UNIT 1: EDUCATIONAL TECHNOLOGY

UNIT STRUCTURE

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1.1 LEARNING OBJECTIVES

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

- conceptualise educational technology;
- know the nature and types of educational technology;
- describe the scope of educational technology;
- develop understanding about the significance of educational technology;
- explain the components of educational technology.

1.2 INTRODUCTION

All aspects of human life today are influenced by scientific innovations and discoveries. The field of education is not out of its reach. Increased used of radios, tape recorders, televisions, computers, etc. has helped the education sector to get closer to educational technology. At present, all the fields of education such as goals, methods and techniques, teaching process and research are incomplete and crippled without technology.

Educational technology helps in both theoretical and practical area of knowledge. Educational technology has revolutionised the old concept of education and developed a trend in the old system of education. The term 'educational technology' was first used by Brynmawr Jones of England in the year 1967. After that, the National Council of Educational Technology analysed the term and now it is impossible to imagine an education system without educational technology. In this unit we shall discuss various aspects related to educational technology. Specially, we shall, discuss the meaning and nature of educational technology, the different types and scope of educational technology and its significance and components of educational technology here.

1.3 MEANING OF EDUCATIONAL TECHNOLOGY

J. K. Galbriath, in his book 'The New Industrial State' mentions two features of all kinds of technology. These are: (i) the systematic application of scientific knowledge in practical work and (ii) the division of practical work into parts and subparts. Educational technology means to achieve these two features. Educational technology does not determine the purpose of education. This task is determined by political leaders and philosophers on the basis of the broader direction of society. Educational technology determines the behavioural purpose of learning. It is a science on the basis of which methods and techniques are developed and formulated to achieve a pre-determined learning objective. After determining the learning objectives, educational technology works for the attainment of these aims.

At present, educational technology can be described as a systematic approach to the systematic design of the learning system. It provides methods and materials to improve the learning-teaching-evaluation process. Educational technology is not a result or concept of education; it is a way to achieve a pre-determined goal. Educational technology is not just technology in education or technology of education, but both are involved in the whole teaching-learning process. It involves the refinement of the behaviour of the teachers and the students.

Educational technology is the combination of five M's. These 5M are- Machines, Materials, Men, Media and Method. All these M's are related to one another and all of them are functional in order to achieve the educational goal. Educational technology is a process that establishes an interrelationship between the operation of machines, materials, men, media and methods to fulfil pre-determined educational purpose.

Some definitions of educational technology are mentioned below:

- According to G. O. M. Leith, "Educational technology is the systematic application of scientific knowledge about teaching-learning and conditions of learning to improve the efficiency of teaching and learning".
- In the words of B. C. Mathis, "Educational technology refers to the development of a set of systematic methods, practical knowledge for designing, operating and testing in school".
- According to Takshi Sakamato, "Educational technology is applied to practical study which aims at maximising educational effect by controlling such relevant facts as educational purpose, educational content, teaching materials, methods, educational environment, conduct of students, behaviour of instructors and inter-relations between students and instructors or teachers".

Therefore, it can be said that the concept of educational technology is very broad. It covers all aspects involved in the planning, implementation and evaluation of the teaching-learning process.



CHECK YOUR PROGRESS

Q 1: Who first used the term 'educational technology'?

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Q 2: Give a definition of educational technology.

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ACTIVITY 1.1

1. Find out from the students and teachers of different schools and colleges about the importance of technology in the field of education.

1.4 NATURE OF EDUCATIONAL TECHNOLOGY

On the basis of meaning and definitions of educational technology, some features of educational technology are mentioned below:

- The basis of educational technology is science. It studies the effects of science and technology on education. Science and technology are used in the context of education. So it can be called a practical aspect of science.
- Educational technology is a dynamic, continuous, progressive and productive approach. Trend and application of educational technology is changes with time and circumstances.
- With the help of this, various new modes of teaching-learning such as - Programmed Learning/Instruction, Micro-Teaching and Interaction Analysis etc. can be made possible.
- Educational technology adopts school as a method. In this system, school building, infrastructure, teacher, etc. are input; various methods, techniques, teaching, examination, etc. are the process and the student's skills are output.
- Educational technology provides technical guidance and solutions to the problems of education.
- Educational technology covers the entire teaching-learning process with the help of following components:
  - Specialization of goals and behavioural objectives
  - Analysis of student characteristics
  - Selection and organization of learning materials.
  - Procedures and Strategies for Content Presentation
  - Use of Aids, Mass Media and Communication Strategies
  - Effective exploration of Learning Conditions and Learning

Environment

- Evaluation of continuous feedback and results.

- Educational technology can bring about the desired change in traditional teaching methods more efficiently and at lower cost.
- Educational technology includes all human and non-human resources of the teaching-learning process.

1.5 TYPES OF EDUCATIONAL TECHNOLOGY

Broadly educational technology is divided into four types. These types are explained below:

- **Teaching Technology:** Teaching is an art. Teaching technology has made this art easier, more accurate, practical and purposeful, and for this, scientific principles have been used in teaching technology. Two components of teaching are content and classroom behaviour or communication. Teaching technology covers both these components. According to Skinner (1968), teaching technology is that science which enhances a teacher's effectiveness and enriches the teaching process still more. Laying emphasis on the importance of teaching technology, Oliver (1960), Braham (1972) and Mitchell (1972) have said that teaching technology is needed in the present times which can make the teaching process more and more systematic and organised. In the changing circumstances, this technology works like a pillar to assist a teacher in carrying out his responsibility, making education and teaching more useful and effective. Teaching technology is born when the principles of psychology (how to teach), principle of sociology (what to teach) and principle of philosophy (why to teach) are put together to determine how to carry out effective teaching. In this regard, Dr. R. A. Sharma opined "It is the application of philosophical, sociological and scientific knowledge to teaching for achieving some specific learning objectives." Teaching technology makes the teaching process more effective, psychological, practical and experimental

by which all students and teachers are benefited.

Some of the characteristics of teaching technology are mentioned below:

- The teaching technology helps the teacher to understand the cognitive, affective and psychomotor or conative abilities of the students.
- With the help of teaching technology, effective relationship can be established among three focal points of education - the teacher, the students and the subject matter.
- This technology practically use the knowledge of sociology, philosophy, psychology and science in order to make teaching process progressive.
- Teaching technology helps to observe, analyse, evaluate and improve the classroom behaviour of both students and teachers.
- Teaching technology facilitates learning, creates a supportive environment for learning to take place and helps the learner respond to such an environment effectively.
- Teaching technology provide guidelines to make teaching more practical and experimental.
- This technology motivates for the adaption of suitable teaching strategies, methods of teaching and teaching techniques.
- This technology also provides knowledge about how to control the behaviour of the students.

- **Instructional Technology:** Instructional technology mainly concerned with the right use of audio-visual aids and teaching materials for providing conceptual and practical information. It is that kind of educational technology which helps the teacher and the learner in the instructional task for the realisation of the instructional objectives in the teaching-learning situation. When psychological and scientific principles are assimilated into the teaching-learning process, then it is termed as instructional technology. The origin of instructional technology is from psychological laboratory experiments. The most important example of instructional

technology is programmed learning/instruction which helps the students to learn on the basis of their individual differences. In the words of Mc Murin, "Instructional technology is a systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives based on research on human learning and communication on human and non-human resources to bring about more effective instruction." Again according to Mangal, "Instructional technology may be defined as a subsystem of educational technology which helps the instructor or the learner himself as a part of his self-learning or auto instruction by determining the media, methods and materials for the realisation of the stipulated instructional objectives in a given teaching-learning situation." B. F. Skinner, Robert Glasser, Norman A. Crowder, Mager, Gilbert are some educationists who contributed in the development of instructional technology.

Some of the characteristics of instructional technology are mentioned below:

- The main function of instructional technology is to provide information.
- Cognitive objectives can be effectively realised with the help of instructional technology,
- This technology gives opportunities to students to learn at their own rate.
- In this technology, right responses of the respondents are reinforced.
- Instructional technology uses the principles of psychology, philosophy and science.
- Instructional technology makes use of both human and non-human resources for making teaching effective.
- This technology maintains coordination among different topics by analysing content.
- This technology evaluates terminal behaviour under classroom conditions.

- **Behavioural Technology:** Behavioural technology focuses on psychological principles in the teaching-learning process that influences desirable behavioural changes of student. Behavioural technology studies how student behaviour can be changed in a desirable way and how teachers' behaviour can be developed in the classroom. Behavioural technology is that science which studies the behaviour of teachers in the field of education by using scientific methods and also modifies the behaviour of teachers as needed. Amidon, Flander, Skinner, Ober and Anderson are some chief exponents who contributed a lot in the field of behavioural technology. The main purpose of behavioural technology is to modify the learning process so that students' behaviour can be modified according to the desired objectives of learning. This technology studies and modifies both verbal and non-verbal behaviours.

  The main features of behavioural technology are:

  - Behavioural technology studies both verbal and non-verbal behaviours in the classroom.
  - The objective of behavioural technology is to bring about desirable change in the classroom behaviour.
  - This technology is psychology-oriented ideology.
  - This technology is helpful for the development of teaching principles.
  - This technology evaluates the teacher scientifically.
  - It applies psychological principles in the field of teaching and learning.
  - This technology helps in realizing the cognitive and psycho-motor objectives.
  - This technology is based on different principles of operant conditioning and reinforcement etc.
  - This technology emphasizes on individual differences.
- **Instructional Design:** The fourth type of educational technology is instructional design. Instructional design occupies an important place in the teaching process. The term instructional design consists of

two words; these are- instruction and design. Instruction means the act of providing information and design means the principles 'verified by scientific methods'. The designs used in teaching circumstances, works, methods and approaches jointly are called instructional design. According to David Marrill, "Instructional design is the process of specifying and producing particular environmental situations which cause the learner to interact in such a way that specified change occurs in his behaviour." In the words of Derick Unwin, "Instructional design is concerned application of modern skills and techniques of requirement of education and training. This includes the facilitation of learning by manipulation of media and methods and the control of the environment in so far as this reflects on learning."



CHECK YOUR PROGRESS

Q 3: Mention one feature of teaching technology.

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Q 4: Define instructional design.

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1.6 SCOPE OF EDUCATIONAL TECHNOLOGY

It is important to know the scope of educational technology in order to determine its limitations and scope of work. The following are some of the scopes of educational technology.

- **Analysis of Teaching-Learning Process:** This is an important aspect of educational technology and it scientifically discuss the concept of teaching, variables of teaching, theories of learning, stages of teaching, levels of teaching, principles and maxims of teaching, concept of learning, relationship between teaching and learning, relevance of the theory of learning, the integration of

teaching and learning theory for appropriate educational process, etc.

- **Development of Educational Goals or Objectives:** This aspect of educational technology tries to discuss the educational needs and aspirations of the society. It surveys the resources available to meet these needs and aspirations. In addition to this, it studies the objectives of classroom teaching and learning as well as broader educational objectives, behavioural analysis of these objectives and so on.
- **Development of Curriculum:** This aspect of educational technology is important in the development of the curriculum required to achieve a stipulated objectives. This aspect of educational technology tries to discuss about ways of selecting appropriate learning methods, topics, organization of topics in appropriate sizes, arrangement of appropriate instruction for the subject and analysis of the curriculum based on objectives, methods, materials and assessment tools etc.
- **Development of Teaching-Learning Material:** This aspect of educational technology deals with the production and development of appropriate teaching-learning materials based on specific objectives, curriculum and available materials. In this regard, educational technology develops important strategies or instructional approaches and instructional materials such as programmed learning materials, computer aided learning materials, mass media instruction materials, planning of teaching and learning instruments etc.
- **Preparation of Teacher:** Teacher is the key person in the teaching-learning process. Therefore, teachers need proper training to carry out their complex responsibilities smoothly. Educational technology has taken the training or preparation of teachers as an important subject of study. In this case, some contents of study are- teaching model, stimulated teaching, micro-teaching, team teaching, modification of teacher behaviour, teacher effectiveness, classroom

interaction, etc.

- **Development and Selection of Teaching-Learning Strategies and Tactics:** This aspect of educational technology is deals with the central problem of the teaching-learning process. Here, educational technology tries to describe the ways and means of discovering, selecting and developing suitable strategies and tactics of teaching in terms of optimum learning and available teaching-learning resources, availability of teaching methods, devices and models of teaching along with their appropriate selection and use for optimum results.
- **Development, Selection and Use of the Appropriate Audio-Visual aids:** Educational technology covers this aspect by discussing various audio-visual tools used for educational purpose, their selection according to teaching-learning situation, development and production of educational resources etc. It also covers the proper storage and cost of these devices.
- **Effective Utilization of the Hardware and Mass-Media:** Educational technology tries to describe different materials such as sophisticated resources and gadgets used in education in terms of their specific functions and applicability in a particular teaching-learning situation; along with their selection, proper handling and maintenance, preparation and development etc.
- **Application of System Approach and its different Components:** Education is a system where various systematic and scientific measures are taken for the attainment of educational objectives. Therefore, educational technology incorporates and attempts to study the various aspects associated with system approach. System approach of educational technology include the interpretation of the educational process, the theories and principles of system approach, the effectiveness of different components in terms of its input and output aspects, and various human and non-human resources.
- **Feedback and Control through Evaluation:** Feedback and control are two essential aspects of the teaching-learning situation.

Feedback makes teaching strategies more effective. On the other hand, the assessment is related with the entire educational system, such as - goals, methods, content, curriculum, etc. The assessment provides feedback to teachers and students for their appropriate work in preparation and execution level.

Therefore, it can be said that educational technology is essentially related to all the variables of the teaching-learning process such as stages, levels and directions. The scope of educational technology is unlimited because there is no limit to the scope of education.



CHECK YOUR PROGRESS

Q 5: Write briefly about one important subject-matter of educational technology.

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1.7 SIGNIFICANCE OF EDUCATIONAL TECHNOLOGY

It is not possible to imagine an education system without the use of educational technology. It is actually need of the hour. Significance of educational technology is analysed with the help of following points:

- Educational technology broadens the outlook and approach of education and makes education more realistic, experimental and innovative.
- Education technology developed an objective and realistic viewpoint towards the study of educational problems.
- Use of educational technology made education an individualised activity rather than making it a collective or group activity.
- Educational technology has improved the quality of teaching by using more flexible and variable methods and techniques of teaching.
- Educational technology contributed in equalise educational

opportunity to all people irrespective of their socio-economic status. It also helps in providing equal educational opportunity to those who are especially able and those who are living in geographical isolation.

- Through the use of educational technology, development of mass education by making it open to all people has been made possible.
- Spirit of innovation and experimentation has been encouraged by the use of educational technology in modern education.

Thus, it is observed that educational technology play an important role in the present education system.

1.8 COMPONENTS OF EDUCATIONAL TECHNOLOGY

The components of educational technology can be divided into three main categories. These are: hardware approach, software approach and system approach. These components are briefly described below:

- **Hardware Approach or Educational Technology-1**: In hardware approach, special emphasis is given on teaching tools. This approach is based on the theories and practices of physics and engineering sciences. This approach is originated from physics and engineering technology. Education is incomplete without the use of devices like tape recorders, televisions, projectors etc. The compulsory application of these devices is strengthened by the hardware approach. In 1961, David said that this approach was essential for teaching and training. That's why Silverman called it Technology in Education. Silverman termed this approach as 'Relative Technology'. Dr. Ruhela said, "This part of educational technology refers to tools and hardware such as teaching machines, televisions, tape recorders, etc., which are used in the field of instruction."

A. Lumsdeine was the first to describe the hardware approach. This approach is also known as audio-visual aids. Here, more emphasis is given technology of machine. This approach believes that machines

can teach and is therefore related to cognitive aspect of instruction. This approach lays special emphasis on three things. These are: Preservation of Learning, Transmission of Learning and Advancement of Learning.

Some of the devices of hardware approach are - chalk boards, radios, overhead projectors, slide projectors, VCRs, televisions, monitors, computer calculators, computer printers, audio-visual recorders, etc.

- **Software Approach or Educational Technology-2:** The software approach is mainly concerned by the use of psychological principles in the field of teaching and learning so that desirable changes can be brought about in students. This approach is also known as instructional technology, teaching technology, behavioural technology, etc. Silverman has called this approach of educational technology a new name of 'Constructive educational technology'. Machines are used in this approach to present the content more effectively. This approach is mainly concerned with all the three aspects of education - input, process and output. Software approaches involve a variety of psychological aspects of student learning such as interest, aptitude, motivation, reinforcement, modification, feedback and so on. According to Davis, "This view of educational technology is closely associated with modern principles of programmed learning and is characterized by task analysis, writing precise objectives, selection of correct responses and constant evaluation".

Some of the software approaches of educational technology are- chalk work, transparencies, slides, video programmes, computer programmes, recorded materials, written materials etc.

There are certain differences between hardware and software approaches of educational technology. These are mentioned below:

Hardware Approach	Software Approach
1. This approach is originated from physics and engineering science.	1. This approach is originated from behavioural technology.
2. This approach is related with the development and application of audio-visual aids, modern apparatus and mass-media.	2. This approach is related to the development and application of software techniques such as teaching content, teaching-learning techniques and other means etc.
3. This approach is also known as 'Relative technology'.	3. This approach is known as 'Constructive educational technology'.
4. This approach is mainly concerned with the use of machines in the field of education.	4. This approach is mainly concerned with the use of psychological principles in the field of education for desirable changes of students' behaviour.
5. Some of the devices of hardware approach are - chalk boards, radios, overhead projectors, slide projectors, VCRs, televisions, monitors, computer calculators, computer printers, audio-visual recorders, etc.	5. Some of the software approaches of educational technology are- chalk work, transparencies, slides, video programmes, computer programmes, recorded materials, written materials etc.

- **System Approach or Educational Technology - 3:** In the age of modern educational technology, system approach is not a new concept. This approach is significant for technology, commercial and administrative work. The term System approach has been formed by two words: system + approach. System means the totality in which all the elements, factors and components work in a self-contained manner. System approach believes in totality. Teaching and learning according to this approach Is a social and technological

process. This approach is learner-centred. As a process, a system approach incorporates all the elements of education. In system approach, all the elements teachers, students, curriculum, classrooms, instructional materials and strategies, social environment, etc. are included.

According to Keshow and Michean, "Systems approach is one of the techniques which aims at finding the most efficient and economically intelligent methods for solving the problems of education scientifically." Again, Hall opined, "A system approach is a set of objects together with a relationship between the objectives and their attributes."

Following are the characteristics of system approach:

- System approach is the base of planning, development, presentation and evaluation of instruction.
- In provides a suitable basis for the determination of objectives from analysis of environment system.
- This approach is integrated and dynamic.
- Instructional objectives are so set by which their accomplishment can be observed easily.
- In this approach, elements are systematically arranged which functions in a specific manner.
- This approach uses the human resource, finance, machinery and material for problem solving in an effective manner.



CHECK YOUR PROGRESS

Q 6: What is the view of Ruhela regarding hardware approach of educational technology?

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Q 7: Mention three features of system approach.

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1.9 LET US SUM UP

In this unit we have discussed the following matters:

- Educational technology can be described as a systematic approach to the systematic design of the learning system. It provides methods and materials to improve the learning-teaching-evaluation process.
- Educational technology is the combination of five M's. These 5M are- Machines, Materials, Men, Media and Method.
- The basis of educational technology is science. It studies the effects of science and technology on education. Science and technology are used in the context of education. So it can be called a practical aspect of science.
- Educational technology is divided into four types. These are- teaching technology, behavioural technology, instructional technology and instructional design.
- Educational technology is essentially related to all the variables of the teaching-learning process such as stages, levels and directions. The scope of educational technology is infinite because there is no limit to the scope of education.
- In hardware approach, special emphasis is given on teaching tools. This approach is based on the theories and practices of physics and engineering sciences.
- Software approach is mainly concerned with all the three aspects of education- input, process and output. Software approaches involve a variety of psychological aspects of student learning such as interest, aptitude, motivation, reinforcement, modification, feedback and so on.



1.10 FURTHER READING

1) Kulshreshtha and Kulshreshtha (2016). Foundations of Educational Technology. Meerut: R. Lall Book Depot.
2) Mangal and Mangal (2009). Essentials of Educational Technology. Delhi:

PHI Learning Private Limited.

3) Sampath ET. Al (2004). Introduction to Educational Technology. New Delhi: Sterling Publishers Private Limited.

4) Sharma, A. R. (1992). Educational Technology. Agra: Vinod Pustak Mandir.

5) Sharma, R. A. (2012). Educational Technology and Management. Meerut: R. Lall Book Depot.

1.11 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Brynmor Jones.

Ans to Q No 1: According to G. O. M. Leith, "Educational technology is the systematic application of scientific knowledge about teaching-learning and conditions of learning to improve the efficiency of teaching and learning".

Ans to Q No 1: One feature of teaching technology is: The cognitive, affective and psycho-motor domains are studies with the help of teaching technology.

Ans to Q No 1: According to David Marrill, "Instructional design is the process of specifying and producing particular environmental situations which cause the learner to interact in such a way that specified change occurs in his behaviour."

Ans to Q No 1: One important subject matter of educational technology is development of curriculum. This scope of educational technology is important in the development of the curriculum required to achieve a stipulated objectives. This aspect of educational technology tries to discuss about ways of selecting appropriate learning methods, topics, organization of topics in appropriate sizes, arrangement of appropriate instruction for the subject and analysis of the curriculum based on objectives, methods, materials and assessment tools etc.

Ans to Q No 1: Dr. Ruhela said that hardware approach of educational technology refers to tools and hardware such as teaching machines, televisions, tape recorders, etc., which are used in the field of instruction.

Ans to Q No 1: Three features of system approach are:

- System approach is the base of planning, development, presentation and evaluation of instruction.
- In provides a suitable basis for the determination of objectives from analysis of environment system.
- This approach is integrated and dynamic.

1.12 POSSIBLE QUESTIONS

Very Short Questions

Q 1: What is 5M of educational technology?

Q 2: What is meant by hardware approach of educational technology?

Q 3: Define teaching technology.

Q 4: What are the three elements of system approach?

Q 5: Define system approach.

Short Questions (Answer each question in around 150 words).

Q 1: Differentiate hardware and software approach of educational technology.

Q 2: Write a note on behavioural technology.

Q 3: Write a note on the nature of educational technology.

Q 4: Describe the significance of educational technology.

Q 5: Write the characteristics of instructional technology.

Long Questions. (Answer each question in around 300-500 words)

Q 1: What is meant by educational technology? Explain its nature.

Q 2: Briefly discuss the components of educational technology.

Q 3: Describe the scope of educational technology.

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