education, classification of educational technology, meaning and nature of ICT, a brief introduction to different audio mediums and audio-visual mediums, and computer. The concept of E-learning, its goals and the concept of Internet, its advantages and disadvantages are explained. It describes the scope and evolution of educational technology and Information and Communication Technology (ICT) in education; compares satellite technology with terrestrial technology; and discusses teleconferencing, mobile learning, social networks in education, OER, online learning and u-learning. The Block also briefly presents learning theories and discusses their implications for use of ICT in education. At the end, it explains three teaching-learning systems, namely, formal, informal and non-formal, their emergence, characteristic features and design and development of ICT mediated teaching learning system.

Block 2 focuses on non-digital teaching learning resources like chalkboard, textbooks, workbook programmed learning materials (PLM), self-instructional module, charts, maps, models, poster, OHP, slides and filmstrips. It describes digital teaching learning resources like radio, television, computer, Internet, web radio, Web 2.0 technologies, E-book, chat rooms, E-conference, and search engine. It explains Open Educational Resources (OER), their uses, how to create and share OER and OER repositories. At the end, educational software, their uses for classroom learning, special learners and assessment have been discussed.

Block 3 begins with ICT mediated teaching-learning environment, physical constituents of ICT mediated teaching-learning environment, layout of the

learning space, shift from non-digital to digital technology in the teaching-learning process, social autonomy and responsibility of learners in the choice of technology, synchronous and asynchronous interaction and adapting learning environment to make classroom inclusive. It elaborates selection and integration of ICT resources. It describes Technology Pedagogy and Content Knowledge Framework (TPACK) to demonstrate how technology can be integrated with content and pedagogy. The role of ICT in student assessment and various Online/Web-based assessment tools for both objective and subjective types of test have been described. The Block ends with discussion on various ICT tools for collaboration, co-creation, and sharing of knowledge..

Block 4 explains the concept of educational management and discusses various applications of ICT in school governance, administrative activities, and financial management. It discusses different learning support systems, and ICT based learning systems like digital library, virtual laboratories, virtual world, simulation, electronic mail and discussion forum. The role and use of ICT in inclusive classroom has been explained in the Block. In the end, we discuss social, legal and ethical issues pertaining to the use of ICT. Ethical issues like intellectual property, copyright in the digital world, plagiarism, privacy policy, etc. are discussed. The impact of ICT on different socio-cultural issues like cyberbullying, Internet addiction, etc. has been analysed.

In this Course, you may find discussion on the use of same ICT devices/tools/softwares in different units. However, they have been discussed in a particular unit in the light of the requirement of the unit.

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# BLOCK 1 UNDERSTANDING ICT

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## **Introduction to the Block**

Block 1 of the course provides you an introduction to the understanding of the concepts of educational technology and information and communication technology (ICT). It serves as an advance organizer to the entire course. Apart from explaining the concepts of educational technology and ICT, the Block introduces you to various types of educational technologies and ICTs used for educational purposes.

Unit 1 explains the concept of Educational Technology and differentiates between Technology in Education and Technology of Education. Technology in Education is also known as hardware approach to educational technology, whereas Technology of Education is known as software approach to educational technology. It provides a classification of educational technology into eight broad categories on the basis of the senses that are stimulated by educational technologies. We explain meaning and nature of ICT. A brief introduction to audio mediums like radio, audio CD/DVD, Podcast and audio-visual mediums like television, video CD/DVD has been made in the Unit. Similarly, a brief introduction to computer, its components, and types has also been made. The concept of E-learning, its goals, how E-learning caters to the 21<sup>st</sup> century skills and competencies and communication technologies used in E-learning are discussed. Differences between E-learning and traditional learning are explained. At the end, the concept of Internet, its advantages and disadvantages are explained.

Unit-2 focuses on the scope and evolution of educational technology and Information and Communication Technology (ICT) in education. The four phases of evolution of educational technology and ICT in education, namely, audio-visual, cybernetic, psycho-sociological and information and communication technology have been discussed. A comparison between satellite and terrestrial technologies has been made. We also discuss teleconferencing, its types, mobile learning, social networks in education. OER, its features, how to use OERs optimally, its advantages and disadvantages have been described. At the end, we explain the concept of online learning and u-learning.

Unit 3 is concerned with learning theories and their implications for use of ICT in education. In this Unit, learning theories coming under three major schools of thought on learning, namely, behaviourism, cognitivism and constructivism have been briefly presented followed by their implications for use of ICT in education. The Unit also discusses how to use information and communication technologies optimally for teaching-learning purposes.

Unit 4 deals with teaching-learning systems. We discuss three categories of teaching-learning systems, namely, formal, informal and non-formal, their emergence, characteristic features and impact on the individuals. Basic components, steps and process in the design development of ICT mediated teaching learning systems have been discussed. Various uses of ICTs for classroom teaching have been described. Virtual Learning Environment (VLE) and its features. collaborative learning, its features and use of ICT for collaborative learning have been presented in this Unit.

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# UNIT 1 MEANING AND NATURE OF INFORMATION COMMUNICATION TECHNOLOGY(ICT)

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## Structure

- 1.1 Introduction
- 1.2 Objectives
- 1.3 Concept of Educational Technology
  - 1.3.1 Technology in Education: Hardware Approach
  - 1.3.2 Technology of Education: Software Approach
- 1.4 Classification of Educational Technology
- 1.5 Meaning and Nature of ICT
- 1.6 Audio Medium
  - 1.6.1 Radio
  - 1.6.2 Audio CD/DVD
  - 1.6.3 Podcast
- 1.7 Audio Visual Medium
  - 1.7.1 Television
  - 1.7.2 Video CD/DVD
- 1.8 Computer
  - 1.8.1 Basic Components of a Computer
  - 1.8.2 Types of Computer
- 1.9 E-learning
  - 1.9.1 Goals for E-learning
  - 1.9.2 E-learning and 21<sup>st</sup> Century Skills and Competencies
  - 1.9.3 Communication Technologies used in E-learning
  - 1.9.4 E-learning and Traditional Learning
- 1.10 Internet in Education
  - 1.10.1 Advantages of Internet in Education
  - 1.10.2 Applications of Internet in Education
- 1.11 Let Us Sum Up
- 1.12 Suggested Readings and References
- 1.13 Answers to Check Your Progress

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## 1.1 INTRODUCTION

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You may be aware of the use of different technologies such as radio, television, computer, etc., in the teaching-learning process. In fact, all these technologies have transformed the teaching and learning process. Radio, television and newer digital technologies such as computers, mobile and the Internet constitute Information and Communication Technologies,. They have been visualized as powerful teaching- learning tools for optimizing learning outcomes of learners.

This Unit has been adapted from Unit 1 of MES-031: ET: An Overview, Unit 8,12 and 13 of BES-002: Teaching-Learning and Assessment of IGNOU.



Different ICTs have potentiality to expand the access to education, strengthen the process of education and enhance the quality of education. The present Unit is an attempt to give you an understanding of the concepts of educational technology and information and communication technologies (ICT) as well as to introduce you to various ICTs briefly.

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## 1.2 OBJECTIVES

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After going through the unit, you will be able to:

- explain the concept of ‘educational technology’;
- differentiate between technology in education and technology of education;
- classify various types of educational technology;
- explain the meaning and nature of ICT;
- describe various audio and audio-visual media;
- describe the various components and types of computer;
- explain the meaning of E-learning;
- discuss various communication technologies used in E-learning;
- differentiate between E-learning and traditional learning;
- explain the meaning of Internet; and
- discuss the advantages and applications of Internet in education.

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## 1.3 CONCEPT OF EDUCATIONAL TECHNOLOGY

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You, as a teacher, must be using technology in your classroom teaching to make your presentations more effective. But to most people, the term ‘educational technology’ is associated only with the equipment or the hardware part, which they use such as overhead projector, television, computers, etc. But the concept of educational technology should not to be confused with the electronic gadgetry; it has a wider meaning as wide as education itself. By this it means that educational technology is concerned with the design and evaluation of the curriculum and learning experiences to be provided and also with the problems of implementing it.

Let us understand the meaning of the term ‘educational technology’ by splitting it into education and technology, Technology, as we understand, refers to the systematic application of techniques and principles to achieve an objective. Technology results in new designs and devices to improve human productivity. Education is the process of acquiring and imparting knowledge crucial to the development of a learner, Therefore, it can be concluded that the educational technology would be the application of the principles of education to improve human learning.

There have been a number of definitions of educational technology which have been produced over the years; let us go through them to get the better understanding of the term ‘Educational Technology’.

*“Educational Technology is the development, application and evaluation of systems, techniques and aids to improve human learning.”* (National Council for Educational Technology for the United Kingdom” (NCET, 1967)



Another definition by National Center for Programmed Learning, has put the term of Educational Technology as “*Educational Technology is the application of the scientific knowledge about learning, and conditions of learning, to improve the effectiveness and efficiency of teaching and training. In the absence of the scientifically established principles, educational technology implements techniques of empirical testing to improve learning situation*”.

Derik Unwin (1969) has also defined educational technology as ‘*the application of modern skills and techniques to the requirements of education and training.*’

G.O.M. Leith (1975) defined “educational technology” as “an application of scientific knowledge about learning and conditions of learning to improve the effectiveness and efficiency of teaching and learning”.

According to UNESCO, “Educational technology is a communication resulting from the application of the scientific methods to the behavioral science of teaching and learning. This communication may or may not require the use of media such as television broadcasts, radio, cassettes etc.”

The main components of this communication process as given by UNESCO are as follows:

- a) Goals or the behavioral objectives,
- b) Analysis of the characteristics of learners,
- c) Selection and organization of content,
- d) Selection of media,
- e) Evaluation, and
- f) Feedback.

After going through all the above definitions of the educational technology, you can conclude that the chief role of educational technology is to improve the effectiveness and efficiency of the teaching and learning process. Educational technology as it exists today is the result of the integration of the technological devices with the newly explored psychological principles of learning, teaching, behavioral modification, etc.

In short, educational technology, in its widest sense can be understood to be including the development, application and evaluation of systemic knowledge about learning and instruction to teaching and training with the aim of improving their quality and efficiency.

According to Ellington et.al. (2005), this increase in the efficiency due to the use of educational technology in various situations can be manifested in many different ways, which are as follows;

- a) Increasing the quality of learning or degree of mastery among the learners;
- b) Decreasing the time taken by learners to attain the desired goals;
- c) Increasing the efficiency of teachers in terms of numbers of learners taught, without reducing the quality of learning;
- d) Reducing costs, without affecting the quality; and

- e) Increasing the independence of learners, and the flexibility of education and training provisions.

The scope of educational technology encompasses educational objectives, media and other characteristics, criteria of selecting media and resources, management of resources as well as their evaluation.

Till now, we have discussed that educational technology is the means for effective learning. But the effective learning could only come through the effective application of educational technology, which in turn is dependent upon the proper integration of hardware with the appropriate software. For example, an interactive television, which is a highly developed hardware, cannot provide quality output if it does not have quality educational programmes.

Now, this is understood that both the hardware and the software are needed for the effective use of Educational Technology. Although hardware is an important component, but it is of little use if suitable software is not available. Thus what is needed is both technology in education and technology of education. Let us reflect on these terms more closely.

### **1.3.1 Technology in Education: Hardware Approach**

Technology in education is also called the hardware approach to educational technology because it is concerned with the electronic gadgets such as television, radio, language labs and various other projected media, which are being used to educate learners. Technology in education includes tangible aspects of technology. This side of educational technology has been derived from the principles of physical sciences, as the main thrust is on the development of the electronic equipment like monitors, cameras etc which could be used in the teaching-learning process.

### **1.3.2 Technology of Education: Software Approach**

Technology of education approach to educational technology involves a systematic, scientific application of appropriate scientific research, both from the physical sciences and from the social sciences such as psychology and sociology to solve a problem. Here, it is important to understand that *Technology of Education* emphasizes on the techniques of teaching and learning derived from the principles, ideas and practices drawn from various fields of knowledge like psychology, sociology, philosophy, management studies, cybernetic, etc. in order to optimize the teaching-learning process. In other words, we can say that the technology of education includes 'intangible' aspect of education. For example, teachers or trainers use a number of methods and techniques while organizing instructional programmes. Methods like inquiry teaching, simulated teaching, programmed instruction, computer-assisted instruction are the results of application of pedagogic principles derived from psychology of education.

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## **1.4 CLASSIFICATION OF EDUCATIONAL TECHNOLOGY**

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Teaching-learning aids are classified in several ways. Edgar Dale's cone of experience provides us with one such possibility of classifying them. Educational technologies are classified on the basis of four important characteristic, viz.

stimulations provided to the sense organs, learner's control over media, types of experience they provide, and their reach. The most widely used classification is on the basis of the senses that are stimulated by educational technologies. These can be classified as follows:

**I) Visual (Verbal) Print or Duplicated**

- Textbook, Supplementary Book
- Reference books, Encyclopedia, etc.
- Magazine, Newspaper, etc.
- Documents and Clippings
- Duplicated Written Material
- Programmed Learning Material and Self-instructional Modules
- Case Studies (Simulating Reality) and Case Report

**II) Visual (Pictorial) Non-projected Two-dimensional**

- Blackboard Writing and Drawing
- Charts
- Posters
- Maps
- Diagrams
- Graphs
- Photographs
- Cartoons
- Comic Strips

**III) Audio**

- Human voice
- Gramophone records
- Audio tapes/discs
- Stereo records
- Radio broadcast
- Telephonic conversation

**IV) Visual Non-projected Three-dimensional**

- Model
- Mock-up
- Diorama
- Globe
- Relief Map
- Specimen
- Puppet
- Hologram

V) **Visual Projected (Still)**

- Slide
- Filmstrip
- Transparency (OHP)
- Microfilm, Microcard
- Computer

VI) **Audio-visual Projected (With Motion)**

- Motion Picture Film
- Television
- Close-circuit Television
- Video Cassette/Disc

VII) **Multi-Media packages (for more than one sense)**

- Slide + tape + workbook
- Radio + slide or posters (Radio vision)
- Film + posters + workbook (print materials)
- Television + workbook (print materials)
- Any of the above + group discussion
- Any of the above + introductory and summarizing talk by teacher/leader of the group.

VIII) **New emerging media (all of these are multisensory)**

- Tele-conferencing (group discussion through telephones)
- Cable television
- Satellite television/communication satellites
- Computer networking
- Video discs
- Mini computers/micro computers/word processors.

**Source:** S.S. Kulkarni, (1986). *Introduction to Educational Technology*, Bombay: Oxford & IBH Publishing Co., pp. 143-144:

New emerging media also include Internet, Mobile technology, etc.

**Check Your Progress**

- Notes:** a) Write your answers in the space provided.  
b) Compare your answers with the one given at the end of the unit.

1) Define educational technology in your own words.

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2) Differentiate between technology in education and technology of education.

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## 1.5 MEANING AND NATURE OF ICT

Information Technology (IT) and Information and Communication Technology (ICT) are very often interchangeably used in the context of modern technology infrastructure. ICT is a broad and comprehensive term, which comprises information technology and communication technology. Information technology includes radio, television, computer and Internet, teleconferencing and mobile. All these information technologies are powered by mainly two types of communication technologies. These are satellite based communication and terrestrial based communication. Satellite based communication is the communication, which takes place between sender and receiver through a communication satellite whereas terrestrial based communication is the communication, which takes place through a network of transmitters spread across a geographical area, a country, or a state. This type of communication is used in the transmission of radio and television in India. However, with the launch of a series of satellites by Indian Space Research Organization (ISRO), satellite based communication is being used for telecommunication. The components of ICT are presented in Fig.1.1.

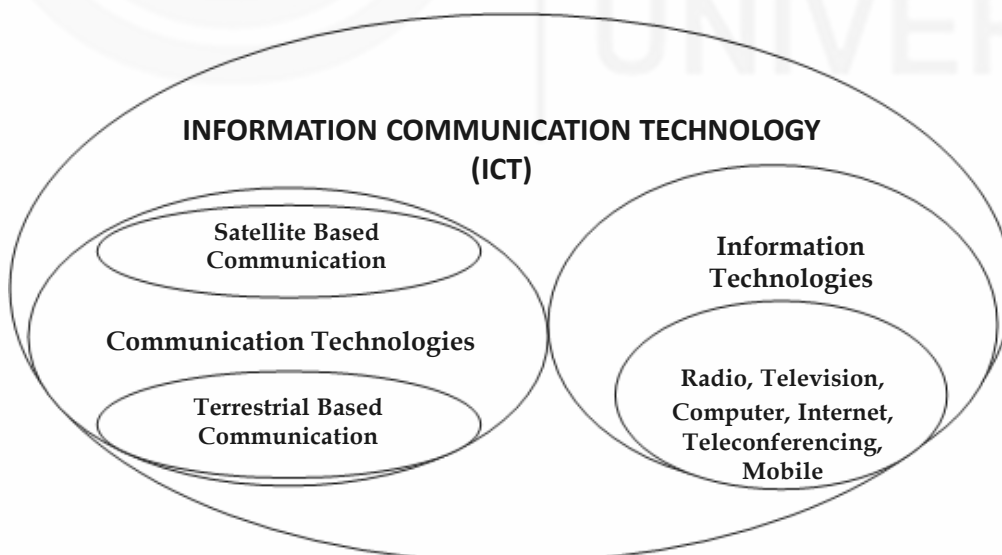


FIG. 1.1: Components of ICT

Communicating information effectively by making use of appropriate technology is called information and communication technology (ICT). In all, ICT is an umbrella term that includes many communication devices such as radio, television, cellular phones, computers and network, satellite systems and so on.

There are many definitions of ICT. ICTs 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, the Internet, broadcasting technologies (radio and television), and telephony, etc.*

According to the United Nations Development Programme (UNDP): “*ICTs are basically information handling tools — a varied set of goods, applications, and services that are used to produce, store, process, distribute and exchange information. They include the “old” ICTs of radio, television and telephone, and the “new” ICTs of computers, satellites and wireless technology and the Internet. These different tools are now able to work together, and combine to form our “networked world”, a massive infrastructure of interconnected telephone services, standardized computer hardware, the Internet, radio and television, which reaches into every corner of the globe.*”

According to C-DEC, Department of Information Technology, Government of India “*the term, information and communication technologies (ICT), refers to forms of technology that are used to transmit, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, computer and network hardware and software; as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs.*”

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

3) Explain the term ‘ICT’?

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4) On the basis above discussion, enlist the technologies, which are included under ICT?

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## 1.6 AUDIO MEDIUM

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Your voice is the most common form of audio medium, which may be used in classroom teaching. You use voice to communicate with others. Voice creates sound, which delivers message to others.

Sender —————→ Sound/message —————→ Receiver

In a classroom when a teacher talks, the message is sent to students in the form of sound. It is one of the most natural ways of communicating.

To make your voice effective medium of communication you should modulate your voice; express your feelings; emphasis, pause at appropriate places. The skills of using voice as an effective classroom transaction are integral part of teacher training programme.

Many audio teaching learning resources are available to make classroom teaching effective

### 1.6.1 Radio

Radio is a popular mass medium, which has been with us from very early times. It is also widely used and most accessible ICT in the country. These days all of us are tuned to Radio through FM channels. Popularity of Radio is due to its easy access, speed and immediacy. Back in 1917 radio was visualized as means for mass education. In India, first radio station was established in Mumbai (Bombay) in July 1927. Two more radio stations in Calcutta and Delhi were established in 1936. All India Radio (AIR) broadcasted radio programmes for the country. In 1937 Calcutta station broadcasted school programmes for the first time and it continues until date.

School educational programmes are still in demand and are used by teachers to generate interest of students. **Gyan Vani** is a dedicated FM channel for educational broadcasts. It is used to broadcast educational programmes from Educational Media Production Centre (EMPC) of Indira Gandhi National Open University (IGNOU), New Delhi. Audio programmes developed by Central Institute of Educational Technology (CIET) of National Council of Educational Research and Training (NCERT) for school children are also broadcast by Gyan Vani.



Fig 1.2: A Radio

Source: <http://commons.wikimedia.org/wiki/Radio>

Radio is used to-

- broadcast lectures by eminent educationists, scientists, etc.
- broadcast drama, stories, commentary, news, etc

Radio is popular all over country, urban as well as rural settings.



While preparing Radio programmes selection of topic is very essential. Topic should support verbal communication i.e. verbal inputs are needed to topic. Sound, music, special effects are added to audio programmes to make it interesting and effective. It helps in creating visual images through sound and thus enriches imagination in children. CIET, State Institute of Educational Technology (SIET) and educational technology divisions of SCERTs produce topic and need based audio programmes for school children.. IGNOU also produces audio programmes for its student teachers enrolled in teacher education programmes. .

### 1.6.2 Audio CD/DVD

Audio recordings in the form of CD or DVD are very popular teaching-learning resource. Stories, poems, songs are frequently used in secondary classes. Discussion and debates with important personalities can be recorded and prepared in the form of Audio CD to be used in classroom to motivate students. NCERT, National Institute of Open Schooling (NIOS) prepare Audio CD/DVD for children which are very effective teaching-learning resources.

You can use a DVD or CD player with speakers in your classroom to see these audio CD/DVD. You may also prepare your own audio CD/DVD, using your mobile, voice recorder or softwares on computer.

### 1.6.3 Podcast

Radio is a mass broadcast medium whereas Podcasts are personalized broadcasts. Podcasts are prepared for specific target and made available to the target group for specific learning objectives. Podcast consists of two words: 'pod' from iPod and 'cast' from broadcasting.

Suppose, you want to narrate a story to your class. You record it and play in your classroom teaching. If children want to hear it at home, you can make it available through Podcasts. Podcasts can be easily made using computer software.

Podcasts are uploaded on web to be listened at any place and any time. Students can download it to hear at any convenient time and place.

#### Check Your Progress

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

b) Compare your answers with the one given at the end of the unit.

5) How will you make your voice an effective medium of communication?

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- 6) True or False
- i) Educational Radio Broadcast is known as Rainbow.
  - ii) Podcast means personalized Broadcast.
  - iii) Radio can be listened to at any time according to one's convenience.
  - iv) Podcast can be used at any time by anyone.

## 1.7 AUDIO VISUAL MEDIUM

It is the most effective medium of ICTs and thus generates interest and motivate learners. Televisions, Video, Multimedia programmes, interactive video are audio-visual ICTs used by teachers.

### 1.7.1 Television

Television is another important medium of disseminating information to its viewers. It is a combination of audio and visual technology, and thus considered to be more effective than audio medium like radio. You must have seen the use of television for multiple purposes of entertainment, information and education. Because of its better accessibility, it can bring learning materials to the masses in more direct, effective and personal way than other educational media.

Television named as 'Doordarshan' started its service on Sept 15, 1959, as the National Television Network of India. In India, since the inception of TV network, television has been perceived as an efficient and effective medium of education and development. With its large audience it has been an efficient tool of imparting education to primary, secondary and university level students.

Some of the major educational television initiatives in India are **Secondary School Television Project (1961)**, **Satellite Instructional Television Experiment (SITE) (1975)**, **Post-SITE Project (1977)**, **Indian National Satellite Project (INSAT) (1982)**, **IGNOU-Doordarshan Telecast (1991)**, **Gyan-Darshan Educational Channel (2000)**, **EduSat, 2004 (a dedicated satellite for education and development launched by ISRO)**. With the help of EDUSAT, television programmes can now be telecast in almost every Indian language and every secondary school can be reached through this satellite to improve both quality and content of secondary education.



Fig 1.3: A Television

Source : <http://commons.wikimedia.org/wiki/Television>

if we have Audio Visual teaching-learning resources for capturing the attention of children, then learning will be interesting and effective. Educational programmes prepared by CIET for children are regularly broadcasted. SIETs produce programmes in local languages for children. .

Television is useful as it brings to children a wide variety of programmes in their local language. They can use it to learn about new things and then clarify the points they did not understand with their teacher.

As a teacher, you should try to prepare children to watch the programme. You should ask questions related to the topic being telecast on TV. This will raise their curiosity level and they will be more alert and focused while watching the TV programme. After watching the programme, there should be discussion. This will help in retention of the points learned and helps in consolidating the learning. Both pre and post screening discussions are important as they help in construction of concepts among learners.

### 1.7.2 Video CD/DVD



Fig 1. 4 : Video CD

Source: <http://commons.wikimedia.org/wiki/File:Cd-r.jpg>

Source: [http://commons.wikimedia.org/wiki/File:CD\\_autolev\\_crop.jpg](http://commons.wikimedia.org/wiki/File:CD_autolev_crop.jpg)

Video programmes are developed on specific topics to be used in classroom teaching. A script is prepared and the programme is developed using cameras. Professionals generally develop video programmes. Though as a teacher, you can prepare short films for your students and make them available through CD or DVD for them to watch in class or later at their home. Video programmes may be run on DVD player as well as computer. CIET, NCERT has developed many Video CD and DVD s for school Children. NIOS develops programme for school children. Besides these organizations, many private organizations also develop programmes for children but the cost is more and thus not all children can be benefited by theses video programmes.

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## 1.8 COMPUTER

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All of us are familiar with computer. Computer is a device that operates systematically by accepting inputs from human operator, processes different kinds of data and provides outputs as per intended objectives. One can find different types of computers, which are meant for different purposes. Let us understand the basic components of a computer.

### 1.8.1 Basic Components of a Computer

A computer is a system comprising many parts working together. The different parts of a computer are:

- i) **Control Unit:** The control unit, often called a control system or central processing unit (CPU) manages the computer's various components. It reads

and interprets (decodes) the program instructions, transforms them into a series of control signals, which activate other parts of the computer.

- ii) **Arithmetic Logic Unit (ALU):** As the name indicates, the arithmetic and logic related operations of the computer are performed by ALU.
- iii) **Memory:** The memory of computer is the place where the information is stored. There are two types of memories:
  - a) **RAM (Random Access Memory):** RAM is the main 'working' memory used by the computer. RAM can be read and written to anytime the CPU commands it. The contents of RAM are erased when the power to the computer is turned off i.e. programs stored in RAM are volatile.
  - b) **ROM (Read Only Memory):** ROM memory Read Only Memory (ROM), as the name suggests, is a special type of memory chip that holds software that can be read, but not written to ROM, retains its data indefinitely even if the power is switched off. Hence, programs stored in ROM are non- volatile.



Fig.1.5: Components of a Computer

- iv) **Input/Output (I/O):** I/O is the means by which a computer exchanges information with the outside world. Devices that provide inputs or outputs to the computer are called peripherals. The different I/O devices are:
  - a) **Input Devices-**It is used to feed instructions to the computer. Mouse, Keyboard, Tracker Balls, Scanners, Touch Pads, Light Pens and Joysticks are some of the input devices.
  - b) **Output Devices-**After processing the data, output devices are used to provide the processed data. Monitor, Printers, Plotters, Speakers, and Speech Synthesizers are some of the output devices.
  - c) **Storage Devices-**Storage devices are used to store information. Hard Disks, Floppy Disks, CD-ROM Risks and DVD Drives are some of the storage devices.

## 1.8.2 Types of Computers

Computers can generally be classified according to size and power, though there is considerable overlap among them. Computers are also classified on the basis of physical structures and the purpose of their use. Based on capacity, speed and

reliability, they can be classified into five categories.

- i) **Personal Computer:** It is a small, single-user computer, based on a microprocessor. In addition to the microprocessor, a personal computer has a keyboard for entering data, a monitor for displaying information, and a storage device for saving data.
- ii) **Workstation:** It is a powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and monitor with a higher-quality. It is a type of computer used for engineering applications (Computer Aided Design/ Computer Aided Management), desktop publishing and software development, etc.
- iii) **Minicomputer:** It is a multi-user computer capable of supporting users starting from ten to hundreds simultaneously. It is a midsize computer.
- iv) **Mainframe:** It is a powerful multi-user computer capable of supporting hundreds or thousands of users simultaneously. Mainframe is a very large and expensive computer.
- v) **Supercomputer:** An extremely fast computer that can perform hundreds of millions of instructions per second. Supercomputer is a broad term for one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amount of mathematical calculations.

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## 1.9 E-LEARNING

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Emergence of Internet has influenced various fields of education. Can you identify any application of Internet in the teaching-learning process or in other activities of your school? As an extension of Internet technology, a new concept called e-learning has come into existence. There exist different definitions for E-learning. We will discuss definitions of E-learning, its applications at secondary level, etc.

E-learning is a broad term, encompassing a wide variety of electronic technologies used for educational purposes, and a wide variety of educational formats and designs (Bates and Poole, 2005; OECD, 2005; and Allen and Seamen, 2008). E-learning comprises all forms of electronically supported teaching and learning. E-learning helps learners learn at their own pace, anytime and anywhere with the help of computers, LCD projectors, TV, CD ROMs, electronic storage devices, web based tools, virtual classrooms, etc. If a teacher uses such devices in teaching-learning, it is termed as E-learning.

There are several variations of E-learning. These are CBT (Computer-Based Training), Technology-Enhanced Learning (TEL), Computer-supported collaborative learning (CSC), IBT (Internet-Based Training) or WBT (Web-Based Training), E-learning is also known as e-learning or e-Learning.

### 1.9.1 Goals for E-Learning

The broad goals of E-learning are as follows:

- It increases learners' access to learning and flexibility in learning;
- It enhances the quality and efficiency of teaching-learning process;



- Skills and competencies required of different subject areas are developed with e-learning strategies;
- E-learning techniques meet the learning styles of different students;
- The burden of cost of education can be minimized using e-learning. Hence, the education system becomes cost-effective.

### 1.9.2 E-learning and 21<sup>st</sup> Century Skills and Competencies

Various skills and competencies are required to lead successful life in the twenty first century. E-learning strategies help build up in the learners necessary skills needed for the twenty first century. The following skills are of great importance to future generation to succeed in life.

- Good communication skills (reading, writing, speaking, listening)
- Ability to learn independently
- Social skills (ethics, positive attitude, responsibility)
- Teamwork skills (collaborative learning, networking)
- Ability to adapt to changing circumstances
- Thinking skills (problem-solving, critical, logical, numerical skills)
- Knowledge navigation
- Entrepreneurship (taking initiative, seeing opportunities)
- Digital literacy

### 1.9.3 Communication Technologies Used in E-Learning

Communication technologies are generally categorized into asynchronous or synchronous. Both these types of communication technology used in E-learning are discussed in the coming sections.

**Asynchronous:** As the name indicates, the participants are in not in synchronous (same time) with each other in Asynchronous mode of communication. The participants mentioned here are mainly the students and teachers. Students and teachers move at their own pace to transfer information. The information to be

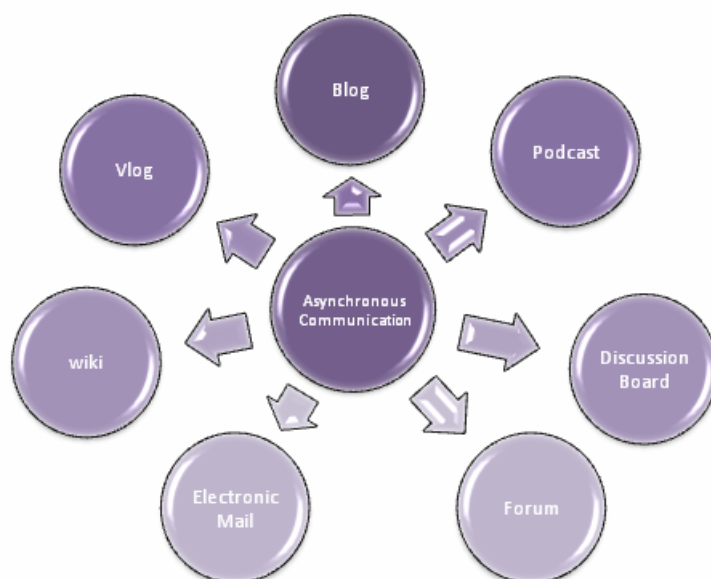
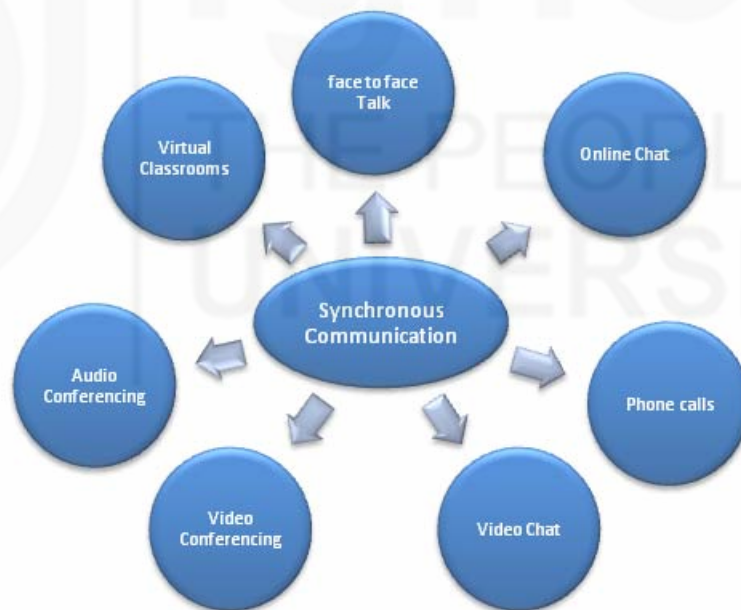


Fig.1.6: Various Communication Technologies used in E-Learning

passed on to the students may be posted on any website medium such as wikis, blog, etc., which can be retrieved by students at a later time. Similarly, postings of students can be retrieved by teachers and be given feedback. Hence in asynchronous communication, interaction between students and teachers occur at different times. Examples for asynchronous communication technology are blogs, wikis, video-blogs, vlog, forum, discussion boards, and electronic mail (E-mail).

**Synchronous:** In synchronous communication, interaction between teacher and students occur at the same period of time. Synchronous mode helps students acquire information within no time, since both are engaged in the process of conversation at the same time. Compared with asynchronous mode, synchronous communication is better for teaching –learning process. Earlier asynchronous mode was prevalent in teaching –learning process, but after the advent of information technology, the process of sending information became much easier, with the use of Internet and related applications of e-learning. The simplest form of synchronous communication occur with the participation of two persons i.e teacher and student, while in advance synchronous communication a large number of people can join to share their ideas like students belonging to different classes, students of the same classes, teachers of the same school, etc. Examples of synchronous communication are face to face talk through online, online chat, phone calls, video chat, virtual classrooms, video conferencing and audio conferencing.



**Fig.1.7: Various Forms of Synchronous Communication**

Now the question is “how can secondary teachers make use of asynchronous mode of E-learning”? One of the methods is that the teacher can direct students to collect materials related to school assignments from Internet. Secondly, the teacher can arrange a debate on any topic through Skype or with any other chat software. Here students are asked to share their ideas through Skype or any chat room and finally teacher concludes the topic. But this mode of study requires computer facility with Internet connection and comes under synchronous style of E-learning.



Now we will discuss some strategies used for E-learning. These strategies belong to either synchronous or a synchronous mode. The various E-learning strategies are given below in diagrammatic form.

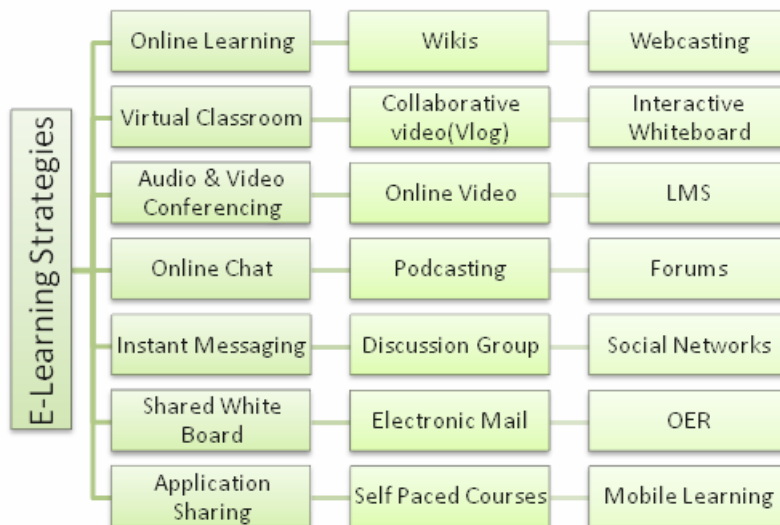


Fig.1.8: Various E-Learning Strategies

Now let us discuss these strategies separately.

**Online Learning:** Online learning is an Internet or Intranet-based teaching and learning system designed for web-based delivery, without face-to-face contact between teacher and learners. Internet is the main tool used in online learning. The other different tools used in online learning are either asynchronous (email, mailing lists, bulletin boards) or synchronous (text-based chat, audio chat, videoconferencing) in nature.

**Virtual Classroom:** A virtual classroom duplicates the context of a real classroom. In virtual classroom students and teachers use their computers to go to a virtual meeting place instead of a classroom. Students can indicate when they want to speak. Teachers can let students speak through audio and video conferencing. Teachers and students can use instant messaging and chat. Teachers can choose from a variety of synchronous technologies for interaction between them and students.

**Audio and Video Conferencing:** These are two type of strategies used in E-learning. In audio conferencing conversation happens between students and teachers without both of them seeing each other and while in video conferencing students and teachers can see each other.

**Online Chat:** Chat allows several people to communicate with each other. Each participant uses a computer to type his/her comments. The other participants can see the name of the persons and their comments.

**Instant Messaging:** Instant messaging is similar to chat. One person communicates to another through typing. Instant messaging also provides some additional features. With instant messaging, you can keep a list of people that you might like to chat with. The list will indicate if they are online, offline, available for chat or busy.

**Shared Whiteboard:** A shared whiteboard lets a group of people communicate by typing comments, drawing, highlighting and pointing. A shared whiteboard is a common feature within virtual classroom software packages.

**Application Sharing:** You can demonstrate how to use software applications to remote learners with application sharing. A teacher can also let learners take control of the application to practice performing tasks.

**Self-Paced Courses:** The obvious advantage of a self-paced course is convenience. People can get the training they need at any time. This can include just-in-time training where a person gets exactly the training he or she needs to perform a task. Self-paced courses are created with E-learning authoring tools. Self-paced courses can be delivered in many ways including Internet, Intranet or Local Area Networks, CD-ROM or DVD.

**Discussion Groups:** A discussion group is a collection of conversations that occur over time. It allows for comments to be posted and viewed by students and teachers as per their convenience. Other names for discussion groups are message boards, bulletin boards and discussion forums.

**Electronic mail:** It is one of the most popular tools used in E-learning. By definition it is mail delivered through electronic means. Today, e-mail is primarily known as communication from one person to another or many others through the use of computer and networks.

**Podcasting:** Podcasts are digital audio or video files containing meaningful content for learning that are available in websites and podcasting is the process of creating and distributing such learning material.

**Online Video:** Online videos are video files containing learning contents available in the Internet. Educational online videos are available in You Tube, Blip T1, and Google Video etc.

**Blogs:** Blog is a personal website that contains content organised like a journal or diary. Each entry is dated, and the entries are displayed on the webpage in reverse chronological order, so that the most recent entry is posted at the top. Readers catch up with blogs by starting at the top and reading down until they encounter material they have read. Usually blog is the work of an individual but blogs combining contributions of several people make “group blogs”.

**Collaborative Video (Vlog):** A video-blog or vlog is simply a blog that uses video as its primary medium in each post and vlogging is the act of publishing video to a blog.

**Webcasting:** Webcasting is defined as the dissemination of recorded or live content over the Internet

**Wiki:** Wikis are open, dynamic websites with collaboratively constructed knowledge, information, and resources, which are freely available to any Internet user. Wikis allow users virtually from anywhere to create and contribute to any wiki of their choice. At the same time, wikis enable users of the technology to critically review and collaboratively revise the wiki they use. As a result, users can quickly and frequently update information, fix errors, and constantly extend the knowledge network.

**Interactive Whiteboard:** It is a large interactive display that connects to a computer and a projector. A projector is used to display a computer’s video output onto the whiteboard, which then acts as a huge touch screen, where users control

the computer using a pen, finger, or other device (SMART technologies, 2006). Interactive whiteboard are usually equipped with four digital writing utensils that use digital ink replacing the traditional whiteboard markers.

**Learning Management Systems:** In order to provide online courses and programmes on World Wide Web(WWW),we require a software system called Learning Management System(LMS).An LMS is an integrated set of softwares/ programmes that automate the administration ,tracking and reporting of online courses /programmes. It provides a centralized organizational approach to learning for scheduling of courses and registration of learners, and assessment of their learning outcomes. Some of the examples of LMS are Moodle, Black-Board etc.

### 1.9.4 E-Learning and Traditional Learning

We have learnt that E-learning has wide range of applications in educational field. Traditional classrooms were teacher oriented and presentations were verbal in style. The emergence of online teaching has made learning a learner centered and an active process. The major differences between traditional classroom and online classroom are listed in the Table.1.1.

**Table.1.1: Differences between Traditional Classroom and Online Classroom**

Traditional Classroom	Online Classroom
<ul style="list-style-type: none"> <li>• It is teacher focused. Teacher is the central component of teaching l-learning process.</li> <li>• Learning is more passive; there are fewer roles for learners in the instructional process.</li> <li>• Teacher concentrates on delivering knowledge and subject content</li> <li>• Instructional strategy is verbal-oriented and is based on traditional methods of teaching</li> <li>• Multimedia may be used, but delivery of instruction is mainly verbal</li> <li>• Student interaction with technology is less</li> <li>• Focus on face-to-face interaction between teacher and learners</li> <li>• Less chance for motivation and self-learning</li> <li>• More use of traditional styles of teaching</li> <li>• Use of technological instruments is less.</li> <li>• Opportunity of interaction between students and teacher is limited</li> <li>• Duration and period of study is fixed</li> <li>• Rigid in character</li> </ul>	<ul style="list-style-type: none"> <li>• It is learner focused. Learner is the central focus of teaching –learning process.</li> <li>• Learning is more active and role of learners is more in the instructional process</li> <li>• Teacher helps in construction of knowledge</li> <li>• Less focus on verbal instruction. Instructional strategies make use of different styles and methods of teaching</li> <li>• Multimedia are used in a variety of ways</li> <li>• Students’ interaction with technology is more</li> <li>• Opportunity of face-to-face interaction between teacher and learners is less</li> <li>• It gives learners chances for self-learning and motivation</li> <li>• Makes use of innovative techniques of instruction</li> <li>• Use of technological instruments is more</li> <li>• Opportunity of interaction between teacher and student is more</li> <li>• Duration and period of study is not fixed</li> <li>• Flexible in nature</li> </ul>

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

7) What do you mean by online learning? How is it different from traditional learning?

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8) Select any topic from any subject of your choice and explain the ways of teaching by selecting any one of the approaches of E-learning?

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**1.10 INTERNET IN EDUCATION**

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Internet is one of the innovations of technological era. Internet is a means of connecting a computer to any other computer located anywhere in the world via dedicated routers and servers. When two computers are connected over the Internet, they can send and receive all kinds of information such as text, graphics, voice, video, and computer programs.

The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries a vast range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support e-mail.

Suppose you are opening Internet with Google software, its home page will appear as shown in Fig: 1.9. There is option to search for WebPages, images, maps, etc. Similarly, you will get option ‘save the page’ you have visited, the website which you have visited more frequently and so on. There are plenty of options in Internet which may be used for your educational purposes.

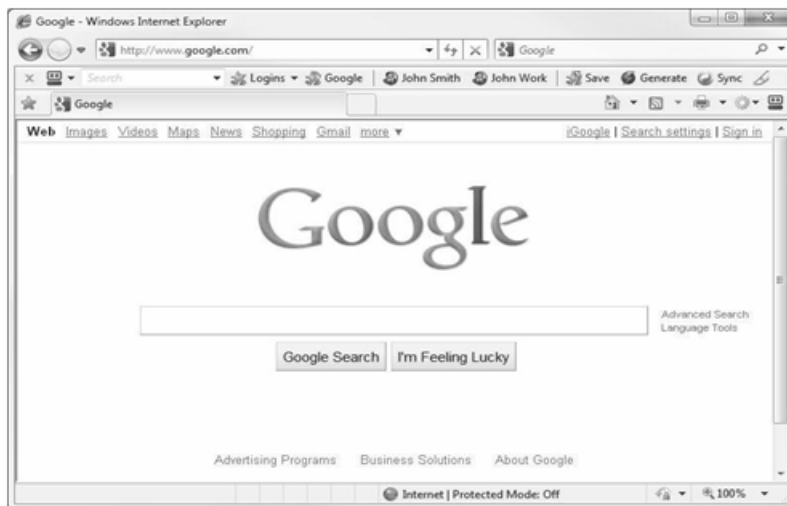


Fig.1.9: Home Page of Google Search

### 1.10.1 Advantages of Internet in Education

For the last many years Internet has influenced every walk of human life. This can be observed in the educational sector also. Many educational institutions are using Internet in admission, teaching-learning process, educational evaluation and administration, etc. Some advantages of Internet in education are as follows:

- It is easy to get connected and obtain information.
- It acts as a source of information and a platform to share information.
- It helps to get latest and updated information.
- It is used as a medium for online learning.
- It acts as a multimedia for learning.
- It is a fast medium of communication.
- It provides learners opportunity to work from home and other spaces.

### 1.10.2 Application of Internet in Education

In the above section, we have discussed about the advantages of Internet in education. Internet has a lot of applications in secondary education. We will focus our discussion on its applications in secondary education. Internet has its applications in the following areas of a school system: 1) student admission, 2) academic evaluation, 3) classroom teaching-learning activities, 4) school administration and management.

Moreover, it is used: 1) as a teaching machine, 2) as a source of information, 3) as a communication tool, 4) as a support to teacher and students., and 5) as an artificial intelligence tool.

To understand the use of Internet in teaching –learning process, a case of a secondary teacher using Internet in teaching-learning process is explained below.

Shyama, a secondary social science teacher assigned students to work on a project titled “types of pollutions”. Students were asked to collect the relevant materials from the web to prepare the project report. Students found the relevant materials from different websites. Some of these were as follows:

- 1) <http://library.thinkquest.org/C0111040/Types/types.php>
- 2) <http://en.wikipedia.org/wiki/Pollution>
- 3) [http://greenliving.lovetoknow.com/Types\\_of\\_Pollution](http://greenliving.lovetoknow.com/Types_of_Pollution)
- 4) <http://typesofpollution.info/>
- 5) <http://hassam.hubpages.com/hub/Types-And-Causes-Of-Pollution>

So, here students searched Internet to collect information and to complete the assignment. Similarly students can use Internet for other tasks too. If students find difficulty at any stage of learning, they can refer to Internet.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

9) State any four advantages of Internet in education.

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## 1.11 LET US SUM UP

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In this Unit, we explained the concept of Educational Technology. Educational Technology is the result of the integration of the technological devices with the psychological principles of learning and teaching. The differences between Technology in Education and Technology of Education were discussed. Technology in Education is also known as hardware approach to educational technology, whereas Technology of Education is known as software approach to educational technology. We provided a classification of educational technology into eight broad categories on the basis of the senses that are stimulated by educational technologies. We explained meaning of ICT. Communicating information effectively by making use of appropriate technology is called information and communication technology (ICT). A brief introduction to audio mediums like radio, audio CD/DVD, Podcast and audio-visual mediums like television, video CD/DVD was made. Similarly, a brief introduction to computer, its components, and types was also made. The concept of E-learning, its goals, how E-learning caters to the 21<sup>st</sup> century skills and competencies and communication technologies used in E-learning were discussed. Differences between E-learning and traditional learning were explained. At the end, we explained the concept of Internet, its advantages and disadvantages.

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### 1.13 ANSWERS TO CHECK YOUR PROGRESS

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- 1) Educational technology, in its wide sense can be understood to be including the development, application and evaluation of systemic knowledge about learning and instruction to teaching and training with the aim of improving their quality and efficiency.
- 2) Technology in education is also called the hardware approach to educational technology because it is concerned with the electronic gadgets such as television, radio, language labs and various other projected media, which are being used to educate learners. Technology of education approach to educational technology involves a systematic, scientific application of appropriate scientific research, both from the physical sciences and from the social sciences such as psychology and sociology to solve a problem.
- 3) Information and communication technology consists of three specific terms, **information**, **communication** and **technology**. Communicating information



## Understanding ICT

effectively by making use of appropriate technology is called information and communication technology (ICT).

- 4) Radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, computer and network hardware and software etc. are included under ICT.
- 5) You can make your voice effective medium of communication through modulating your voice; expressing your feelings; emphasis, pause at appropriate places while speaking.
- 6) True or False
  - i) False
  - ii) True
  - iii) False
  - iv) True.
- 7) Online learning is known in various terms such as technology supported learning, computer supported learning, etc. However, it can broadly be defined as the learning supported with the help of Internet technology. For the features of online learning refer to sec 1.9.4.
- 8) Topics like states of matter from science curriculum and Indian Parliament from social science can be taught using project method with the help of Internet. Students may be asked to collect various articles from Internet and group them according to their features. Then it must be named and arranged in Microsoft word software. Finally, they may be asked to display it in classes with physical material in their hand.
- 9)
  - 1) It helps to get latest and updated information.
  - 2) It is used as a medium for online learning.
  - 3) It acts as a multimedia for learning.
  - 4) It is a fast medium of communication.

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## **UNIT 2 SCOPE AND EVOLUTION OF INFORMATION AND COMMUNICATION TECHNOLOGY(ICT)**

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### **Structure**

- 2.1 Introduction
- 2.2 Objectives
- 2.3 Scope of Information and Communication Technology (ICT) in Education
- 2.4 Evolution of Educational Technology and ICT in Education
  - 2.4.1 Audio-visual Phase
  - 2.4.2 Cybernetic Phase
  - 2.4.3 Psycho-sociological Phase
  - 2.4.4 Information and Communication Technology Phase
- 2.5 Satellite and Terrestrial Communication
  - 2.5.1 Satellite Versus Terrestrial Communication
- 2.6 Teleconferencing
  - 2.6.1 Audio Teleconferencing
  - 2.6.2 Video Teleconferencing
  - 2.6.3 Computer Conferencing
- 2.7 Mobile Learning
- 2.8 Social Networks in Education
  - 2.8.1 Application of Social Networks in Education
- 2.9 Open Educational Resource (OER)
  - 2.9.1 Features of OER
  - 2.9.2 Locating OER
  - 2.9.3 Advantages of using OER
  - 2.9.4 Disadvantages of OER
- 2.10 Online Learning
- 2.11 U-learning
- 2.12 Let Us Sum Up
- 2.13 Suggested Readings and References
- 2.14 Answers to Check Your Progress

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### **2.1 INTRODUCTION**

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This is an age of information technology and the use of technology can be seen ubiquitously in our daily life. It not only makes learning more comprehensive and simple but also helps to display more information in a lesser time. At the same time it brings diversity to your classroom teaching, to display more information to learners, and to enhance student learning.

This Unit has been adapted from Unit 4 of ES-0361: Educational Technology, Unit 1 and 3 of MES-031: ET: An Overview and Unit-13 of BES-002: Teaching-learning Assessment of IGNOU.

You would also agree that the use of technology not only saves time and energy but also allow for more attention to be paid by the learners. Educational technology encompasses all aspects related to the facilitation of learning process. In the Unit-1, an attempt was made to understand the concept and nature of educational technology and ICT. Your understanding of educational technology and ICT will further be broadened by going through scope of educational technology and ICT in education and a synoptic view of how educational technology and ICT in education have evolved throughout history. Hence, this unit will describe how educational technology and ICT in education have evolved. It also discusses satellite and terrestrial communication, teleconferencing, mobile learning, social networks, open educational resources, online learning and u-learning.

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## 2.2 OBJECTIVES

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

- describe the evolution of educational technology and ICT in education;
- differentiate between terrestrial communication and satellite communication;
- explain the concept of teleconferencing;
- distinguish between audio teleconferencing and video teleconferencing;
- discuss the uses of mobile in learning of children;
- explain the concept of open educational resources;
- discuss advantages and disadvantages of open educational resources; and
- explain the concept of online learning and u-learning.

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## 2.3 SCOPE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN EDUCATION

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**Activity:** As a teacher, you are acquainted with the use of ICT in education. Now, for better understanding of the scope of ICT in education, recall your experiences in the classroom and write some items as to what according to you are within the scope of ICT in education. While reading the following, please check the new points that you have not written.

ICT, as you know, is used to raise the efficiency of education. But with the passage of time, the system of education is facing new problems to be tackled. So, the hardware and software of ICT are ever expanding. Therefore, the application of ICT in education is much more than what it was a few decades back. Following are some of the applications of ICT in education that are worth noting.

**Mass education:** There has been explosion of population and knowledge. There is, therefore, a need to educate the masses. The problem is multiplied further by having a large section of illiterate people. So, ICT has a tremendous application to educate a large section of people and to impart a large amount of knowledge in a limited span of time. In this regard, the mass media viz., TV, radio, and other modern technologies like computers and information technology (E-mail, internet, mobile, etc.) has a lot of scope. The illiterate masses can also be made literate with the help of innovative methods and practices of teaching and learning.

**Historical information:** Any branch of knowledge that we deal with has a historical base. Such information is of tremendous importance for the students to understand any branch of knowledge in its totality. Such incidents when occur can be recorded with the help of audio-video CD. Such audio-video CD becomes the source of information for learners to learn. The main advantage of such CDs is that we cannot create or repeat the history once more howsoever we try hard and place it before the learner. For example, can we have the same view of the explosion of Hiroshima and Nagasaki (1946) and show it to our students? This is neither feasible nor possible. Further, for example, we cannot have the same view of Nuclear test conducted at Pokhran (1998). So such records.....in the form of a film taken when the incident is happening are of immense value to the learners which ICT can only provide.

**Costly and hazardous experiments:** In many fields of science and technology there are some experiments having great implications for effective learning which are not advisable for the teacher to conduct in the classroom because of cost and health hazards involved. Such experiments, once conducted carefully in the laboratory or elsewhere can be recorded with the help of new information and communication technology and be used by teachers and students for effective learning.

**Gaming and simulation:** If historical events which are either costly or hazardous which cannot be conducted, then ICT can rescue us by doing the same through simulation. Computer technology in this regard plays the main role. This can provide a lifelike picture of phenomena in three dimensions (3D). It can also show the operation of different parts of a phenomenon and the consequences. The other possibility is games. Children can learn, through play, many concepts that just cannot be taught in the formal set of the classroom. The gaming and simulation has a great scope in the training of military personnel and in the field of aviation.

**Distance education:** ICT has a great scope in distance education and open school programme. Today there is a great need for personnel training and education on regular basis for updating oneself in the field of work. In this regard, distance education programmes, a relatively less formal process of education, have acquired new status. Educational technology with its innovative practices can educate the learners who cannot come to the classroom setup for their education. In this regard programmed learning materials, modules, contact programme, and counselling are some innovations which can help distance learners.

**Collection, storing and retrieval of information:** There are digital cameras and mobiles which provide us the facility to take same photographs of events that take place in a fraction of second. There are also satellites that work for us day and night to provide us information about places which are not accessible to us. Information can be collected with the help of this new electronic technology both in audio and in video form. Such information can be stored with magnetic and electronic devices easily and can be retrieved within no time.

**Research:** As mentioned earlier, information can be collected and stored to be used for educational purposes. Information can also be collected and stored in the same way for research. Further, for analysis and reporting, computer can be used. Not only quantitative data but also qualitative data can be analysed and

there lies the role of computer and the different methods of data analysis methods and techniques. Moreover, in developmental type of research, different kinds of packages can be developed for raising the effectiveness of learning. There are many researches already conducted in this field i.e., computer assisted instruction(CAI), and computer assisted language learning packages.

With the facilities of Internet, Website, and INFLIBNET, the researchers as well as a learner wanting to inquire or find out something that is happening elsewhere can have access to a large amount of information sitting at home. He can formulate his hypotheses, problems, and ideas and get them solved while at home. In this process, the research findings are not only disseminated but also the quality of research can be increased.

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## **2.4 EVOLUTION OF EDUCATIONAL TECHNOLOGY AND ICT IN EDUCATION**

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After having discussed the scope of ICT in education, let us understand how educational technology and ICT in education have evolved. The evolution of educational technology and ICT in education has not taken in a single day. The developed educational technology, which we use today, is the result of improvisation, which is done by their own potential to solve problems. Whether one talks about the discoveries and inventions, human beings are never behind. Similarly, as human being has evolved, his/her communication style has also evolved, his/her communication from non-verbal gestures to the verbal interactions, his/her medium of interactions have also changed.

Simultaneously, there has been a change in the perspective of understanding learning. The nature of learning has moved from group learning to individual learning. Technology, to support the various kinds of learning, has also evolved at the same time. In this section, we will discuss the evolution of educational technology and ICT in education. These technologies which have passed through phases which are as follows:

- a) Audio-visual phase
- b) Psycho-sociological phase
- c) Cybernetic phase
- d) Information Communication Technology phase

### **2.4.1 Audio Visual Phase**

J.A. Commenius prepared a first ‘visualized book’ that contained 150 pictures and also said ‘let pictures be the source of delight to the children and let these become familiar with them before they enter school’. Later, philosopher like Rousseau also said that learning process must be directed to the learner’s natural curiosity and Pestolozzi put action to his words by proposing the ‘object method’. The object method is based on instruction via sense perception. Although attempts on the use of concrete aids were made much before, but the intensive development in the audio-video started in the 20th century.

This phase is designated as an extensive use of variety of devices such as moving pictures, radio, slide films to transmit ideas and experiences, which appeals to

the sense perceptions of the learners especially about the abstract concept. In other words, you can say that these devices act as supplementary devices. The audio visual device utilizes more than one sensory channel (for example, while watching any educational programme on television, you are using both the visual and auditory perception), which helps in clarifying, establishing and correcting the concepts, interpretations and appreciations. However, the materials to be used along with these audio visual aids need to be developed based on the psychological principles of learning.

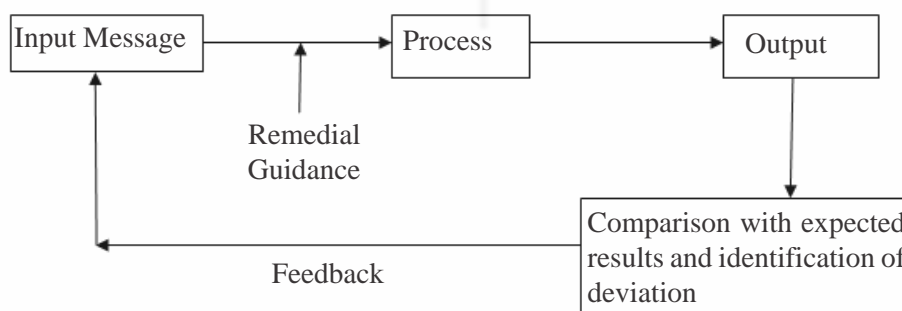
Also these aids have always been used as a tool to disseminate the knowledge from one place to another. In this process of transmitting the information, it is considered important to transfer the correct message.

## 2.4.2 Cybernetic Phase

This phase of educational technology has evolved during the Second World War. The word ‘cybernetics’ was first used by Norbert Wiener (1948) to define the automatic control systems. Wiener defined cybernetics as the science of control and communication in men and machines. Consider a situation, when you are browsing an Internet site. Suddenly, a message pops up on the screen, that there is a “Virus” which has entered your computer. Here, the anti-virus software provided you the feedback and as a result you removed the virus from your computer. Cybernetics lays emphasis on feedback. The feedback here refers to a kind of reciprocal interaction between two or more events in which one activity generates a secondary action that in turn redirects the primary action. It is also defined as the comparative study of human control.

**The feedback mechanism has three functions:**

- It propels the system towards the target or the defined path;
- It compares the effect of this action with the true path and detects any deviation negative or positive; and
- It utilizes error signal to redirect the system.



**Fig.2.1: Cybernetic Model**

**Source:** Kulkarni, S.S. (1986) *Introduction to Educational Technology*, New Delhi: Oxford & IBH Publishing Co.

In most of the industrial processes, which emerged during and after World War II, the concept of feedback became operational for correcting any deviant step. For example, in a refrigerator, the thermostat informs the system of cooling whether a certain temperature has been reached or not reached and instructs it to perform accordingly.



This information for remedial action (steering the boat according to the charted path avoiding any deviations) was crucial not only in industry but also in education. Out of this emphasis arose the programmed learning instruction movement where it was emphasized that at every step a student should be told/reinforced about his/her progress (or deviation).

Thus, the cybernetic principles have led to the concretization and direct application of principles to teaching and learning. These cybernetic principles have following implications on teaching-learning:

- a) The activity involved is geared to the learner's stage of growth-physical and cognitive.
- b) The learner is provided with some criteria for indicating to him/her specifically what progress he/she is making.
- c) The learner is presented with the activity both in verbal and non verbal context in varied situations.

### 2.4.3 Psycho-Sociological Phase

This phase has a long history, which can be traced back to the learning theory on the laws of learning given by Thordike, 1913. Based on his theory, Pressey (1926) developed a teaching machine. This machine provided an automatic scoring device to the learners for immediate feedback. So, this was the first step towards the formulation of systematic learning. Subsequently, the theory of B. F. Skinner (1953) on operant conditioning, whose main contribution was that human behavior could be shaped, opened a new chapter in the development of programmed learning materials.

#### Teaching Machines

Learning, as you know, involves both learner and teacher but now with the development of technology, the physical presence of teacher may not be required. Teaching machines represent this development in education. Teaching machines act as a liberating device that allows die individual differences. In 1924, Sidney L. Pressey created a crude teaching machine suitable for rote-and-drill learning. He showed that automated-instruction facilitated learning by providing for immediate reinforcement, individual pace setting, and active responding. According to him, "teaching machines are unique among instructional aids, in that the student not merely passively listens, watches, or reads but actively responds. And as he does so he finds out whether his response is correct or not and a record may be kept which aids in improving the materials". These machines ranged from a very simple to complex.

A teaching machine incorporates a closed loop system of teaching that cyclically:

- a) display an information to learners,
- b) seek learner response,
- c) evaluate, reinforce and control next display.

Based upon me responses in the teaching machines, they can be broadly classified under two categories;



- a) **Constructed response devices:** These devices are based on the Skinner's principles, namely emission of response is considered more effective in learning than simple recognition.
- b) **Multiple choice machines:** In these machines, it is possible to prepare branches for every reply to a given question.

The greatest value of such machines is the individualized instruction, which helps the learners to learn at their own pace. Also, it provides well-designed and structured learning situation for desired behavioral change in the learner. But it has a delimitation too, as a good teacher can always determine the effective and ineffective communication and modify their teaching on the basis of the students responses, it is not possible with the teaching machines.

In addition to the contributions made by the behaviorist, cognitive psychologist who lays main thrust on information that is perceived and processed by an individual has a profound implication on the pedagogical perspective about the meaning of learning.

With the adoption of the philosophy of a "constructivist" framework, the meaning of learning has changed from just the assimilation of information where teacher was thought to be the generator of knowledge and student as receiver of knowledge. Hence, from this theory it is clear that learning is an active process of constructing meaning on the part of each individual learner's experiences.

These different meanings of learning have implications on how we approach each educational content and on how ICT has to be incorporated coherently with the teaching and learning practices.

Human being, as you know, is a social being. Hence the importance of observing and modeling the behaviors, attitudes, and emotional reactions of others is common phenomenon. Sociologists, particularly the school of group dynamics has also contributed a lot to the understanding of the teaching-learning process, through their work on 'group processes'.

#### **2.4.4 Information and Communication Technology Phase**

Recent innovations in information communication technology have revolutionized the means of instruction. Now, we are using Multimedia, E-mail, Internet, intranet, website and mobile to impart instruction. These are telecommunication modes through which instructional materials can be given to students. Development of the bandwidth for the Internet and intranet has enabled teachers to impart instruction within and outside the organization.

This stage is also marked with the advances in the software and hardware potential of the systems. Several organizations like, audio video research center, educational media research centers and different departments of education and educational technology are engaged in the development of educational software. As you know, open and distance learning system uses all kind of information and communication technologies like television, radio, interactive radio technology, teleconferencing, computer conferencing, mobile technology in the delivery of instructional inputs.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

1) Differentiate between the first phase and the last phase in the evolution of educational technology and ICT in education.

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2) What are the important implications of cybernetics in learning?

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## **2.5 SATELLITE AND TERRESTRIAL COMMUNICATION**

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### **2.5.1 Satellite Versus Terrestrial Communication**

Satellite-based communication is the communication which takes place between the sender and the receiver through satellite technology. It has specific utility for distance learners or for the distance learning system. Right from the advent of the communication satellites, it has been recognized that communication through satellite has unique benefits such as long distance, quality of performance, networking, including one point to multi-points to one-point transmission capabilities. Now-a-days radio and television broadcast takes place through satellites. Yet non-satellite communication or terrestrial communication has a significant role to play in meeting the communication needs of a country, where there is no provision of satellite communication. Earlier, television broadcast was taking place with the help of terrestrial technology. The fact is that the satellite and terrestrial systems supplement each other to make communication more effective. Now let us compare the satellite-based communication and the terrestrial systems of communication.

#### **Satellite and terrestrial communication: A comparison**

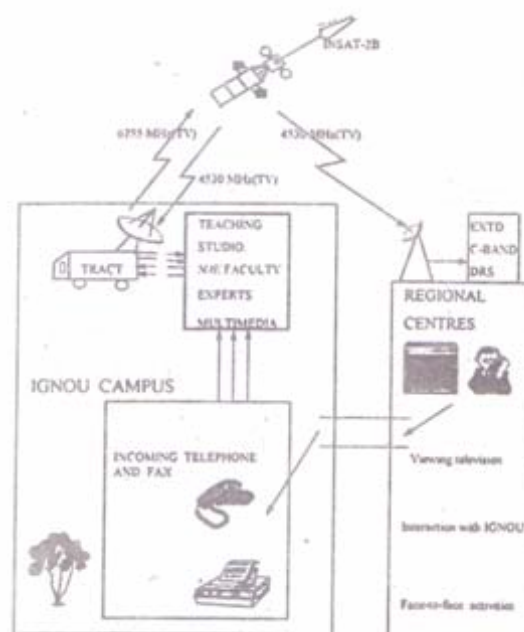
Satellite and terrestrial systems – as modes of communication – are not opposed to one another. Both systems supplement each other’s potential to make communication more accessible and economical.

Satellite	Terrestrial
Does not require ground-base, high-power, high-tower systems.	Needs high power, high-tower systems, (The height of the transmitter at Pitampura, Delhi is 235 metres).
Does not need much ground equipment; direct reception television sets can receive signals directly from the satellite.	Needs a number of transmitters for wide coverage.
Cost of equipment is high, however the costs are now falling fast.	Cost of equipment is low.
Being a highly centralized system it provides more positive pacing and control over the developmental process.	At times difficult because of technical and managerial hindrances in systems coordination. Further, because of the position taken by the local authorities controlling the flow of information at the regional level, it becomes difficult at times.
Use of satellite technology could inspire the teachers, students, and parents for modernization because it brings the whole world together into a remote village.	Because of limited coverage, it has some drawbacks.
Planning and implementation require more lead time.	Needs comparatively less time.
Effective for a large country or a group of countries.	Suitable for a small country or a part of the country.
Independent of distance.	Limited coverage area.
Independent of the nature of terrain.	Difficult in mountainous and sea areas.
Can meet the increasing demand of communication without additional cost.	Communication capacity is bound to the regional system installation and requires additional cost.
More effective in meeting the overall needs of people at the national level.	Serves regional information needs better.
A satellite failure can result in the entire system being inoperative which might pose severe readjustment strains on the communication.	System failure would not be as disastrous as in the case of the satellite system; readjustment and repair of damage is manageable.
Needs parking spaces for the geosynchronous satellite which is becoming more and more scarce.	Does not need parking space.
Worldwide network connections via satellite can resolve the problem of unequal educational opportunities and can provide a truly world-wide sharing of educational resources for international education.	Network is possible at the regional level only.

Source: IGNOU(2009)

## 2.6 TELECONFERENCING

Teleconferencing is a new technology, which connects electronically a number of users located at different places to interact through audio-video, or computer technology. The technology is very useful for the distance education system as it provides both learners and teachers of distance system to link themselves for teaching-learning purpose. All of us know that interaction is an effective way of providing feedback in the teaching-learning process. In a face-to-face mode, a learner receives immediate feedback when he/she interacts with the teacher. He/she also receives feedback from the peers. In fact, the interaction process, which takes place in face-to-face mode, may be one to one (between a teacher and a student) or one to many (between a teacher and a group of students). The same kind of interaction patterns exists also in teleconferencing. There may be interaction between a distance teacher with a distance learner, between a distance teacher and a group of learners and amongst distance learners themselves. Teleconferencing provides a platform wherein the distance learners can interact with guest speakers or scholars of national and international eminence. In teleconferencing, there are mainly teaching end and several learning ends. Teaching end is a studio with an uplink facility. In the case of Indira Gandhi National Open University (IGNOU), the studio of Electronic Media Production Centre (EMPC) serves as the teaching end. Learning ends are centres having downlink facility as well as telephone talkback system. In the case of IGNOU, all the Regional Centres and a number of Study Centres serve as learning ends. Distance learners of IGNOU came to these learning ends and interact with the resource persons at the teaching end. IGNOU used teleconferencing for the first time to organize Extended Contact Programme (ECP) of PG Diploma in Higher Education (PGDHE) students in October 1993. The IGNOU headquarters in Delhi was linked with ten regional centres throughout the country. A one-way video and two-way audio mode of teleconferencing was adopted for the purpose. Fig. 2.2 below presents the communication links involved in the programme (IGNOU, 2007).



**Fig. 2.2: A one-way video and two-way audio mode of teleconferencing**

## Types of Teleconferencing

There can be different types of teleconferencing based on different types of technological configurations. For your purpose we discuss three types of the teleconferencing system being used in India these days. They are:

- **Audio teleconferencing**
- **Video teleconferencing**
- **Computer teleconferencing**

These types have been classified according to the use of the technological configuration. Let us discuss each type in detail.

### 2.6.1 Audio Teleconferencing

You might have the experience of talking to a person located at a distant place over the telephone. But with the help of the latest technology, you can talk with more persons located at multiple sites. The technology which facilitates conversation with more persons located at different places over the telephone is called audio teleconferencing. This technology is useful to organize learning experiences. Through this technology distance learners can talk to the teachers as well as their fellow learners. It is an effective communication tool for sharing information/ideas/experiences to pertaining different aspects of distance learning. The role of teacher in audio-conferencing is very important as he/she designs and directs the process of conferencing towards the achievement of learning goals. He/she can motivate distance learners and remove the feeling of isolation among them. It is a fully interactive medium and interaction takes place in real time. The students can benefit from this medium immensely.

### 2.6.2 Video Teleconferencing

Video conferencing is the teleconferencing technology in which both learners and the teacher can see and hear each other. This is becoming a useful medium for organizing learning experiences in distance learning system. These are:

- Two-way video conferencing
- One-way video conferencing

Let us discuss each type in the following paragraphs.

#### i) Two-way video conferencing

In two-way videoconferencing, participants are linked by two-way vision as well as two-way audio. Both audio and visual messages are exchanged between distance teacher and learners located at different places. Both at the teaching end and learning ends, there are television screens, which display pictures from distant locations. The links are essentially telephone connections. These links are more costly than those for audio conferencing because more data must be transferred, either by broadband ISDN cable or through television transmitters and receivers via satellite.(COL, 1997).

Two-way video conferencing is very much interactive in nature. Learners can see and talk with their teachers and vice-versa. They get a lot of motivation from the teachers when they are engaged in live dialoguing. They can raise questions, clear doubts and seek clarifications from teachers. They can also see their fellow



learners at other learning ends and can also raise questions, clear doubts and seek clarifications from them.

### ii) **One-way video conferencing**

In one-way video conferencing, audio communication takes place two-way between teaching end and learning ends and visual communication is one-way from the teaching end. The type of video conferencing begun in IGNOU in the early nineties was two-way audio and one-way video conferencing. Distance learners watch the presentations by the experts on television screens at the learning centres (namely, Regional centres/ Study centres in the case of IGNOU) and talk with experts at the teaching end (namely, studio of Electronic Media Production Centre (EMPC) of IGNOU) using long-line telephone facilities.

This technology has been very useful for organizing different kinds of learning experiences cutting across various disciplines in sciences, social sciences, humanities, management, health sciences, computer and information sciences, law, agriculture sciences, etc.

### **2.6.3 Computer Conferencing**

The term computer conferencing refers to computer-based meeting, for exchange of pictures, words, graphics etc., between multiple sites. Special hardware and software systems are used to support computer conferencing activities in both real time and non-real time. Real time, in this context, implies synchronous communication in which messages can be sent and received as you view the screen and interact with the system and the other participants tied in the network. The non-real time elements i.e. asynchronous communication, in contrast, may encompass a series of longer messages, a central database of information and a record of current and past comments and all the participants can see (Mirabito, 1994).

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## **2.7 MOBILE LEARNING**

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Mobile phones first arrived in India in 1995, and since then their application has grown exponentially. Education through mobile is often referred as *mLearning*.

*mLearning* makes education more accessible as it enables learners to pursue their studies according to their own schedule. The portability of mobile technology enables students to learn at all times and at all places. For those in rural or remote areas where environmental and infrastructure challenges hinder other learning modalities, particularly *eLearning*, *mLearning* presents great opportunities. *mLearning* provides a potential way forward for the expansion of education programs to larger segments of the population. *mLearning* allows a method of educational delivery that could be more cost-effective than other methods.



The technological capacities of mobile phones allow communication by voice and text and capture still and moving images. Recent 'smart phones' allow users to view PDFs, spreadsheets and word-processed files, and possess additional features such as a stopwatch and a GPS (Global Positioning System).



If mobile phones are to be used in schools, school authorities need to address certain issues. These are leadership and school culture; attitudes of teachers and students; appropriate curriculum activities; professional development of teachers; technical integration and support; and policies pertaining to the use of mobile phone.

**Mobile Phones in Education can be used in the following ways:**

- 1) Send SMS on mobile phones to find definitions, currency conversion, math equations, translation of texts into different languages, etc.
- 2) Use it as an internet browser to access endless information
- 3) Read news articles and current events and books on it
- 4) Download and use education programs such as Google Maps and use as GPS
- 5) Use it as a digital or video camera for school projects, publishing, etc.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

- 3) Mention any three differences between satellite communication and terrestrial communication.

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- 4) Differentiate between audio teleconferencing and video teleconferencing

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- 5) Mention any three ways, mobile can be used as a helping tool in teaching-learning process?

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## 2.8 SOCIAL NETWORKS IN EDUCATION

Go through the situation given in the Box -1.

### Box-1

Suppose one of your students wants to share his/ her doubts on any of the academic concept with other students around the world. How can the student do that? One possible solution is he/ she can get the help of social networks.

Let us discuss about such social networks. Social network sites are defined as web-based services that allow individuals to: (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site. Social networking websites allow users to be part of a virtual community. The two most popular sites are Facebook and MySpace(See Fig:2.3). These websites provide users with simple tools to create a custom profile with text and pictures. A typical profile includes basic information about the user, at least one photo, and possibly a blog or other comments published by the user. Advanced profiles may include videos, photo albums, online applications (in Facebook), or custom layouts (in MySpace). After creating a profile, users can add friends, send messages to other users, and leave comments directly on friends' profiles. These features provide the building blocks for creating online communities.

### Facebook



Source:www.crunchbase.com

### Myspace



Source: www.youseemii.fr/blog/myspace

Fig. 2.3: Home Page of Social Networks-Facebook and Myspace

### 2.8.1 Application of Social Networks in Education

Now our question is how we can make use of social network sites for teaching purpose in secondary classes. As you know even small kids now-a-days are becoming more technically literate in comparison to their parents or teachers. As teachers, you know that each student has his/ her own style of learning. Some prefer learning in the morning while others in late night. For example, if two students study during the night and if some doubts arise during the course of their study, they can make use of social network sites to clear their doubts. Similarly, they can join in some discussion boards, which are active at the same time. Otherwise they can post their ideas on any of the “forum” available. Even

they can make use of the help of online teachers through social networks. So these are some of the methods students can make use of in their studies. Here teachers also have a great role to play. They can also help students by clearing doubts through social network sites. Let us go through another example on social network sites.

### An Example of Social Networking

There was a teacher from America and there was a student from India. They were interacting through Facebook accounts. The conversation was as follows:

**Student:** Madam, I have a doubt on periodic table. Can you help me?

**Teacher:** Oh....Sure.. What is your doubt?

**Student:** First, tell me madam, what is periodic table?

**Teacher:** It is the arrangement of chemical elements based on their atomic weight.

**Student:** How many groups and periods are there in periodic table?

**Teacher:** 18 groups and 7 periods.

The conversation continued for a long time. This example was cited to give an insight about the use of social networks in education. Similarly students can interact with peers, subject experts, senior teachers, etc. The use of social networks lies on the creativity of secondary teacher.

### Check Your Progress

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

b) Compare your answers with the one given at the end of the unit.

6) "A social network is one of the emerging technological tools in teaching-learning process". Comment

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## 2.9 OPEN EDUCATIONAL RESOURCES (OER)

As you know when students are given assignments on any subject matter, usually they make use of the library and refer to the books to complete the task. They can also get the help of open educational resources. From the Internet library, students refer to open books, which are similar to the books in our traditional library. But open educational resource is entirely a different concept. Let us understand the concept of open educational resources.

The term 'Open Educational Resources' (OER) was first introduced at a conference hosted by the UNESCO in 2000. There is no authoritatively accredited

definition for the term OER at present. Open Educational Resources are any type of educational material that is freely available for teachers and students to use, adapt, share, and reuse. “Open Educational Resources (OER) are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or repurposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge (Atkins, Brown, & Hammond 2007). They are typically made freely available over the Web or the Internet. Open educational resources help both teachers and students. Teachers use OER to procure updated contents of subject of teaching, whereas students use it for multiple purposes.

### 2.9.1 Features of OER

- It is available to students free of cost.
- It is available for use at any time any place.
- It provides latest contents in any subject areas.
- It contains options to edit, share and reuse.

OER materials, generally contain the following elements:

- i) Learning content:** OER generally include the contents in text form. Apart from text material, supplementary contents are available in animations, pictures, PowerPoint slide, links to other related sites, references, lecture materials, reference journals, suggested reference readings, learning objects, learning modules, videos related to contents, experiments, simulated materials, real videos, images, softwares to run specific programmes, tools to create and edit contents, and other supporting softwares to access the content of OER.
- ii) Tools:** One of the chief characteristics of OER is that the content available can be edited. Any user referring to the OER materials must obtain the license to edit the related content to the existing materials. Softwares and tools required for editing are available in OER. Edition in the existing documents keeps on updating content of OER. To support editing, content creation tools, content management systems, organizing tools, content development tools, content designing tools, etc. are available in OER.
- iii) Implementation:** OER materials available need to be published for use by the public. Hence, proper licenses and policies are required to make OER available to the public. Similarly, proper rules and regulations need to be formulated for the use of OER materials. Problems related to copyright is a major concern in the use of OER materials. OER includes clear-cut policy frameworks related to the copyright concerned.

### 2.9.2 Locating OER

By now, you have understood the concept of open educational resources. But the question for teachers is how to locate them. Teachers can find innumerable number of OER repositories where OER materials are available. For instance, the materials of IGNOU are available in E-GyanKosh, an online repository of teaching materials

of IGNOU. You can see one of the OER material of IGNOU in the following figure, where you can search the required course material that you wish to study.



### 2.9.3 Advantages of Using OER

- **Expanded access to learning:** The access to OER is unlimited due to their availability on Internet. Anyone one can access to the OER materials irrespective of time and region
- **Access to materials cheap:** Distribution and access to OER materials is cheaper in comparison to other forms of distribution and access.
- **Supplementation of class materials:** OER can supplement textbooks and lectures where deficiencies in information are evident.
- **Enhancement of course quality:** They add to the regular course content, thereby enhancing their quality.
- **Quick circulation:** Since they are available on Internet, easy access and quick circulation is possible.
- **Lower student cost:** It reduces the cost of education.
- **Showcasing of innovation and talent:** Innovative and novel contents are available in OER
- **Continually improved resources:** OER keep on updating the content and hence students and teachers get latest contents that they need.

### 2.9.4 Disadvantages of OER

- **Quality issues:** Many OER materials are available on Internet. This may or may not be of good quality. Try to select quality OER materials for teaching purpose.
- **Lack of human interaction between teachers and students:** OER do not provide opportunity to interact among the people concerned. Teachers and students are separated during the course of using OER.
- **Language and/or cultural barriers:** OER are not available in all languages. Therefore, they may not suit to your culture and context of teaching.
- **Technological issues:** OER come in different forms. Students who are not well versed with the use of OER face problem in accessing such materials.
- **Intellectual property/copyright concerns:** The access and use of OER for personal purposes is not allowed due to copy right issues.

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## 2.10 ONLINE LEARNING

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Internet has become a powerful technological tool for organizing Learning experiences online in open and distance learning system. It can be understood as a network of computers across the globe wherein information is shared and exchanged among the people of the world in a short time. Morrison (1997) defines Internet as a vast telecommunication network consisting of a group of internationally interconnected computers that communicate electronically. Galbreath (1997) has defined the Internet as a network of networks with a universal addressing scheme allowing real-time, computer-to-computer, local-independent communication and information exchanging. Communication on Internet takes place on synchronous or asynchronous, one-to-one, one-to-many and many-to-many basis.

Internet can be used to provide online learning programmes to distance learners. Online Learning programmes comprise self-learning materials, audio-video support, assignments, academic counselling, teachers-learners conferencing, etc. Like print based material, online self-learning materials comprise text, structures, diagram, self-check exercises etc. But unlike print based material it contains animation, audio and video integrated with text material and provide the learner with a lot of scope for interactivity. Audio-video support can also be made available to learners through online independent of learning material. The design of learning materials on the net is based on using new pedagogical models based on conversation. The academic counselling can also be provided through online using lectures, discussions chat synchronously or as asynchronously, wherein the learners can raise queries and clear their doubts. Assignments and feedback on assignment responses can also be provided to students online. The most important aspect of online learning is that it facilitates collaborative learning through online conferencing. They can engage themselves in virtual classroom learning. They form collaborative groups in the form of cyberclub and Internet among themselves regarding their learning problems using e-mail. In many subject areas, like medicine, sciences and other applied areas practical training can be provided in simulated learning environment.

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## 2.11 U—LEARNING

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Ubiquitous learning or u-learning is recent development in education. U-learning is supported by ubiquitous computing technologies which refers to the small hand-held devices that can be used both for communications and computation. In earlier days, separate electronic devices were used for communication and computation like phone for communication, computers and calculators for computation. But later, devices like mobile which are handy in nature and capable of doing both these functions were invented. In addition to smart mobile phones, contactless smart cards, hand-held terminals, Personal Digital Assistants(PDA), sensor network nodes, Radio Frequency Identification (RFID), etc, also make use of ubiquitous computing technologies. These devices have sensors to interact with living environment. Thus, ubiquitous computing technologies allows both communication and services anytime and anywhere. The changes in the technologies have led to the transformation of e-learning to mobile learning and mobile learning to u-learning.



The learning based on ubiquitous technology is known as u-learning. The most significant role of ubiquitous computing technology in u-learning is to construct a ubiquitous learning environment, which enables anyone to learn at any place at any time. (Saadijah, et.al. 2010) As we know, learning is the process of acquiring knowledge and skill. To develop knowledge and skill, an appropriate learning environment is to be created. In traditional classrooms, the learning environment is fixed. But in the u-learning the student will be in a ubiquitous learning environment (ULE) or u-space. The students will carry a mobile device primarily for learning (PDA or mobile phone, etc.) having sensors attached which will help the ULE server to track and locate students. Thus, students are free to learn anywhere and anytime as they feel. In such a learning situation, students have the freedom to interact with peers, clear their queries leading to their own learning at their own pace. So, u-learning is embedded in students' daily life allowing them to learn anytime as they wish. Thus, we may broadly say, u learning is 'learning anywhere and anytime'. The definition refers to any environment that allows any mobile learning devices to access the learning and teaching contents via wireless networks in any location at any time. The commonly used definition of u-learning is "learning with u-computing technology" (Yang et al., 2008).

Let us discuss some of the applications of u-learning. First, learning with the help of nay hand-held device is u-learning. A broader application would be, say for example, a student entering the lab is detected by the sensor and necessary instruction to that particular student will be provided by the server. Similarly, students entering the school premises having sensors attached to their uniforms will be sensed and details will be collected /fetched by the teachers. Owing to the facilities provided by u-learning, the popularity is increasing day by day. Below given are some of the characteristics(Saadijah, et. al., 2010) of u-learning;

- i) **Permanency:** The information remains unless the learners purposely remove it.
- ii) **Accessibility:** The information is always available whenever the learners need to use it.
- iii) **Immediacy:** The information can be retrieved immediately by the learners.
- iv) **Interactivity:** The learners can interact with peers, teachers, and experts efficiently and effectively through different media.
- v) **Context-awareness:** The environment can adapt to the learner's real situation to provide adequate information for the learners.

### Check Your Progress

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

b) Compare your answers with the one given at the end of the unit.

7) What are Open Educational Resources? How are they useful in teaching-learning process?

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8) Explain the meaning of U-learning. ..... ..... ..... ..... .....
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## 2.12 LET US SUM UP

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In continuation with the Unit-1, the Unit-2 focused on scope and evolution of Information and Communication Technology (ICT) in education. The scope of using ICT in education covers mass education, providing historical information, conducting costly and hazardous experiments, playing games and carrying out simulation, providing distance education, conducting research, etc. Educational technology and ICT in education have evolved through four different phases, namely, audio-visual, cybernetic, psycho-sociological and information and communication technology. A comparison between satellite and terrestrial technologies has been made. We also discussed teleconferencing, its types, mobile learning, social networks in education. A brief presentation was made on OER, its features, how to use OERs optimally, its advantages and disadvantages. At the end, we explained the concept of online learning and u-learning.

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## 2.14 ANSWERS TO CHECK YOUR PROGRESS

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- 1) ICTs like films, radio and television were popular which provided one way interaction but in the last phase the two way interaction became possible
- 2) The main implication of the cybernetics was the active involvement of the learner in his/her learning.
- 3)

<p>Satellite Communication</p> <p>i) Planning and implementation require more lead time.</p> <p>ii) Effective for a large country or a group of countries.</p> <p>iii) Independent of distance.</p>	<p>Terrestrial Communication</p> <p>Needs comparatively less time.</p> <p>Suitable for a small country or a part of the country.</p> <p>Limited coverage area.</p>
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- 4) The technology which facilitates conversation with more persons located at different places over the telephone is called audio conferencing. Video conferencing is the teleconferencing technology in which both learners and the teacher can see and hear each other.
- 5)
  - i) Reading news articles and current events and books on it
  - ii) Downloading and use education programs such as Google Maps and use as GPS
  - iii) Using it as a digital or video camera for school projects, publishing, etc.
- 6) Social networks are important tools in the teaching-learning process. Social networks are online communities, where individuals can share everything among themselves. In educational context, students and teachers can share among themselves their experiences and problems so that teaching-learning process becomes an interesting activity. We define social network sites as web-based services that allow individuals to: (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users

## Understanding ICT

with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system.

- 7) Open educational resources are educational materials and resources offered freely and openly for anyone to use and under some licenses to re-mix, improve and redistribute.
- 8) U-learning refers to any learning environment that allows any mobile learning devices to access the learning and teaching contents via wireless networks in any location at any time. The commonly used definition of u-learning is “learning with u-computing technology.



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## UNIT 3 LEARNING THEORIES: IMPLICATIONS FOR ICT

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### Structure

- 3.1 Introduction
- 3.2 Objectives
- 3.3 Theories of Learning and their Implications for using ICT in Education
  - 3.3.1 Behaviourism
  - 3.3.2 Implications of Behaviourism for using ICT in Education
  - 3.3.3 Cognitivism
  - 3.3.4 Implications of Cognitivism for using ICT in Education
  - 3.3.5 Constructivism
  - 3.3.6 Implications of Constructivism for using ICT in Education
- 3.4 Optimum use of ICT for Teaching-Learning Purposes
- 3.5 Let us Sum Up
- 3.6 Suggested Readings and References
- 3.7 Answers to Check Your Progress

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### 3.1 INTRODUCTION

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During the first year of this programme you might have studied the concept of pedagogy and also about learning theories. Hence, you know that pedagogies are guided by learning theories. You also have an understanding of the concept of Information and Communication Technology (ICT), which is the focal point of the first two units of this course. This unit explains briefly learning theories and their implications for use of ICT in teaching-learning process, and projects the linkage among learning theories, pedagogies, and ICT use for instructional purposes.

Why do we need to study the implications of learning theories for ICT use? This is because with increasing access to ICT at educational institutions, and with policies urging teachers to use ICT, there is a possibility of ICT use, being guided by its availability, and the policies requiring ICT use in teaching-learning processes. This type of ICT use treats ICT as the focal point and teaching-learning strategies revolve around the technology in which the institution has invested (Suri, 2008). In such cases learning theories and hence, pedagogy may become subservient to technology use, which assumes the central position in teaching-learning processes, instead of being the means for supporting pedagogies. This leads to the possibility of using even digital technologies just for supporting traditional pedagogies involving information transmission (Laurillard, 2002). The potential of ICT for supporting a pedagogic shift from traditional teaching methods to those that support knowledge construction may not be utilized in such instances. On the other hand, when the focus is on learning theories, ICT is treated as a means to support pedagogy and there are attempts to integrate it seamlessly in the instructional process. Therefore, this unit treats theories of learning as key points and describes their implications for ICT mediated teaching and learning. Subsequently, it states that optimum utilization of ICT depends on the pedagogy,

and hence, the learning theory, which can make learners consumers of information transmitted by ICT, or collaborative creators of knowledge.

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## 3.2 OBJECTIVES

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

- describe different learning theories;
- explain the implications of behaviourism for using ICT in teaching-learning processes;
- discuss the implications of cognitivism for using ICT in teaching-learning processes;
- explain the implications of constructivism for using ICT in teaching-learning processes; and
- discuss the ways to utilise ICT optimally for teaching-learning processes.

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## 3.3 THEORIES OF LEARNING AND THEIR IMPLICATIONS FOR USING ICT IN EDUCATION

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You, might have studied in the first year of this programme the theories of learning and hence you have an understanding of the behaviouristic, cognitive and constructivist approaches to teaching and learning. Therefore, in this section, we shall briefly discuss them and draw out their implications for use of ICT for pedagogic purpose.

### 3.3.1 Behaviourism

According to the learning theories propounded by behaviourists, learning is a mechanical process of associating stimulus with response, which produces a new behaviour. Again, such behaviour according to some psychologists is strengthened by reinforcement. We shall discuss the learning theories propounded by two famous psychologists namely Pavlov and Watson that consider association between stimulus and response to lead to behavioural change i.e. learning and then study their implications. Thereafter, we shall discuss some theories that emphasise the role of reward/reinforcement to strengthen the desirable behaviour.

- **Pavlov's theory of Classical Conditioning**

This theory suggests that reinforcement strengthens the behaviour arising from connection between stimulus and response. In Pavlov's famous experiment, the dog salivated (response-R) when food (unconditioned stimulus- UCS) was served and a bell (conditioned stimulus-CS) rang simultaneously. Later on, even in the absence of food, only on hearing the bell, the dog salivated. This was because response was made even to the CS after it had been paired several times with UCS. For instance, we stop at red traffic signal even when we are no longer asked to do so because the red light (CS) itself generates the response thus leading to learning.

**Watson's Theory of Learning:** J. B. Watson's theory too like Pavlov's theory says that learning is by association of stimulus (S) and response (R) and that there can even be generalisation of stimuli to which the same response is emitted. Let us go through the following example in this regard.



### Example

Rohan was learning to use the computer. Once he lost the data stored in it as it did not function. He developed a fear for electronic data storing devices as he had generalized the stimuli and reverted back to the use of paper and pen. Later with his teacher's encouragement, he once again started using computer and gradually gained faith. This is because connection between the stimuli and response (data storing devices and lack of trust) had been broken.

We see that the response (distrust) had got conditioned for not only the floppy, which had caused a natural response but along with it also for the other data storing devices, which had not evoked a negative response so far (neutral stimulus).

### Thorndike's theory of learning

Thorndike's theory of learning also involves bonding of S and R but rewarding a certain response fixes it over the others. This is called the law of effect i.e. pleasant experiences lead to learning over unpleasant ones. Repeatedly forming connection between S and R i.e. drill, strengthens the connection (Law of use) while disuse does the opposite (Law of disuse). There is also the 'Law of readiness' that says that learning is possible only if the learner is ready i.e. mature and possesses necessary previous experiences for learning. Above all this theory suggests that learning is goal oriented.

### Hull's Theory of Drive Reduction

According to Hull also, learning involves S-R connection but it is basically need based. Let us study the following example-

Mr. X, a teacher, was not computer literate and did not bother about the fact that his computer lay unused. Later on, when imparting instructions through power point presentation was made mandatory, he felt the drive to learn, which caused a state of disequilibrium in him and initiated and sustained learning.

### Skinner's Theory of Learning

B.F Skinner was also, an associationist who believed that learning takes place through association of S and R. He, however, vouched for the role of reinforcement in shaping behaviour i.e. for learning. Unlike Pavlovian conditioning, which conditions a particular behaviour, in operant conditioning the 'operant', which unlike a response, is unanticipated, and when it is emitted, it is reinforced. **Hence reinforcement is contingent to the emission of the desired response.**

### 3.3.2 Implications of Behaviourism for using ICT in Education

Behaviourists consider learning to be a mechanical process of 'association' of response with a stimulus for producing a new behaviour, i.e. learning. They also emphasize the need for 'practice' for strengthening the association so that the newly acquired behaviour can be performed with speed as well as efficiency, and gains the strength of a habit. For instance, while learning to use a computer keyboard, we gain speed and efficiency with practice. You have also read that behaviourists like Pavlov highlight the need for conditioning the response (R)

through proper reinforcements and enabling the learner to respond to even a neutral stimulus (S) that assumes the strength of a natural stimulus.

Hull's theory of drive reduction says that learning involves S-R connection but it is directed towards the satisfaction of a need, which in itself serves as reinforcement, while behaviourists like Pavlov, Skinner and Thorndike are of the view that reinforcement provided by an external agency strengthens the S-R connection and thus the desired behaviour. However, Sprinthall and Sprinthall, (1990) say that Skinners' concept of reinforcement differs from Thorndike's concept of reward, which is a satisfying feeling or experience rather than something concrete. Apart from the need for reward and practice, Thorndike also emphasized the significance of other factors like the readiness of learners, and goal oriented learning endeavours, for learning. What are the *implications* of these aspects of behaviourism on ICT use in teaching and learning? We are listing some of the implications. You may take a critical look at them in the light of behaviourism and add some more.

- Learning experience needs to be enjoyable: While using ICT for teaching we need to understand that once the novelty of the device wears off, learners may lose interest unless the content taught is interesting. Hence, children may be excited as you take them to a smart classroom and use computers but to sustain their interest you need to teach in a way that they enjoy learning.

Read the following:

In 1999, as a part of the “hole in the wall” project, carried out in Delhi, a computer was put in hole in a wall in a way that children of a nearby slum could access it. The children started using it and could acquire basic computing skills mostly on their own. The project showed that there can be incidental learning of such skills provided the learners can access suitable computing facility, with entertaining and motivating content and some minimal (human) guidance.

**Source:** Edutopia, February3, 2012).

You may read about this project carried out by Sugata Mitra.

Note the words ‘entertaining and motivating content’ in the box given above. This explains the reason for designing educational games, using computers and mobile devices, in a way that learning experiences educate as well as entertain and keep the learners interested. For example- for a game built around a pizza party, children, while playing the game, attend the party and learn to count, add and subtract; there are games for language learning while playing the game; an online squabble game requiring players to create meaningful words, encourages thinking and helps the expansion of vocabulary but sustains their interest by challenging them with cues for word making.

- Reinforcing desired learning experience: Skinner is of the view that teachers can be more effective if they act as behavioural engineers and shape behaviour through reinforcement (Parsons, Hinson, Brown, 2001). Therefore computer assisted instructions are developed not just for teaching but also for, assessing learning and providing feedback that reinforces the desired behaviour. You may have also played games on computer or mobile phone and got feedback about your performance in the form of scores,

congratulatory messages and so on. When you design ICT mediated learning experiences, you need to keep in mind the need for providing such reinforcement verbally/textually/ pictorially.

Use of emoticons for providing feedback. One can find emoticons in smartphones. They are used by people to express their feelings.

Thorndike's learning theory is - behaviouristic – 😊

Pavlov's theory of learning is-constructivist- 😞-Read the text again

### Feedback in self learning material

Why does this unit include 'check your progress' and their suggested answers? The unit has been developed as a Self Learning Material (SLM), which is based on the concept of 'programmed learning'. Programmed learning aims to introduce behavioural change (learning) through suitable learning experiences that are analysed and presented in small learnable units for introducing learning. This unit also includes small segments of instructional content called frames. Following the teaching of a segment, learning is assessed and 'reinforced' through feedback.

- Practice for learning and its retention: Computer Assisted Instructions often include provision for drill and immediate feedback. This reduces the chances of extinction of response to the stimulus and thereby the termination of the newly acquired behaviour.

### A multiplication drill

$$2 \times 3 = 6 - \text{👍}$$

$$3 \times 4 = 13 - \text{👎 -try again}$$

$$3 \times 4 = 12 - \text{👍}$$

$$4 \times 5 = 20 - \text{👍}$$

- Learning requires readiness in terms of maturity and previous knowledge: Previous knowledge, maturity, interest determine readiness. For example a computer training of the advanced level, requires the mastery of the basics. We need to keep this in mind while selecting/developing content/ learning experiences for our learners. Therefore, while developing an audio/video programme we need to carry out a need survey to understand the academic background of the target group (learners) and pitch the difficulty level of the programme accordingly. For example for a video programme on "states of matter" for fifth standard students will you include content on the molecular structure of water? Why?
- Learning is goal oriented and need based: Formulating clear objectives for teaching-learning purposes and sharing them with learners is important. For example, before engaging children in an addition drill, we may tell them that this will help them in learning addition and subsequently multiplication and thus enable them to calculate the cost of the things they buy.

Behaviouristic approaches are criticised as they lead to the adoption of traditional methods of teaching requiring information transmission through lectures for filling

gaps in learner's knowledge. Learners are also engaged in drill and practice for strengthening the S-R association, but not in the generation of new concepts. It also considers learning as an individual instead of a social process and hence, does not take into account the need for discussions and team work for learning. Nevertheless, behaviourism has led to the development of important instructional technologies, tutorials with individual instructions and feedback that reward learning and motivate learners (Shield, 2000; Sutton, 2003). It has also led to the idea of programmed learning, which is still popular for developing SLM.

Behaviourism is although criticised for defining learning as a mechanical process of responding to a stimulus, and encouraging teaching through transmission of information for rote learning but it is difficult to dispense with it altogether. Can we avoid learning by S-R association? How do we learn to stop when the traffic signal turns red and start when it turns green? Do we not get conditioned to stop at a red signal? Can we avoid rote learning? How do we learn our telephone number, our address, songs of a language we may not understand? Do we learn these things by attaching meaning or by rote? Does practice help in learning the use of the computer commands like 'Ctrl+s, Ctrl+b, Ctrl+alt+del'? We learn many things through association, conditioning and repeated practice. S-R association is required even for operating complicated machines like car, computer, aeroplane, mobile phone, and the like. Look at your television remote control device, or your mobile phone. They have many symbols to which you have learnt to respond for operations like increasing or decreasing brightness, volume of audio, and so on. Therefore, when you develop a CD or an online course, you may create various icons for communicating messages like 'forward', 'backward', 'pause', 'start', 'skip', etc., but an icon should require the same response every time it is used so that the S-R connection is established. For instance, if an icon is used once for 'pause', every time it has to be used for pause so that users associate the action 'pause' to it.

### 3.3.3 Cognitivism

Associationists view learning as perceptible change in behaviour and emphasize what learners do. They advocate for S-R and R-S patterns of learning but neo-behaviourists go beyond this and include besides overt behaviour, the internal processes involved within the organism (O) thus making S-O-R combination (Parson, Hinson and Brown, 2001). For instance, learning by observation where by the process is observed and understood and thereby learnt. For example, one can watch a video programme with demonstration of an experiment and repeat it by grasping the content and without resorting to random trial and error. Thus learning is not considered as a mechanical process but requires the application of insight and involves thought process i.e. cognition of the learner. Mental processes like memory, reasoning, organizing ideas, making strategies for acquiring facts and concepts are needed for learning (Seifert, 1991). This requires one to consider the entire field of operation i.e. the problem in its entirety and not isolated stimuli. Hence it is also called gestalt (whole) theory of learning as the learner considers the whole field with all the variables involved and perceive their relations.

### 3.3.4 Implications of Cognitivism for using ICT in Education

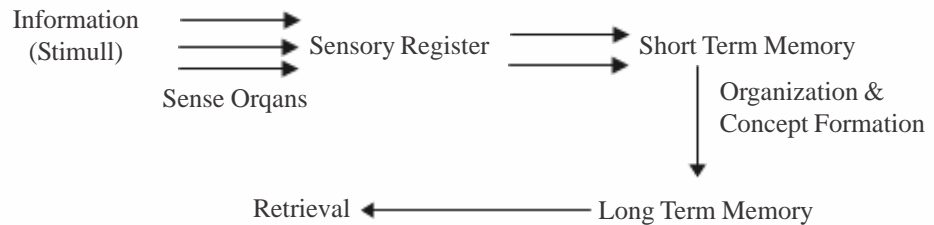
You have studied Piaget's view on acquisition of knowledge, and hence about the growth of the mental structure, the schema (building blocks of knowledge).

While associationists view learning as perceptible change in overt behaviour exhibited as response (R) to stimulus (S), and place emphasis on what learners 'do', neo-behaviourists go beyond this and include besides overt behaviour, the internal processes involved within the organism (O) for making S-O-R combination (Parson, Hinson and Brown, 2001). Therefore, cognitivism does not view learning as a mechanical process but a process of thinking i.e. cognition for meaning making. Mental processes like memory, reasoning, organizing ideas, making strategies for acquiring facts and concepts are needed for such learning (Seifert, 1991) and this requires the consideration of the entire field of operation (gestalt) and the relation among the variables comprising it, instead of considering isolated stimuli. Information processing is thus carried out and as indicated in Figure 3.1, the following steps are therefore essential:

- Receiving initial sensory input from sense organ(s) : The sensory register receives the information but holds it for a short duration and retains only the stimuli to which we pay 'attention'. Objective qualities of the stimuli i.e., well defined features of the stimuli facilitate its retention. For example, a teacher points to Assam in the political map of India and taps the pointed end of a stick on it to draw attention to the stimulus; on a website some links are labelled as 'new' and the word 'new' blinks to draw attention. While the information is still in the sensory register, we perceive it by attaching meaning to it. From the sensory register the information perceived passes on to the 'short term memory' but remains there for a limited period. Thereafter it is either forgotten or becomes long term memory. Hence, information processing is not merely the process of shifting information from sensory register to STM and then to LTM but it also involves the organization of the information and attaching meaning to it for forming concepts (Sprinthall & Sprinthall, 1990). For example, when a child learns about sparrows, the information is transferred to her STM and she makes meaning with the help of her earlier learning of crows and pigeons and her new learning then becomes a part of her LTM but a telephone number she has learnt may be retained in the STM only till she has dialled the number. The learning does not become a part of LTM in this case.
- Transferring STM to Long Term Memory (LTM) as well as recalling the LTM requires effort, but practise lessens the effort. For e.g., unlike those teaching a particular content every year, others who had learnt it long back may need some time to recall it.

Can rote learning be a part of LTM? You know that rote learning, unlike meaningful learning, implies learning by repetition rather than by comprehension. Although such learning is not considered to be as effective as insightful learning but rote learning may also be transferred to LTM and may become life long memory, like the rhymes and songs we had learnt in our childhood often without understanding their meaning. However, we may not be able to recall the 'laws of motion' we had learnt as adolescents if we had learnt them by rote. This is because like the rhymes and songs we may not have fully understood the laws but unlike the rhymes we may not have rehearsed them to the point of 'over learning' i.e. repetition, which is necessary for transfer to the LTM and retention.





**Figure 3.1 Information Processing Model**

What are the implications of cognitivism and especially Information Processing for ICT use in teaching and learning? Some of the implications are the following:

- Learning is basically a process of meaning making. The learner constructs knowledge but individually. Hence, ICT use needs to be directed towards engaging the learner with the content in a way that s/he is enabled to recall earlier relevant learning and use it for anchoring new learning. For example, for teaching the implications of learning theories for ICT use, we are referring to the theories of learning you have learnt earlier but in an online course, you may create hyperlinks and new concepts may be hyperlinked to the content taught earlier. You may have come across such content with hyperlinks, in wikis, that lead to explanations and / illustrations for the hyperlinked word.
- Using ICT for repeatedly playing a particular content like a poem or a song may help in making it a part of LTM but you need to check whether the learner has understood the concept, as the content learnt this way may not necessarily lead to meaningful learning, and may be lost.
- It is necessary to draw learner’s attention for learning to begin. If we fail to draw the learner’s attention and arouse interest in learning, the information we provide may be lost. Therefore, we use methods like using an interesting introductory message prior to teaching the content, apart from techniques for drawing attention like underlining, using bullets, creating boxes with text, and the like.
- Learners need to be active for learning. Hence, activities requiring them to search for information, examine it, evaluate and select appropriate content, analyze and synthesize it, draw inferences, that make them more active than situations in which they are recipients of the information and inferences drawn by teachers and others, support learning. Hence, learners need to use ICT more while in a classroom teachers usually are the main users of ICT and learners remain passive.
- Goal oriented and self-directed learning requires clear objectives. For example, the units of this course begin with clear objectives of teaching and learning. Hence, while developing an audio/video/online course/ multimedia CD you should be clear about the goals of teaching and learning.
- Learning requires scaffolding. Hence, even while teaching through ICT, advance organizers can be helpful for rooting new learning to earlier one by comparing and contrasting old and new ideas, or by simply linking them.
- Learners do not need to be ‘trained’ as they can make meaning and be self directed learners, who can take charge of their learning. This, however,



requires that irrespective of the medium used for delivering it, the self learning material is structured, focussed and as per the learner's abilities and needs. It should also raise questions that elicit critical thinking. The feedback from teachers may also include comments that encourage thinking.

- As the learner needs to process information, the content, for instance of an online course or any unit of a teaching-learning process, should have a well defined and coherent structure, logical sequencing, summary, relevant examples, analogies, concept maps, and other such features for facilitating information processing.
- Though learners engage in information processing, the importance of drill and practice remains. For examples, we may watch a video showing a process, understand it and reproduce it but practising it will lead to perfection and naturalization.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

1) For designing an online course does behaviourism have any implications?

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2) How should the instructional content be designed for programmed learning?

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3) What are the features that learning material should have, for fostering thought process?

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### 3.3 5 Constructivism

For the modern educationist, education is much beyond memorizing facts and performing fixed operations. It is ‘metacognition’ which refers to the ability to understand and manipulate cognitive process through questioning, planning, regulating thought and thus perform critical thinking (Parsons, Hinson and Broom, 2001). In the new paradigm of education wherein technology is getting integrated, **construction** of knowledge gets promoted. The learner constructs knowledge through his/her own efforts rather than being fed with fixed information from an outside agency. Intimately related to constructivist approach is the ‘**Humanistic approach**’ which places the learner at the centre stage and allows learning at one’s own pace and style. There is faith in the learner’s potential and allows the learner to fully exercise and use the potential. These approaches are adopted when technology is integrated as the learner occupies the centre stage. Moreover, not all learners will try to construct knowledge in the same way as would have happened if a teacher would have spoon fed them with the same information. Thus, educational technology nurtures creativity and helps in overcoming a straitjacketed approach.

### 3.3.6 Implications of Constructivism for using ICT in Education

You know that as per the constructivist approaches learners should not be merely recipients of the knowledge constructed by others but they should engage in activities that lead to knowledge construction. You also know that social constructivists like Vygotsky consider learning to be a social process requiring discussion, negotiation, attaining consensus, and hence team work. ICT has the potential to support collaborative knowledge construction (Jarvela, Hakkarainen, Lipponen, & Lehtinen, 2001) and Web 2.0 technologies like wikis, blogs and podcasts if effectively deployed can enhance learning experiences, and deepen levels of learners’ engagement and collaboration within digital learning environments (Boulos, Inocencio & Wheeler, 2006). This is because sociability aspects of Web 2.0 tools built through their social softwares make them ideal for educational purposes as they can support conversational interaction, feedback and social networking (McLoughlin & Lee, 2007).

What are the implications of constructivism for teaching and learning with ICT? Some of them are the following:

- **ICT use for enhancing learner engagement:** ICT should enhance the level of active participation of learners in learning processes. The content taught, therefore, has to be interactive that questions, requires learners to critique, contextualize it by bringing into play their own experiences, for cognitive engagement of learners. Activities requiring collaborative work with peers and provision of support from teachers will enhance learners’ social engagement.
- **ICT use for supporting knowledge construction:** ICT needs to be used for supporting knowledge construction by learners. For example, ICT may be used just for downloading images of food chain or it may be used for searching for information about the birds and animals of a locality and their food habit; downloading images of the birds and animals, images of necessary icons like arrows, and using the images to organize the organisms in a way that depicts a food chain.

- **ICT use for making learning a social process:** Unlike behaviourists and cognitivists, social constructivists consider learning as a social process. Hence, ICT needs to be used for learning collaboratively. Activities requiring teams to solve problems, making discoveries and using ICT for collecting, processing, managing and sharing information and the resources created are, therefore, to be planned for teaching. We know that many children today use social media and, often for carrying out school projects and assignments they become communities of practice that engage in computer based collaborative learning. However, do schools recognize, support and channelize such informal and unguided practices for collaborative creation of content?
- There is an emerging need for pedagogies that harness web 2.0 technologies to promote collaborative learning (Safran, Helic, & Gütl, 2007). Therefore, while using ICT for teaching and learning purposes, you need to see that it brings together learners, and helps them share files, data and messages for negotiated meaning making.
- **ICT use for situated learning:** Situated learning is a form of authentic learning that happens in real world situations. Working in the real world situation leads to the acquisition of knowledge that is embedded in the situation, as well as the application of such knowledge to the real world complex problems emerging in the situation. For instance, while working at schools you may come across a problem related to classroom management that you had not studied during teacher education. You may learn to manage it and also apply your learning in similar situations. This type of learning is contextualized and technology helps in simulating the situation and creating a micro world that represents the real world. For example, we can learn - to fly an airplane in a simulated situation; the basic operations of mathematics through simulated purchase and sale of goods; to solve problems pertaining to management of organizations by studying the problem, engaging in decision making and reflecting on the outcomes of the decisions.

There are games that have been devised for learning by exploring a topic in authentic setting, collaboration and reflection in an educational scenario that combines mobile computing technologies with stationary computers (Spikol, Kurti & Milrad, 2009). There are also games based on participatory simulation that create a scenario mediated by a set of rules that enable inquiry and experimentation, and while playing them, learners are transformed into players who dive into the simulated situation, which is the micro worlds and learn in-context while playing it (Yin, Ogata & Yano, 2009 ).

- **Teacher's Role:** A teacher can develop a constructivist environment by creating learning communities that comprise students, teachers and experts who are engaged in authentic tasks in authentic contexts (UNESCO, 2002). This is possible with ICTs that for instance enable simulations and create virtual world for collaborative learning. Within the virtual environments modelled by ICT, virtual communities of practice can carry out real time actions, collect data from different locales, think, act and reflect collectively and make decisions and solve authentic problems. For example, Second Life is a virtual world that allows players to socialize with other participants, interact with objects, participate in activities, take decisions and learn. Some

other examples of virtual world created for learning are Sciencesim for collaboratively learning science; heritage key for learning history and culture, and the like.

- ICT use for self directed learning: Although collaboration is important for learning, reflection, metacognition and hence self directed learning on part of individual learners is also important. Therefore, the online course you teach may require your learners to maintain a reflective journal for recording their reflections on their learning experiences. Reflection may also be a collective process with the team reviewing experiences and revising the learning process.
- The teacher's role is not passive as learners construct knowledge. S/he needs to guide and facilitate learning. S/he has to play an active role in formulating the objectives of teaching, select and organize the content to be taught, chose suitable pedagogy and technologies. S/he also has to design the content/structure the learning experiences and support and monitor learning on a continuous basis and also see that ICT use is focused and ethical.

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### **3.4 OPTIMUM USE OF ICT FOR TEACHING- LEARNING PURPOSES**

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ICT mediated teaching and learning may have specific objectives, appropriate content that has been organized well, and there may also be provisions for assessment. These steps are adopted for teaching not only through print medium but sometimes also for online courses that includes files in pdf format instead of printed text. ICT use in these cases, however, supports the behaviouristic approach with traditional lecture based pedagogies that may not promote knowledge construction.

ICT although has the potential for creating learning environments in which learners are self-directed and actively engaged in constructing knowledge but when used only for delivering digitized text, it is only a carrier of information. Hence, a lecture delivered through teleconferencing or a CD with a video, or even information made available through a computer followed by testing only alters the source of information and agency of testing without accommodating the learner's active participation in learning process, and this kind of use encourages individualised learning and fails to tap the potential of technology for interactive and collaborative learning (Laurillard, 1993).

The UNESCO (2002, p.17), however, says that "ICTs provide an array of powerful tools that may help in transforming the present isolated, teacher-centred and text-bound classrooms into rich, student-focused, interactive knowledge environments". ICT therefore has the potential for introducing a shift from traditional lecture based pedagogies to those that support knowledge construction (UNESCO, 2002; 2011). Hence, ICT use needs to be directed for information processing, collaborative content creation and problem solving for reforming instructional practices (UNESCO, 2008) and schools must transform the traditional paradigm of teaching and learning through appropriate use of technology. Which learning theory should guide ICT use for such transformation? Behaviourist approaches will make learners consume information and train them to associate response to stimulus. The UNESCO (2002), therefore, says that for

reforming education, schools should use ICT for practicing constructivist approaches.

Constructivist pedagogies use diversity of viewpoints, cultural experiences, divergent opinion that is best realized through interactions with group members from other cultures, languages and geographies, and the use of ICT like the Internet can support this and move education beyond the narrow type of knowledge transmission (Anderson & Dron, 2011). Hence, we need to see that the Internet is not used merely for downloading information but is also used for collaborative knowledge creation.

According to Lombardi (2007) learning-by-doing is the most effective way to learn but not every activity can be carried out within classrooms, like certain experiments that are too dangerous, difficult, expensive, or even impossible to conduct in the classroom. Lombardi also says that teachers cannot show the cause of an earthquake within a classroom, or take students into the past but ICT can model simulated situations for experimenting, animate objects for showing natural phenomena like the movement of tectonic plates, reconstruct the past, connect learners with experts, and so on but ICT can be used for making abstractions concrete, and for making learning a social process, besides making it a cognitive process. However, for this ICT use needs to be based on the contemporary learning theories that view learning as an active, contextualised and a social process, which is not necessarily a linear one (the view that learning is a linear process organizes learning experiences in a linear sequence like the chapters of a textbook, while in real life, learning experiences are not sequenced thus. For instance, a child living in a desert may not experience the seasons as presented in a textbook and may not learn about monsoon for several years.

How can we use ICT for implementing constructivist learning theories? Some examples of ICT use for this are as follows:

- **Making learning an active and social process:** Asking learners to collect information from various websites will enable them to use ICT but this will make them consumers of information. For implementing the constructivist view point and making learning an active process and social process, learners should be a part of an environment in which they explore knowledge sources as a team, discuss with peers and experts and create knowledge. As a teacher you may create a discussion group, or use web 2.0 technologies like a wiki or a blog for this. Educational games like Savannah have been designed for collaborative learning. This game can be played using a handheld gaming device as children engage in role play as members of a pride of lions and interact with the objects and other lions in a virtual savannah (Owen, 2009).
- **Using ICT for Problem-Based Learning:** Learners may solve authentic problems faced in real life, like the problem of malnutrition in the community. They may collect data about the height and weight of young children of the community in which the school is situated, process it using spreadsheets, and using a wiki develop the report collaboratively and share the findings on a website they have created.
- **Using ICT for cognitive apprenticeship:** ICTs can be used to create learning spaces within which novice learners learn while working with



experts. For example in an online discussion forum, new and experienced script writers may work together for developing scripts.

- **Using ICT use for situated learning:** This involves the use of apprenticeship, coaching, collaboration, authentic contexts, tasks, activities and cognitive tools in real world settings (Brown, Collins & Duguid, 1989). We have already mentioned a few examples of ICT use for such learning like simulated lessons for learning to fly an airplane.
- **For Self-Regulated Learning:** Education is much beyond memorizing facts and performing fixed operations, and involves ‘metacognition’, which is the ability to understand and manipulate cognitive process through questioning, planning, regulating thought and thus perform critical thinking (Parsons, Hinson and Broom, 2001). ICT allows continuous review and improvement of the learning resources created. Hence, ICT tools can be used to develop metacognitive skills and make learners more reflective and self-regulated (Hsiao, 1999, as cited in UNESCO, 2002).

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

4) What is the main purpose of using projected slides by the teacher during teaching-learning processes? Is it beneficial for ‘learning’ or for ‘teaching’?

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5) In what way should ICT be used for facilitating learning?

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6) Which technologies can support learning in a social context?

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### 3.5 LET US SUM UP

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According to behaviourists learning is a mechanical process of responding to a stimulus that leads to change in the overt behaviour of the learner. Behaviourist pedagogies, therefore, seek behavioural changes like the ability to explain, narrate, differentiate, develop, create, analyze, and so on, that can be assessed. For introducing these changes, information transmission is the commonly used pedagogy. Hence, if the approach to teaching and learning remains behaviouristic, even when ICT is used, it is used for supporting a lecture based pedagogy. For instance, the power point slides made using a computer are usually only the carriers of text, illustrations and so on and at best serve as an alternate channel of communication that can very well be substituted by a chart paper. Such pedagogies do not utilize the potential of ICT for supporting active, collaborative and reflective learning. However, can we altogether abandon behaviouristic approaches? The use of signs and symbols is common even for advanced machinery and we learn to respond to these stimuli. Hence, an online course or a multimedia CD we develop may use symbols for pause, start, going back, forward, next, audio, notice board, assessment results and so on. Similarly, we may develop computer assisted instructions for drill for supporting learning that may not require meaning making but only rote like, names of state capitals, names of geographical features, colours, designs of national flags, national animals, and other such things.

Cognitivists consider learning to be an insightful activity that involves thought process and meaning making. ICT use for presenting advance organisers, linkages to concepts learnt earlier and other relevant concepts, content map and other scaffolding devices is in accordance with this approach. Constructivism too holds that knowledge is not meant for being transmitted but has to be constructed by learners within a social setting. This explains the use of web 2.0 technologies like wikis, blogs, podcasts that include the space and mechanism for discussions with peers and experts and even collaborative creation of artefacts; virtual worlds; simulated learning situations, and the like. Therefore, evolving ICT has the potential to support pedagogies based on constructivist approaches, and as schools are supposed to reform educational practices by introducing pedagogies based on constructivist learning theories, ICT use for teaching and learning at schools needs to be directed to this end (UNESCO, 2002). Therefore, ICT needs to be used for imparting pedagogically sound instructions that enhance learners' activities like communication with content, peers and teachers; collaboration with peers; participation in activities for learning by doing in real and simulated environments; analysis of data; synthesis for drawing inferences, making decisions and the like.

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### **3.7 ANSWERS TO CHECK YOUR PROGRESS**

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- 1) Yes, we need to design instructional content taking into consideration the 'readiness; of our learners; provide pleasing learning experiences, include scope for practice, use symbols intelligently for communicating meanings.
- 2) It should include logically sequenced, small meaningful segments (frames) that are followed by scope for assessment of learning and feedback thereon.
- 3) Links to earlier learning, means for drawing attention like underlining, bullets etc., scaffoldings like a concept map, advance organizers, illustrations, examples and so on, relevant questions, cases, etc. For example a scaffolding technique has been used in the design of an interactive simulation framework for developing a participatory simulation game for collaborative in-context learning, and the scaffolding provided initially is gradually phasing out like the scaffolds of children's bicycles (Yin, Ogata & Yano, 2009). ).
- 4) It can be useful for reminding the teacher to cover the points she wants to teach, project illustrations, highlight the main points. Therefore, it serves more as a tool that supports teaching than learning, and has limited role in encouraging learners' activity, thought process and knowledge construction.
- 5) ICT use for learning rather than teaching and engaging learners in tasks like carrying out collaborative activities involving search for information, organising content, making meaning through discussions and negotiations, creating learning resources, playing educational games, engaging in simulation .
- 6) Web 2.0 technologies like wikis and social media that allow learners to interact, negotiate meaning and develop content collaboratively.

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## UNIT 4 TEACHING LEARNING SYSTEMS

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### Structure

- 4.1 Introduction
- 4.2 Objectives
- 4.3 Teaching-Learning Systems: Informal, Formal and Non-Formal
  - 4.3.1 Informal Learning Systems
  - 4.3.2 Formal Learning Systems
  - 4.3.3 Non-Formal Learning Systems
- 4.4 Design, Development and Potential of ICT for Teaching-learning Systems
  - 4.4.1 Design and Development of ICTs for Teaching and Learning
  - 4.4.2 Potential of ICT for Student Learning
- 4.5 ICT for Classroom Teaching
  - 4.5.1 ICT In Teaching-Learning Process
  - 4.5.2 ICT for Diagnostic Testing and Remedial Teaching
  - 4.5.3 ICT for Evaluation Activities
  - 4.5.4 ICT for Psychological Analysis of Learners
  - 4.5.5 ICT for Development of Reasoning and Thinking Among Students
  - 4.5.6 ICT for Instructional Material Development
- 4.6 ICT for Virtual Learning Situation
- 4.7 Collaborative Learning with ICTs
- 4.8 Let Us Sum Up
- 4.9 Suggested Readings and References
- 4.10 Answers to Check Your Progress

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### 4.1 INTRODUCTION

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Education is a process of lifelong learning. It is brought about through informal, formal and non formal systems of learning. It has been rightly said: ‘Learning begins from the mother’s womb and continues upto the grave’. How does learning take place. This is a very ticklish question and may evoke multiple answers. Broadly speaking ‘learning’ in the present context, occurs through different means or systems commonly categorized as informal, formal and non-formal learning systems. Whether the means or systems, the quality and efficiency of learning are of central importance. In this unit, you will read about different teaching learning system – informal, formal and non-formal. You will also read design, development and potential of ICT for teaching-learning systems, using ICT for classroom teaching-learning, virtual learning, and collaborative learning.

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### 4.2 OBJECTIVES

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

- describe in detail the three teaching-learning systems, formal, informal and non-formal;
- differentiate between different types of teaching-learning systems;

- discuss design and development of ICT for teaching-learning systems;
- describe the use of ICT for classroom teaching;
- explain the meaning and role of virtual learning; and
- discuss how ICT can play a role in collaborative learning.

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### 4.3 TEACHING-LEARNING SYSTEMS: INFORMAL, FORMAL AND NON-FORMAL

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Teaching learning Systems are embedded in different learning environments and social spaces which impact the educational process. These learning environments have been broadly categorized by educationists into three categories of learning systems: informal, formal and non-formal systems. Let us understand the characteristics of each of these learning systems and their impact on the education of the masses.

#### 4.3.1 Informal Learning Systems

Humans learn in any kind of environment. Truly speaking, learning of an individual begins from the time of birth and continues through infancy to childhood to adulthood to old age and beyond. The family or the home is the first learning environment that the child encounters. This kind of education is a bit primitive yet diverse, comprising a range of tasks a child learns in a family setting. All these activities, and behaviours, and actions lead to what may be termed as “informal learning” and may occur inside the home or may be institutional, such as i) excursion, fairs, visit to neighbourhood places for fun-making, entertainment, etc. ii) listening to radio/audio programmes, iii) watching television, playing games on a mobile phone or outdoor games/activities in groups, iv) attending a play school or joining community functions, visit to fairs, farms and religious places, markets etc. v) entering the world of work – as a farmer, labourer, shopkeeper or some other profession so as to earn one’s own livelihood and thus become an ‘independent human being’ or a ‘citizen’.

In brief, the ‘informal learning system’, as it might have existed before the beginning of the formal learning system remains mostly rooted in home, family, neighbourhood, local community or village.

A time demarcation between the types of learning activities comprising informal, formal and non formal systems is difficult. Learning activities can, of course, be grouped under any of the three learning systems.

We may now list out some of the characteristics of the ‘informal learning system’. These are as follows:

- i) The informal learning system encompasses a diverse range of activities which result from learners’ interaction with their physical and social environment.
- ii) There is absence of “organised” and “structured learning” experience in the informal learning system.
- iii) Activities and tasks that lead to desirable learning outcomes may be termed as informal education/learning.



- iv) Informal learning can take place in various social and physical spaces since it has no prescribed/ organized structure. However, it does have had a rigid ‘traditional structure’ upon which the present formal learning system is built.
- v) Informal learning system is purposeful but can also be ‘incidental’
- vi) Like formal learning and non-formal learning, ‘informal learning’ is a lifelong process as it begins from birth and continues to death of the individual.

In conclusion, we may say that seemingly there are no explicit or defined objectives of the informal learning system, yet the major objectives of (i) preparation for leading a fruitful adult-life, (ii) becoming a self-sufficient, and productive citizen (iii) adjusting with others in the society and (iv) evolving as a responsible citizen, are definitely achieved in a fair degree. In fact, the informal system is most natural form of socialization and education.

### 4.3.2 Formal Learning Systems

Formal learning system of education corresponds to an organized, systematic and structured mechanism of transmission of knowledge, skills, attitudes, beliefs, customs, traditions and values which the society holds, propagates and preserves.

The process of formal education is contiguous involving the learner, teacher and or the school. As rightly said, ‘the school is an institution of the society’ established and administered by it as per the broad societal goals. The present day education system adopted by schools, colleges and universities are established by the government and/or other private bodies of the society and regulated by the state according to broad constitutional norms and societal beliefs and practices.

Most of us – you, the students and we, the teachers- are the product of the huge edifice of the formal learning system as prevalent today. Let us examine some of the characteristic features of the formal learning system in general. These are as follows:

- i) **Well-defined goals:** The formal learning system is rooted in and primarily based on broader societal aims, stated explicitly and are targeted to be achieved over a long time frame. These long-term goals are designed to be achieved through short term and intermediate goals.
- ii) **Fixed timing:** ‘Learning’ in a formal education system takes place within a time frame defined and prescribed by the school or the state. As you know, from your own experience, the formal learning system is afflicted with a very rigid time frame, strict rules and regulations.
- iii) **Defined content and curriculum:** The curriculum and the content are generally determined and regulated by the state or its agencies and are based on broad societal needs, demands and conditions.
- iv) **Entry requirements:** The entry requirements are fixed and decided by the state for every level of education- primary, secondary and tertiary. For example, entry to college education is subject to completion of school teaching.



- v) **Transaction of curriculum:** Curriculum as transacted at different levels is mostly structurally rigid. The learner has little freedom and remains embroiled in rules and regulations. The teacher exercises greater control.
- vi) **Assessment of achievement of learning objectives:** Well defined and structured mechanisms are in place in the formal education systems to assess the attainment of learning objectives. Achievement of objectives is assessed mainly by conducting periodic tests and examinations.

With all their inadequacies and inflexibilities, the formal learning system today, have become the integral part of education mechanisms the world over. Unquestionably, their huge contributions to the cause of education at large, are momentous in all respects.

However, in view of ever-increasing and rapidly changing needs and demands of the society, the formal learning systems are giving way to non-formal learning and open and distance learning (ODL) systems all over the world.

### 4.3.3 Non-Formal Learning Systems

Formal learning system is characterized by its well-defined features. In the absence of any of the features described in the foregoing sub-sections, the education process acquires non-formal characteristics (Claudia, 1988). For example, if the communication is non-contiguous, or if period of completion of study is flexible, we may say that the learning system is 'non-formal'.

In fact, the non-formal learning system has not been singularly and comprehensively defined to distinguish it from the formal learning system. However, non-formal education has been defined as any organized educational activity outside the established formal system- whether operating separately or as an important feature of some broader activity that is intended to serve identifiable learning clientele and learning objectives. (Coombs, Processor and Ahmed, 1973).

Non-formal learning system began to evolve nearly five decades ago in the 1960s, when a global concern was expressed regarding the unsuitability of curricula to meet individual and societal needs. Countries across the world experienced the constraints of prohibitive costs involved in providing education through the formal system. The ideas of 'lifelong learning' and 'a learning society' emerged through the report of the UNESCO International Education Commission, 'Learning to be' in 1972. The concept of "de-schooling" by Ivan Illich highlighted the rigidity and redundancy of formal learning systems like schools and colleges, to meet newly emerging needs of society. Initially the non-formal learning processes began nearly a century ago in the form of correspondence studies. Correspondence learning dates back to 1856 in Berlin. In 1886, England introduced a correspondence learning course. Similarly, 'A Society to Encourage Study at Home' was set up in 1873 in Boston and so on. This form of education was basically a two-way postal communication of educational materials.

Distance learning mode essentially evolved from correspondence education. According to Holmberg, "Learning supported by those teaching methods in which, because of physical separateness of learners and teachers, the interactive as well as pre-active phase of teaching is conducted through print, mechanical or electronic devices". (Claudia, 1988)

A more broad-based model of non-formal learning is that of ‘open learning’. Some examples of non-formal learning systems in the world are the Open Universities, Open Schools, Flexi Learning Models, etc. The initiatives in India under non-formal education models are the adult literacy programmes, national literacy mission, health awareness programmes and other such initiatives which focus on learning needs of specific target groups. (Claudia,1988)

Let us now discuss some characteristic features of Non-formal education (NFE) Systems.

- i) NFE programmes are targeted to achieve special educational goals and objectives, for example specific goal of Open University system is to provide the disadvantaged segment of the population access to quality higher education.
- ii) Some NFE programmes have fixed time limits and are to be completed within stipulated time frames. For example, health awareness programmes and agriculture extension programmes, which may be organized on a recurrent basis till the goals are achieved.
- iii) The curricula are tailored to meet the educational needs of the specific target groups and are more individualized. For example, curricula of extension and development programmes vary for target groups of rural and urban areas.
- iv) The pedagogy is more learner-centric and flexible, and it derives resources from the community.
- v) NFE mechanisms are administrated in a self-governing mode adopting a democratic approach.
- vi) Assessments are carried out mid-term and end-of-term basis through formative and summative methods.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

- 1) Give two differences between informal and non-formal learning systems with appropriate examples.

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## 4.4 DESIGN, DEVELOPMENT AND POTENTIAL OF ICT FOR TEACHING-LEARNING SYSTEMS.

After having understood three different forms of teaching-learning systems, let us discuss how ICTs can be designed and developed for teaching-learning systems.

### 4.4.1 Design and Development of ICTs for Teaching and Learning

Let us see how ICTs can be integrated in the learning experiences of the learners. The important aspects to be considered in the learning design particularly using ICTs according to Oliver (1999) are:

- 1) Learning tasks to be done
- 2) Learning resources to be provided for doing the learning tasks
- 3) Support systems to be used by the teacher to facilitate learning

This is illustrated in Figure 4.1.

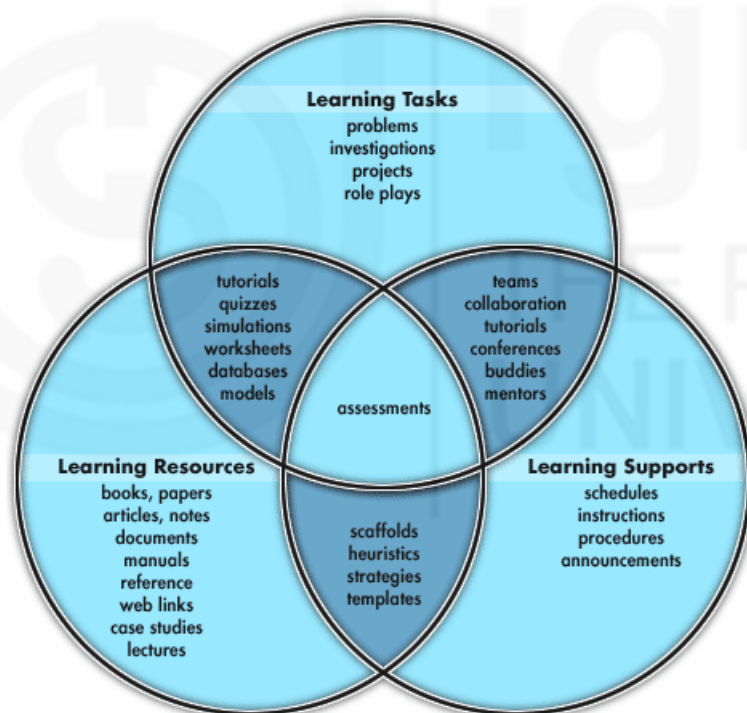


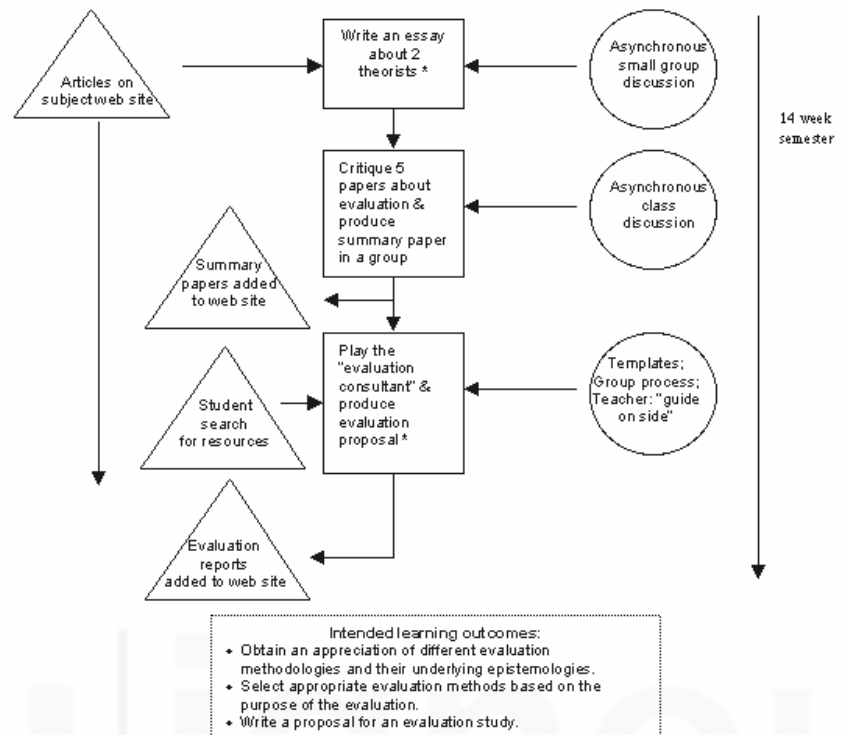
Fig. 4. 1: Components of a Learning Design

**Source:** Oliver, R. (1999): Exploring Strategies for Online Teaching and Learning. Distance Education, 20(2), 240-254 ([http://www.learningdesigns.uow.edu.au/project/learn\\_design.htm](http://www.learningdesigns.uow.edu.au/project/learn_design.htm) retrieved on 07-06-2017)

#### Development of a learning design sequence using ICT

The above learning sequence illustrates a framework that can be used to provide ICT mediated learning experiences. The format primarily deals with contents or resources that learners use, the tasks or activities performed by them and the support mechanisms made available to them to complete the assigned learning tasks.

Let us see how a learning design can be developed using ICT based on the model discussed above with an example shown in Figure 4.2



**Fig. 4.2: An illustration of a learning design employed in a fictitious Educational Technology subject about Evaluation methods**

**Source:** Oliver, R. (1999): Exploring Strategies for Online Teaching and Learning. Distance Education, 20(2), 240-254 ([http://www.learningdesigns.uow.edu.au/project/learn\\_design.htm](http://www.learningdesigns.uow.edu.au/project/learn_design.htm) retrieved on 07-06-2017)

The components represented in the Figure 4. 2 above are explained as follows:

- i) **Activities:** The rectangles represent the learning tasks and the assessable activities are marked by an asterisk, for e.g., produce an evaluation proposal.
- ii) **Learning resources:** The triangles represent the learning resources, for e.g., website support. Arrow from the activity (square) to the resource (triangle) indicates that a resource is created during the activity and later becomes a resource for others. For e.g., during the given activity of writing in a group, the summary paper produced can be used later by other learners. When the arrow is shown from the resource (triangle) to the activity (square) it indicates the resource is being provided to the learner for executing the task. For e.g., students use the web (resource) to write the evaluation proposal (activity) in the above figure 4.2.
- iii) **Learning supports:** Circles shown to the right of the activity represent the support structures for facilitating learning, for e.g., synchronous and/or asynchronous group activities, discussions.

The design using ICT mediation may comprise different combinations of activities, resources and support systems. The resources and support may either be used for the entire duration of the activity or may be used for a specific activity. In the latter instance, a horizontal arrow points to the specific activity and if the same support is provided for the entire duration, then a vertical arrow is shown beginning at the point of initial use of resource to the end. The product of one learning activity can be used as a resource subsequently.

Developing an ICT integrated learning design requires a lot of thoughtful planning by teachers. Simply combining hardware and software will not result in effective learning design, though it has attracted the attention of teachers. Teachers need to have the appropriate tools, resources, and adopt strategies depending upon learning objectives and on the specific target group of learners. Many models, that are in place, provide guidelines and teachers can choose their teaching strategies for ICT integration. Some examples are: ASSURE model (Analyse learners; State objectives; Select media and materials; Utilize media and materials; Require learner participation; Evaluate and revise) given by Heinich, Molenda, Russel and Smaldino (2001). Certain components are basic in all models and can help teachers to develop an effective ICT mediated teaching model.

#### 4.4.2 Potential of ICT for Student Learning

ICTs have enormous potential to enhance students' learning achievement and learning of teachers (Bransford et al, 2000, cited in Bingimlas, K.A., 2009). Research findings by Grabe and Grabe (2007), mention that technologies impact students' skills, motivation and knowledge. ICTs can be used by teachers to assign the task to learners, who then complete the task using ICTs. A World Bank report has stated the impact of ICTs on student achievement as follows:

- a) The positive impact of ICT on student achievement is more likely when ICT is linked to pedagogy.
- b) Test scores are slightly better when students do self-study though Computer Aided Instruction (CAI) i.e., takes tutorials on a computer.
- c) Specific and clearly defined goals for use of ICT in education are required for effective technology enabled learning.
- d) Use of ICTs motivates teachers and learners. There is evidence that ICTs promote learner autonomy.
- e) There are successful models of ICT integration in school learning and in informal settings, i.e., outside the classroom. However, the age at which computer based learning may be introduced is being debated.

**Source:** Trucano, Michael. 2005. Knowledge Maps: ICTs in Education. Washington, DC: *infoDev* / World Bank. Retrieved from <http://www.infodev.org/articles/knowledge-maps-icts-educationon> 29-07-2017

#### Check Your Progress

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

b) Compare your answers with the one given at the end of the unit.

2) What are the components of an ICT mediated learning design?

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3) Explain the importance of technology support in an online learning model.

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## 4.5 ICT FOR CLASSROOM TEACHING

After providing an understanding of design and development of ICTs for teaching-learning, we will explain the need of ICT for classroom teaching.

The ICTs are needed at school level for the following activities (Sansanwal, 2009):

- Teaching-learning process
- Diagnostic Testing and Remedial teaching
- Evaluation activities
- Psychological analysis of learners
- Development of reasoning and thinking abilities among students
- Instructional material development



Fig. 4. 3: Need of ICT in Teaching and Learning Process

### 4.5.1 ICT in Teaching-learning Process

Most teachers feel comfortable in using lecture method, which is not capable of achieving various objectives of classroom instruction. ICT may be of great use in achieving various objectives of teaching –learning process. It provides correct information in a comprehensive manner with different examples. It helps learners to broaden their information base. ICT provides variety in the presentation of



content, which helps learners to learn according to their own pace. It helps in better understanding, and long retention of information.

#### **4.5.2 ICT for Diagnostic Testing and Remedial Teaching**

Being a teacher, you must have experienced that there are some students who fail to understand certain concepts or retain certain information for a long time. Due to large class size, non-availability of diagnostic tests in different subjects, lack of training, resources and desire on the part of teacher, etc. teachers do not conduct diagnostic tests and provide remedial teaching. Here, ICT can help the teachers as well as students in identifying the problem area. Tests can be made available on the website of the school and students can access them from home also. These practices can be monitored by parents also. It is not easy to organize remedial programme for individual students as problems identified may be of varied nature. For this, ICT can be used for developing preparing and delivering individual Remedial Programmes. These programmes may be online or off-line. The instructional materials, if designed specifically for meeting the individual needs of students, and are uploaded on the School website, would definitely benefit students. In this way, ICT can be used for providing remedial teaching to students.

#### **4.5.3 ICT for Evaluation Activities**

The objective of school examination system is to assess the academic performance of students. ICT can be used in educational evaluation. Online tests can be used by individual student to evaluate his/ her learning. Students can instantaneously get the feedback about the status of his/ her understanding. If the answer is wrong, he/ she even can get the correct answer. Not only students, even teachers, can also use it to assess their own understanding of the subject.

#### **4.5.4 ICT for Psychological Analysis of Learners**

There are individual differences. Schools do not have a trained psychologist who can assess students on some of the correlates of academic achievement. It is easy to digitalize all the psychological tests including the scoring process and evaluation. The same may be available on the website and students and teachers can use them, whenever required. Even student can use it individually and can share the results with the teacher who can help him/ her to improve his/ her academic performance. Thus ICT can be used in psychological testing also.

#### **4.5.5 ICT for Development of Reasoning and Thinking Among Students**

ICT can be used in many subjects. ICT provides students a variety of instructional materials and they can choose those that suit them the best. ICT can be used for developing reasoning and thinking abilities among students belonging to different age groups. This is important in the present context as most educational institutions do not pay attention to development of reasoning and thinking abilities among students.

#### **4.5.6 ICT for Instructional Material Development**

At present there is a shortage of qualified and competent teachers in almost all subjects at all levels. Sometimes, instructional materials available in the print

form are not of quality and updated. The text book reading is very often not enjoyable and does not help students in understanding the concepts and retaining the information. There are many teachers who are well known in different subject areas. Their lectures should be recorded in CD-ROM, or should be made available to all the users through broadcast on radio and television. It enhances the quality of instruction in the classrooms. The teacher can also use them to organize discussion after their presentation or broadcast. Teachers can even directly download those lectures. It makes teaching effective, participatory and enjoyable. Digitalized lectures can be uploaded on websites and student teachers can access them as per their needs.

**Activity 1**

Enlist some activities using ICT, which you would like to plan for diagnostic testing of your students in your subject.

**Check Your Progress**

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

b) Compare your answers with the one given at the end of the unit.

4) Discuss the uses of ICT in classroom teaching?

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5) Apart from areas discussed above, what are other areas, where you can use ICTs for improving teaching and learning?

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**4.6 ICT FOR VIRTUAL LEARNING SITUATION**

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One of the applications of Internet based computer learning system is Virtual Learning (VL). In online discussion forum, learners learn more from one another and from lecture and course material in a virtual learning environment (VLE). It is a form of collaborative learning wherein students offer their ideas and share knowledge on an online platform and expand their knowledge base through discussions and reflections of peers. By such reflective processes learners progress towards higher order information processing, construct meaning based on peer interaction and collaboration. (Judd et al as cited in Pinhiero, Simon, 2012).

It is important for you to understand the meaning of VLE. “It is a software tool that brings together an integrated environment, a range of resources that enable the learners and staff to interact online and includes content delivery and tracking” (Becta, 2004).

VLE is a combination of some or all the features that are listed below:

- i) Communication tools: emails, chat rooms, bulletin boards
- ii) Collaboration tools: online forums, intranet
- iii) Tools for creating online content: WIKI, weblogs
- iv) Online assessment methods
- v) Student access to content and communication devices beyond the school.

It is pertinent to look at some advantages of VLE. These are:

- i) Teachers and students experience greater ease of use in an ICT integrated environment
- ii) There is greater communication and dialogue through VLE tools, as stated above.
- iii) Learners have the benefit of accessing the learning process, “anytime anywhere”.
- iv) There is greater motivation and engagement of learners.
- v) It facilitates development of higher order learning skills.
- vi) It provides passive learners opportunities to interact and contribute.
- vii) It boosts learners’ levels of motivation as it promotes increased participation and collaboration through practice.
- viii) Parents can easily monitor their child’s progress and can be more engaged in the school community.

(The above section is abstracted from Becta, 2004, retrieved from: [www.becta.org.uk/research](http://www.becta.org.uk/research))

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## **4.7 COLLABORATIVE LEARNING WITH ICTs**

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The concept of collaborative learning as a pedagogical tool has been in existence for several years dating back to the age of Socratic dialogue. The technique is witnessing a revival in the present times in keeping with the demands of knowledge based economy, requiring knowledge workers to work in teams and share the output.

As the term “collaborative learning” implies, learning takes place in a group through sharing of knowledge among the members of the group. It is a joint activity of meaning making which is attained in a group by setting common learning goals and working together to achieve them. Some educationists also refer to collaborative learning as cooperative learning. In cooperative learning, the task is divided into several parts and the members perform those parts and after individual work, the parts are reorganized into one whole. The task is dealt with in a group and activities are accomplished through shared understanding and meaning making. (Chai and Tan, 2010)

### Features of Collaborative Learning

The features of collaborative learning as revealed through a review of researches on successful groups are as follows:

- a) Setting up of common goals.
- b) Clear cut division of labour, i.e. distribution/allocation of tasks among members.
- c) Making the groups and individuals accountable and responsible.
- d) Ensuring interactivity and negotiability in the group.
- e) Mature group processing.

### ICT mediated collaborative learning

Collaborative learning has academic, social and psychological advantages over other learning designs. Learner is a co constructor of knowledge, is able to examine a situation from different perspectives, and develops leadership attributes and experiences a satisfactory learning experience (Valcarcel,A.G., Basilotta, V., Garcia, L. C., 2014).

ICTs have the potential to further strengthen the collaborative learning design and make it more effective.

As stated by Chai and Tan (2010), ICTs can support collaborative learning in three main ways:

- i) As a tool for interpersonal communication, in face-to-face settings.
- ii) Collaborators activities using a computer, where members are assigned common tasks.
- iii) Collaborative learning supported by a computer with the objective of supporting members to negotiate meaning making.

You will learn more about collaborative learning and use of of ICT for collaborative learning in Unit-12 of Block-3 of this course.

#### Check Your Progress

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

b) Compare your answers with the one given at the end of the unit.

6) What is meant by virtual learning?

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7) Explain the concept of collaborative learning.

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## 4.8 LET US SUM UP

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In this unit, you learnt about teaching learning systems which are categorized as formal, informal and non-formal. Their emergence, characteristic features and impact on the individuals were discussed. Basic components, steps and process in the design and development of ICT mediated teaching learning systems were discussed. Role of ICTs for classroom teaching was described. We explained Virtual Learning Environment and its features. Collaborative Learning, its features and use of ICT for collaborative learning were highlighted at the end of the Unit.

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## 4.10 ANSWERS TO CHECK YOUR PROGRESS

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- 1) Informal learning systems are those which do not have a definite organization and structure. Learning goals are not specified in such systems, however, meaningful learning outcome is expected in informal education systems.

Examples: Reading and educational magazine, watching a good film, listening to radio programmes, undertaking visits and excursions historical places, national museums.



**Non-formal learning systems** are those which are more structured than informal systems but allow greater flexibility to the learner to progress through the programme of study. Learning outcomes are specified. Such learning designs are learner centric and aim to democratize education by enhancing access and outreach of education.

Examples: Open Distance Learning systems, i.e., Open Universities, Open Schools, Online and digital learning systems.

- 2) The components of ICT mediated learning designs are, Pedagogy, i.e., the teaching-learning style, social settings in which learning occurs and the technology support used for facilitation of learning.
- 3) Technology support is crucial for ICT mediated learning systems as it aims to facilitate the learner for effective and faster completion of the assigned learning task. The technology support can be used throughout the period of learning or only for a short duration depending on the structure of the activity or task assigned. A tech mediated design enables greater interaction of the learner with the content, peers and with the teachers, provided it is accessible, available and easily operable by the users.
- 4) ICTs can be used in many areas of classroom teaching such as diagnostic testing, remedial teaching, evaluation activities, psychological analysis of learners, development of reasoning and thinking among students and instructional material development.
- 5) Write on the basis of your own observations.
- 6) Virtual learning is a form of collaborative learning wherein the students offer their ideas and share knowledge on an online platform and expand their knowledge base through discussions and reflections of peers.
- 7) Collaborative learning is a joint activity of meaning making which is attained in a group by setting common learning goals and working together to achieve them.