UNIT 6  MEDIA AND TECHNOLOGY FOR ODE

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6.0 INTRODUCTION

In unit-5, we have highlighted different instructional strategies, instructional designs, implications of theories of learning and communication for distance education and designing of SLMs and key considerations involved in designing the SLPMs. By now, you must have noticed that print medium is the major medium of instruction at IGNOU, and there are other media being used for teaching and learning at a distance. Thus, you understand that media play paramount role in distance education. Without the use of media and technology distance education is just not possible. It is basically through judicious use of media the teaching and learning transactions are carried out in distance education. In other words, the success of distance education is essentially dependent on the effectiveness use of media and technology. In this unit, we therefore attempt to present to you the range of media and technology available for use in distance education along with their pedagogical utilities.

Before we proceed further you may think about the answers to the following questions.

• What role do media play in distance education?
• Can you outline various media and technologies available for distance education?
• Do you know the relative merits and demerits of different media?
• Do you think media affect distance teaching and learning? If yes, how?

If you could get answers to these questions, it’s really good. Even if you could not, you do not worry. We will address these questions in this unit. Have a look at the objectives of this unit below.

6.1 OBJECTIVES

After having read this unit, you should be able to:
• explain the role of media in open and distance education;
• establish the relationship between ‘media’ and ‘technology’;
• enumerate and explain the taxonomies of media in ODE;
• understand the advantages and the limitations of various media and technologies used in ODE; and
• analyse the effect of media on distance teaching and learning.

6.2 MEDIA AND TECHNOLOGY IN DISTANCE EDUCATION

As indicated earlier, the role of media is central to the success of distance education. Since most of the time learners are at a distance from their teachers and the institution (i.e. quasi-permanent separation of learner from the teacher), the content is delivered using different media. The predominant medium used in distance education is normally the printed text. However, printed text does not and cannot replace teachers altogether. Yet, the invention of the printed text did lead to the re-organisation of teaching and opening of an alternative access to education. The emergence of the print medium and the subsequent introduction of postal system led to opening up of education for those who want to pursue education but could not attend regular classes. Correspondence education thus came into existence and it continued for long. However, over time, the use of ‘non-print’ media became increasingly popular and thus correspondence education evolved into distance education.

Media differ in their use of symbol systems to represent different kinds of knowledge. According to Solomon (1979) there are three kinds of symbol systems — digital, analogic and iconic. The digital systems are text-based and contents are logically related (e.g. books, computers). Analogic symbol systems are more expressive and represent performance of dynamic activities (e.g. television). The iconic symbol systems depend upon pictures, colors and signs for encoding knowledge. The combined use of these symbol systems greatly influenced the way different media can represent knowledge. We use a combination of media to represent all the symbol systems so that we can enable the distance learner in such a way that he gets what all his counterpart in the conventional system receives. For example, a lecture could be replaced by a printed text, a practical demonstration through a video, discussion through an audio, and so on. Some media are better suited to represent certain teaching tasks. For example, television can provide direct and concrete experiences to learners as it can:
• demonstrate processes or procedures;
• show ‘models’ or construct examples of abstract ideas;
• demonstrate interpersonal communication; and
• dramatise or reconstruct events through documentary style of production (Bates, 1993a).

In distance education, a judicious use of ‘media-mix’ could increase student motivation, supplement the main medium, and enable the learner to have control over his learning. Since interaction is essential for effective learning, certain media provide increased opportunity for interaction at a distance. Through effective use of appropriate media, the interactivity could be made as good as face-to-face interaction.

6.2.1 Taxonomies of Media

Though media can basically be grouped into ‘print’ and ‘non-print’, experts have proposed taxonomies of media. Here, we will discuss some of the media taxonomies so as to derive a list of media available for distance teachers and learners. Romiszowski (1974) propounded his taxonomy (See Fig. 6.1) based on sensory channels used for carrying information. This classification is considered quite inadequate because of the use of a single criterion. For distance teaching-learning situations, the lower half of the audio, audio-visual and visual column could be used, and according to Romiszowski the media are used in a continuum from ‘self-presenting’ to ‘teacher-presented’.

Schramm (1973), on the other hand, classified media into two categories, viz. big media, and small media, based on cost and recent innovation. According to him, television, sound film, and computers are big media; transparencies, slides, etc. represent small media. Sparke (1988) without making any distinction between methods and media gives the following list:

1) Face-to-Face
   a) Lecture
   b) Classes (as in a school)
   c) Small group discussion, usually for remedial purposes
   d) Tutorials (i.e. a teacher with no more than 3 students)
   e) Self-help groups (i.e. small groups without teacher)

2) Printed Texts
   a) Text-books
   b) Structured tutor-texts (as used in the Open University, UK)

3) Films or TV Programmes
   a) Films for broadcasting
   b) TV tapes

4) Audio
   a) Audio broadcasting
   b) Audio tapes
   c) Audio-vision (i.e. audio tapes supported by printed illustration)
   d) Telephone conferencing
Teaching at a Distance: Design and Development of ODE Resources


Fig. 6.1: A Classification of Instructional Media

<table>
<thead>
<tr>
<th>Audio</th>
<th>Audio Visual</th>
<th>Sensory Channels</th>
<th>Visual</th>
<th>Tactile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher’s voice</td>
<td>CCTV</td>
<td>Chalkboards</td>
<td>Guidance / Control by teacher on actual equipment or objects</td>
<td></td>
</tr>
<tr>
<td>Language laboratories</td>
<td>(Used as an amplifier of detail or audience)</td>
<td>Feltboards</td>
<td>And/or</td>
<td></td>
</tr>
<tr>
<td>Teacher prepared tapes</td>
<td>CCTV</td>
<td>Magnetic boards</td>
<td>Working models</td>
<td></td>
</tr>
<tr>
<td>Audio programmes</td>
<td>(Used for video tape playback)</td>
<td>Actual objects</td>
<td>Mock-ups</td>
<td></td>
</tr>
<tr>
<td>Induction loop systems</td>
<td>A/V programmes</td>
<td>Pictures</td>
<td>Samples of faults</td>
<td></td>
</tr>
<tr>
<td>Off-shelf-tapes</td>
<td></td>
<td>Charts</td>
<td>Texture</td>
<td></td>
</tr>
<tr>
<td>Records</td>
<td></td>
<td>Photographs</td>
<td>Finish, etc.</td>
<td></td>
</tr>
<tr>
<td>Radio broadcasts</td>
<td></td>
<td>Models</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hand-outs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Books (prescribed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Film slides</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Film strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 mm custom made films (short)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concept loops</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off-shelf Pt materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Libraries</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off-shelf silent films</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Training devices supplying artificial feedback simulators</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adoptive teaching machines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5) **Audio-graphics** such as Cyclops (i.e. the recording on the audio tape of spoken commentary and of graphics or alphanumeric data for display on the TV screen).

6) **Computer-Aided Learning (CAL)**
   a) Using tele-type terminals
   b) Using visual display units (e.g. tele-text)
   c) Using the mail (for distance teaching) and a word-processor for preparing the communication from the computer.

7) **Laboratory or Practical Work**
   a) In-built teaching laboratories
   b) Based on a practical apparatus for use in the home or at work
   c) Projects.

8) **Assignments:** These can be associated with any of the above.

Laurillard (1993) gave one of the most comprehensive approaches to media taxonomy. According to her, all media could be categorised into four types: *discursive, adaptive, interactive* and *reflective*. She was concerned about the teaching functions of media, and based the classification of media on their level of interactivity, role in the learning process, and provision for dialogue between teacher and student. We shall explain briefly each of the four categories below:

a) **Discursive:** This category of media enable both teacher and student to agree on learning goals, make their conception accessible to each other, and give mutual feedback. Examples of discursive media are: audio-conferencing, video-conferencing, computer conferencing, and computer supported collaborative work through e-mail or mailing lists.

b) **Adaptive:** This media allow the teachers to alter the focus of the dialogue in the light of the emerging relationship between their own and the student’s conception. Examples of adaptive media are: tutorial programmes, tutorial simulation, intelligent tutoring systems, etc.

c) **Interactive:** This media facilitate a student to act to achieve the task / goal and the teacher to provide feedback so that some change occurs as a result of student’s action. Examples are: simulations, micro-worlds, and modeling.

d) **Reflective:** This category of media allow the teacher to help students link feedback on their action to the topic-goals at every level. Though no specific examples are given for reflective media by Laurillard, most of the media available could be considered reflective. But, normally pedagogical contents are not designed accordingly to be reflective in practice.

Apart from dividing media into different categories based on their pedagogic characteristics, Laurillard also describes print, audio-vision, audio cassettes, television, and video as other media forms.

Bates (1995) in his book *Technology, Open Learning and Distance Education* categorises media into two groups, viz. (i) one-way media, and (ii) two-way
media. The criteria are based on the feedback model of Pask (1975) that increases student learning. Bates has applied this to the available technologies in terms of their ability to facilitate feedback. He also developed criteria for decision-making called ACTIONS for use by distance teaching institutions to choose appropriate ‘media-mix’ for their organisations. Table 6.1 depicts the strengths and weaknesses of different media for distance teaching-learning.

Table 6.1: Relative Strengths of Various Media

<table>
<thead>
<tr>
<th>Media</th>
<th>Access</th>
<th>Costs</th>
<th>Teaching Presentation Skills</th>
<th>Interactivity Learning Material</th>
<th>Organisation</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>One-way media</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>G</td>
<td>G</td>
<td>A</td>
<td>A</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Radio</td>
<td>G</td>
<td>G</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>Audio Cassette</td>
<td>G</td>
<td>G</td>
<td>A</td>
<td>A</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Educational Broadcast TV</td>
<td>A</td>
<td>P</td>
<td>P</td>
<td>G</td>
<td>A</td>
<td>P</td>
</tr>
<tr>
<td>Video Cassette</td>
<td>G</td>
<td>A</td>
<td>P</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Computer based learning</td>
<td>A</td>
<td>P</td>
<td>P</td>
<td>A</td>
<td>A</td>
<td>G</td>
</tr>
<tr>
<td>Multimedia</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Two-way media</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio-conferencing</td>
<td>G</td>
<td>P</td>
<td>G</td>
<td>P</td>
<td>A</td>
<td>P</td>
</tr>
<tr>
<td>Live interactive TV</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>A</td>
</tr>
<tr>
<td>Video-Conferencing</td>
<td>P</td>
<td>P</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>CMC</td>
<td>A</td>
<td>A</td>
<td>G</td>
<td>P</td>
<td>G</td>
<td>A</td>
</tr>
</tbody>
</table>

Notes: G – Good; A – Average; P – Poor.


After having discussed a variety of media taxonomies, let us try to recapitulate and integrate these to develop a simpler form of classification for use in distance education. By now you might be aware that ‘interactivity’ is one of the most important factors in learning, and media which facilitate interactivity are considered more useful. Thus, we will take this as one criterion for our categorisation. The other criterion is a canonical one based on the sensory channel of Romiszowski. Table 6.2 depicts a simple classification of media.
### Table 6.2: A Simple Classification of Media

<table>
<thead>
<tr>
<th>Media</th>
<th>Non-Interactive</th>
<th>Interactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text and Graphic based</td>
<td>Text-books</td>
<td>Self-instructional print material (partially interactive)</td>
</tr>
<tr>
<td>(print-based)</td>
<td>Audio cassette</td>
<td>Telephone, audio conference</td>
</tr>
<tr>
<td>Audio-based</td>
<td>Radio broadcast</td>
<td>audio-vision</td>
</tr>
<tr>
<td>Video-based</td>
<td>Television broadcast</td>
<td>Interactive television</td>
</tr>
<tr>
<td>Computer-based</td>
<td>Video conference</td>
<td>Video conference</td>
</tr>
<tr>
<td></td>
<td>Word-processing CD-ROM</td>
<td>Integrated multi-media.</td>
</tr>
<tr>
<td></td>
<td>(textual delivery of</td>
<td>Computer mediated communication. E-mail</td>
</tr>
<tr>
<td></td>
<td>materials), World Wide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Web (partially interactive)</td>
<td></td>
</tr>
</tbody>
</table>

### Check Your Progress

**Notes:**
a) Space given below the question is for writing your answer.
b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

1) a) Identify five one-way technologies and five two-way technologies used in distance education.

<table>
<thead>
<tr>
<th>One-way</th>
<th>Two-way</th>
</tr>
</thead>
<tbody>
<tr>
<td>................................</td>
<td>..................................................</td>
</tr>
<tr>
<td>................................</td>
<td>..................................................</td>
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<td>..................................................</td>
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<tr>
<td>................................</td>
<td>..................................................</td>
</tr>
</tbody>
</table>

b) What are the bases of categorisation of media according to Laurillard?

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.............................................................................................................
.............................................................................................................
.............................................................................................................
.............................................................................................................
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c) Based on Taylor’s generations of distance education, in which model will you keep IGNOU for its media use and why?

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.............................................................................................................
.............................................................................................................
.............................................................................................................
.............................................................................................................
.............................................................................................................
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### 6.2.2 Print, Electronic and Educational Media: Merits and Demerits

Some of the important strengths and limitations of print, electronic (non-print) and educational media are presented below.

**a) Strengths and Limitations of Print Medium**

It is easy to transmit information through print medium and hence most commonly used in distance education. It is economical and has traditionally been used for pedagogical purposes.

Nevertheless, it demands skills of literacy as well as high levels of study skills. Some other limitations of print are:

- Lack of immediate teacher-learner and learner-learner interaction;
- Less scope for active learner participation;
- Longer wait period for feedback;
- Difficulty in providing individualised instruction; and
- Little use in providing psychomotor skill training.

**b) Strengths and Limitations of Electronic Media**

Though not all non-print media overcome all the limitations of the print medium, some of them do play a vital role in the teaching-learning process. Major strengths of non-print media include the following.

i) They motivate learners psychologically by drawing their attention, arousing their curiosity, motivation and also by providing more appealing rationale.

ii) Learners feel involved through the use of non-print media and thus, training in psychomotor skills could be provided comparatively easily.

iii) Non-print media help to provide a learning atmosphere in which students actively participate in the learning process.

iv) The recent developments in computer technologies facilitate catering to individual needs of learners.

v) As most distance teaching institutions depend on print as a master medium, non-print media can supplement the master medium.

vi) Non-print media are highly suitable for iconic and analogic representation of symbol system for knowledge dissemination.

**c) Merits and Demerits of Various Educational Media**

We present below, in tabular form, the merits and demerits of various educational media.
<table>
<thead>
<tr>
<th>Medium</th>
<th>Merits</th>
<th>Demerits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>• Cheap</td>
<td>• Study skills required (from the students)</td>
</tr>
<tr>
<td></td>
<td>• Easy to prepare</td>
<td>• Time consuming.</td>
</tr>
<tr>
<td></td>
<td>• Applications in a variety of situations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No hardware needed for use.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Quite easy access</td>
<td>• Script-writing and production costly as well as complex.</td>
</tr>
<tr>
<td></td>
<td>• Mass coverage</td>
<td>• Needs costly hardware at user end as well as transmission end.</td>
</tr>
<tr>
<td></td>
<td>• Combines sound and visual presentation</td>
<td>• One-way flow of information.</td>
</tr>
<tr>
<td></td>
<td>• Wide coverage of content and contexts, e.g. lecture, narration,</td>
<td>• Prior collaboration between concerned agencies essential</td>
</tr>
<tr>
<td></td>
<td>demonstration, etc.</td>
<td>• Fixed time schedule</td>
</tr>
<tr>
<td></td>
<td>• Can shift its focus from extensive to intensive.</td>
<td>• Limited air-time.</td>
</tr>
<tr>
<td></td>
<td>• High-tech appeal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Change in image-size possible</td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td>• Information density high.</td>
<td>• Recording and presentation requires costly equipment</td>
</tr>
<tr>
<td></td>
<td>• Wide application range.</td>
<td>• Technical and professional expertise required for production</td>
</tr>
<tr>
<td></td>
<td>• Can be stopped and replayed</td>
<td>• Depends on power supply</td>
</tr>
<tr>
<td></td>
<td>• Allows focus shift-extensive to intensive</td>
<td>• One-way flow of information.</td>
</tr>
<tr>
<td></td>
<td>• High-tech appeal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Combines audio and visual presentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Re-usable, i.e. repeat possible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Permanent record and storage possible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Can be used whenever needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Slow or fast presentation possible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Change in image size possible</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Information density high</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lip sync in learning spoken language possible</td>
<td></td>
</tr>
<tr>
<td>Video tape</td>
<td>• Study skills required (from the students)</td>
<td></td>
</tr>
<tr>
<td>Film and Film</td>
<td>• Time consuming.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Script-writing and production costly as well as complex.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fixed time schedule</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Limited air-time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recording and presentation requires costly equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Technical and professional expertise required for production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Depends on power supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• One-way flow of information.</td>
<td></td>
</tr>
</tbody>
</table>
# Teaching at a Distance: Design and Development of ODE Resources

| Overhead Transparencies | • Helpful in systematic presentation of information: esp. in developmental sequences  
• Easy to use advanced level preparation  
• Presentation rate can be varied  
• Easy to prepare  
• Quite cheap  
• Useful for large groups. | • Need OHP and electricity  
• Need complex skills for Presentation  
• Not easily portable |
|---|---|---|
| Audio-tapes | • Easy to prepare  
• Re-usable  
• Applications in a variety of situations  
• Equipment and tapes easily portable  
• Duplication easy and cheap  
• Especially suitable for language teaching. | • Tends to be over-used  
• Recording often faulty  
• Fixed rate of presentation of information. |
| Radio | • Easy access  
• Portable hardware  
• Relatively affordable because it is cheap  
• Mass coverage  
• Content can be edited for easy comprehension | • Fixed time schedule  
• Depends on power-supply  
• One-way flow of information  
• Script-writing and production quite technical and need advanced skills  
• Costly capital hardware needed  
• Involves prior agreement for education use between educational institution and radio broadcast agency |
| Computer | • Present verbal, digital as well as graphic information  
• Can interact with learners by asking for answers to questions  
• Maintains a record of answers.  
• Can control other media hardware as well | • Computer literacy including programming skills essential  
• Requires more capital input  
• Variety of software essential  
• Resolution of graphic images limited on a micro-computer system  
• Suitable for individual learners or small-size groups only |
Media and Technology for ODE

- Individualises instruction in terms of learners’ need(s) and pace
- Can interface computer and video for learner-controlled programmes
- Can simulate experiences and situations
- Use of hardware and software across various systems is often difficult

Source: IGNOU. (1995). ES-318: Communication Technology for Distance Education. New Delhi: IGNOU.

6.2.3 Relationship between Media, Technology and DE

Etymologically ‘media’ is the plural of ‘medium’, meaning ‘a method of delivering information’. For most of us the commonly encountered medium is the book. Whereas, ‘technology’ is the science of delivering a medium. For example, broadcasting is a ‘technology’ used to deliver ‘audio’ or ‘video’ medium. Bates (1993b) refers media as “the generic form of communication associated with particular ways of representing knowledge, and elaborates that while certain technologies are closely associated with each medium, a variety of technologies may be used to deliver these media” (p.214). It can be derived from the relationship between media and technology, depicted in Table 6.4 that the distinction between these two terms will become less with the integration of media and technologies. For example, computing could well be argued by some as medium and by others as technology.

Table 6.4: Relationship between Media, Technology and DE

<table>
<thead>
<tr>
<th>Media</th>
<th>Technologies</th>
<th>Distance Education Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>Print (including graphics)</td>
<td>Course units; supplementary materials; correspondence tutoring</td>
</tr>
<tr>
<td></td>
<td>Computer</td>
<td>Database; electronic publishing</td>
</tr>
<tr>
<td>Audio</td>
<td>Cassettes; Radio; Telephone</td>
<td>Programmes; telephone tutoring; audio conference</td>
</tr>
<tr>
<td>Television</td>
<td>Broadcasting; Video Cassettes; Video Discs; Cable; Satellite; Fibre Optics; ITFS; Microwave; Video Conferencing</td>
<td>Programmes; lectures; video conferences</td>
</tr>
<tr>
<td>Computing</td>
<td>Computers; Telephone; Satellite; Fibre-optics; ISDN; CD-ROM; CD-I</td>
<td>Computer-aided learning (CAL; CBT); e-mail; computer conferences; audio graphics; databases; multimedia</td>
</tr>
</tbody>
</table>


Nevertheless, Bates distinguishes technology from media through another dimension: some technologies are primarily one-way and the others are primarily
two-way (See Table 6.1). The two-way technologies allow interaction of various kinds: learner-tutor, learner-material, and learner-learner. Garrison (1989) too differentiates technology and media in a similar fashion. According to him, the ancillary media (which are basically one-way communication technology of Bates) are inadequate in themselves or unable to facilitate two-way communication in an educationally viable manner and, therefore, they cannot be classified as technologies.

6.2.4 Instructional and Delivery Technologies in DE

Idrus (1997) has categorised the instructional technologies used in distance education based on the use of delivery technologies, viz. postal-based, computer-based, and telecommunication-based. Table 6.5 depicts the categorisation given by Idrus.

<table>
<thead>
<tr>
<th>Tele-communication-based</th>
<th>Computer-based</th>
<th>Postal-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio or TV Broadcast</td>
<td>Computer-aided instruction (CAI)</td>
<td>Print</td>
</tr>
<tr>
<td>Internet</td>
<td>Computer assisted learning (CAL)</td>
<td>Audio tapes</td>
</tr>
<tr>
<td>Audio Conferencing</td>
<td>Computer based learning (CBL)</td>
<td>Slides</td>
</tr>
<tr>
<td>Audio Graphics</td>
<td>Interactive CAI</td>
<td>Film strips</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td></td>
<td>Video tapes</td>
</tr>
<tr>
<td>Live Interactive TV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Conferencing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Chen (1997) presents the range of systems, media and delivery modes available for distance education. Table 6.6 illustrates five systems, viz. print, audio, graphics, video and computer. Each of these systems has different media. For example, Chen categorises three media for computer systems — computer assisted instruction; e-mail conferencing; Internet, www, etc.

<table>
<thead>
<tr>
<th>System</th>
<th>Media</th>
<th>Delivery Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>Print Materials (programmed instruction, guided lessons)</td>
<td>Mail</td>
</tr>
<tr>
<td>Audio</td>
<td>Audio Cassette Radio Broadcast Audio Teleconferencing Telephones*</td>
<td>Mail Radio Transmission Operator-assisted Telephone lines*</td>
</tr>
<tr>
<td>Electronics Graphics</td>
<td>Electronic Board Fax</td>
<td>Telephone lines Telephone lines</td>
</tr>
<tr>
<td>Video</td>
<td>Instructional Television Fixed Services (ITFS)</td>
<td>Microwave</td>
</tr>
<tr>
<td>Media and Technology for ODE</td>
<td>Media and Technology for ODE</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>Interactive TV; Video Conferencing</td>
<td>Microwave: cable; T-1 line; T-3 line, fibre optics, satellite</td>
<td></td>
</tr>
<tr>
<td>Video tapes</td>
<td>Mail</td>
<td></td>
</tr>
<tr>
<td>Video disc</td>
<td>Mail</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td>Computer-assisted Instruction E-mail Conferencing</td>
<td></td>
</tr>
<tr>
<td>Internet; WWW; Digital Video Conferencing</td>
<td>Telephone lines; T-1 lines; T-3 lines; fibre optics</td>
<td></td>
</tr>
</tbody>
</table>

Note: * Not indicated in the original list

Source: Chen. (1997).

Mason (1998, p.19) while discussing media for delivering global education, elaborates the last category of Chen (i.e. Internet and www) into three kinds:

- **text-based systems**, including electronic mail, computer conferencing, real time chat system, MUDs / MOOs, fax and many uses of the World Wide Web;
- **audio-based systems** such as audio-conferencing and audio-graphics and audio on the web; and
- **video-based systems** such as video-conferencing, one-way and two-way video on the Internet with products like USee Me, Web-casting and other visual media such as video clips on the web.

### 6.2.5 Learning from Media: Pedagogical Utility

Having gone through categories of media and the merits and demerits of various media, it is now useful to make comparative analysis of these media use for distance education. But, for any comparison, we need certain criteria. Here, for the purpose of comparison we are concerned with pedagogic utility, and for that Taylor (1997) has outlined certain characteristics. These characteristics are flexibility in terms of time, place and pace; quality of materials; and interactivity. Based on these utility characteristics of delivery technologies to distance education, he (Taylor) depicts four models — *The Correspondence Model, The Multimedia model, The Tele-learning Model and The Flexible Model* — each representing one generation, i.e. four generations respectively. Later in 2001, Taylor added fifth generation model. All these five generations (models) along with details of the utility characteristics of each associated delivery technology are presented in Table 6.9 under sub-section 6.3.2 of section 6.3.

Chen (1997) on the other hand provides four important issues for consideration while analysing pedagogic utility of media. The issues are: interaction between learners and instructors, instructional strategies, motivation, and feedback / evaluation.

- **Interactivity**: While considering interactivity it is important to consider the type of communication between the teacher and learner. The communication could be one-way, two-way or multiple-way. For example, an audioconference could provide multiple-way interactivity.
- **Instructional Strategies**: It refers to teaching activity through which learners learn. There are a variety of instructional strategies such as lectures, group discussion, problems and case study, interviews, etc.

- **Motivation**: It is said that the motivation of distance learners is high, and therefore, the learning materials are more learner-controlled. The materials must sustain this motivation. Motivation could be designed into the materials through a variety of means, including good lay-out, spacing of the assignment deadline, regular contact programmes, etc.

- **Feedback / Evaluation**: Feedback is highly essential for student learning. The media should be capable of providing formative evaluation data to the learner for his / her overall learning.

A summary of the comparative pedagogic considerations of utility of various media based on Chen’s criteria is given in Table 6.7.

### Table 6.7: Pedagogical Considerations of Media

<table>
<thead>
<tr>
<th>Systems</th>
<th>Teachers / Learners Interaction</th>
<th>Instructional Strategies</th>
<th>Motivation</th>
<th>Feedback / Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>One-way</td>
<td>Confined to mailing</td>
<td>Yes, depending on the design</td>
<td>Delayed</td>
</tr>
<tr>
<td>Audio Cassettes</td>
<td>One-way</td>
<td>Lecture; panel of experts; interviews</td>
<td>Limited</td>
<td>None</td>
</tr>
<tr>
<td>Radio Broadcast</td>
<td>One-way</td>
<td>Lecture; panel of experts; interviews</td>
<td>Limited</td>
<td>None</td>
</tr>
<tr>
<td>Audio Conferencing</td>
<td>Two-way multiple-way</td>
<td>Discussion; addressing a problem</td>
<td>Yes</td>
<td>Immediate</td>
</tr>
<tr>
<td>Electronic Board</td>
<td>Usually one-way; could be two-way if return equipment is available</td>
<td>Lecture; hands-on activities</td>
<td>Yes</td>
<td>Immediate, if return equipment is available</td>
</tr>
<tr>
<td>Fax</td>
<td>One-way</td>
<td>Limited to transmission of data</td>
<td>Limited</td>
<td>Delayed, confined to print correspondence</td>
</tr>
<tr>
<td>ITFS</td>
<td>One-way</td>
<td>Lecture; panel of experts</td>
<td>Limited</td>
<td>None</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td>Two-way Multiple-way</td>
<td>Approximates face-to-face lectures; panel of experts; discussion; interviews</td>
<td>Very strong</td>
<td>Immediate</td>
</tr>
<tr>
<td>Video Cassette</td>
<td>One-way</td>
<td>Lecture; tutorial</td>
<td>Limited</td>
<td>None</td>
</tr>
<tr>
<td>Media and Technology for Interactive Video Disc</td>
<td>One-way</td>
<td>Lecture; tutorial; simulation</td>
<td>Limited</td>
<td>Confined to feedback programme</td>
</tr>
<tr>
<td>Computer-assisted Instruction</td>
<td>One-way</td>
<td>Tutorial; simulation</td>
<td>Yes</td>
<td>Delayed</td>
</tr>
<tr>
<td>E-mail Conferencing</td>
<td>Two-way; multiple-way</td>
<td>Online discussion and learning</td>
<td>Strong</td>
<td>Immediate; delayed, depending on the occurrence of the learning activities</td>
</tr>
<tr>
<td>Internet; WWW</td>
<td>Two-way; multiple-way</td>
<td>Online discussion; electronic researching; problem-solving activities.</td>
<td>Very strong</td>
<td>Immediate; delayed depending on the occurrence of the learning activities</td>
</tr>
</tbody>
</table>

Source: Chen. (1997).

In the following sub-sections, we will discuss the use of print-based, audio-based, video-based and computer-based media in distance education. Here, we are not focusing much on print-based media, as these are most widely used in distance education. Over the years a whole science of the use of layout, illustration and colour, advance organizers, guidelines, pre-tests, objectives, and questioning techniques has developed.

### Check Your Progress

**Notes:**

a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

2) a) What are the four criteria used by Chen to identify pedagogical utility of different media?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print</td>
<td>Rich in meaning.</td>
</tr>
<tr>
<td>Television</td>
<td>Cheap</td>
</tr>
<tr>
<td>Video tape</td>
<td>Fixed schedule</td>
</tr>
<tr>
<td>Radio</td>
<td>Stop and repeat facility</td>
</tr>
<tr>
<td>Computer</td>
<td>Interactivity</td>
</tr>
</tbody>
</table>
6.2.5.1 Print-based Media

Print-based media are very useful for distance education. Most part of the learning happens through books and other printed materials, either they are available in hard copies or soft copies.

The print-based media, which include books and many other materials, use text and pictures as their symbol system. Learning from books is a byproduct of relationship of this symbol system with human information processes. The symbol system used here is stable, which is read by the learner line by line to construct a text-base. They build mental models of the situation in the text-base, which is again matched with the information in long-term memory, if any. Learners comprehend text according to their own pace, subject to difficulty faced by them. They may even selectively study some portion of the text, use titles, summaries and overviews, and move back and forth between texts. Whenever pictures are available, they are used as supplement to the text. Since this process is more or less common, the designers can design the structure of print materials in distance education accordingly. The structure may include titles, explicitly stated behavioural objectives, questions in the text, signals, cohesive text elements, glossary of difficult terms, summary, etc.

6.2.5.2 Audio-based Media

The use of audio media in distance education institutions takes various forms. Mostly, it is used in the form of broadcast radio. Other forms are: audio-cassettes, audio-vision, and telephone teaching.

The advantages of radio are its almost complete availability/accessibility and its ability to reach isolated audiences quickly and at relatively low cost. However, the fixed schedules of broadcast creates problem for distance learners. The characteristics associated with broadcast technology such as scarcity of quality time, ephemeral nature of the programme, and continuous nature of the content are certain disadvantages of radio broadcast. Because of these, most distance teaching institutions use audio cassettes to supplement broadcast, by making available the content of the broadcast in a recorded cassette. The audio cassette allows the learner to use the material in his/her own place, time and pace. Since radio and audio cassette are devoid of interactivity, other developments have taken place, such as audio-vision, telephone teaching, and audio teleconference. In audio-vision, a set of visual (graphic) material is sent along with audio cassette to allow the learner to see the visuals along with listening the programme. Sometimes, the learners are asked to stop-read a visual diagram, do some activities and then continue listening. By doing this the essential component of learning-
interactivity is enforced in audio media. The telephone is mostly used as a supplementary teaching device, either to get information or to clarify doubts. Tutors are available on phone at the appropriate time to respond to learners’ queries on one-to-one basis providing encouragement and academic inputs with a human touch. The audio-conference is an extension of telephone teaching, when a number of telephones can connect to a central telephone through a bridge. Teaching is done through this central telephone, and learners from the receiving end can discuss with their teacher simultaneously. The most important aspect of audio-teleconferencing is collaborative learning, i.e. learning from the experience of other learners by allowing the voice of one learner heard by all others connected to the bridge.

### 6.2.5.3 Video-based Media

The video-based media are distributed through mail, microwave communication, satellite communication and cable. Based on the medium of delivery, there are a wide range of media available in this category. Some of these are video-cassette, Television and videoconference. Television as a medium uses mostly the iconic and analogic symbol system and therefore, represents realism to a great extent. However, broadcast TV has the limitations similar to that of radio or being available at fixed time — continuous and ephemeral. In spite of these disadvantages, it is one of the most widely used media in distance education. The use of video cassette overcomes some of the problems of use of broadcast TV. As such the various formats available for use in video and broadcast TV make them highly suitable for teaching at a distance, where there is need to give demonstration and practical experience. Apart from working at the cognitive and psychomotor level, the rich visual medium allows the development of affective domain as well.

To make this high potential audio-visual medium interactive, another new system has developed with the integration of telecommunication into television. The system is called one-way video and two-way audio teleconference. This has been in use at the Indira Gandhi National Open University to deliver some of its course contents. Of course, later it has been also extended to selected downlinks to make it partly two-way video as well. The teleconference system has a set-up that includes a central studio from where teaching is done. The studio is linked up to a satellite and proceedings in the studio are relayed to receiving stations all over the country. The receiving stations with special dish-antenna capture the proceedings of the studio. The receiving centres are equipped with telephone having STD connections to interact with the studio in real-time mode. Apart from the advantages of television and video cassettes, this system allows feedback and interaction in real-time mode making it pedagogically useful for the learners. This teleconference facility could be delivered at the doorstep of the learner through cable TV networks and thereby allow home-based learning.

There are a few other emerging video-based media in distance education such as video disc, teletext and videotext, among others.

**Multi-media**

Video by itself has multiple media in it – print, audio, motion pictures, graphics, etc. Whenever we recommend the use of multiple media in teaching-learning (in conventional education or distance education situation), the immediate question
asked is – do media influence learning? One of the earliest researchers on the subject concluded that “media do not influence learning under any condition” (Clark, 1983). He further went on to say: “media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes change in our nutrition” (p.445). In contrast to this, a large body of research reported by Kozma (1991) and Bates (1993a) concludes that media have their specific role in learning. The present section is primarily based on the reporting of these two experts in media research. Kozma used a framework of learning where a learner actively collaborates with the medium to construct knowledge.

Most dynamic video medium is Television. Let us discuss how it can be used effectively for promoting learning.

**Learning from Television**

Television uses iconic and analogic symbol system to represent knowledge. Research on television viewing indicates that the viewers are normally at a low level of engagement. However, for learners viewing a programme with a purpose, it is a more serious exercise including thoughtful involvement, constructing more detailed, elaborate representation and drawing more inferences from them. Learning from television is enhanced, if the following conditions are met.

- **Delivery:** The student must have easy access to watching the programme. This means the transmission time must be suitable to the learner. Moreover, increasing repeat telecast of the programme will also facilitate access.

- **Prior experience of learning from television:** Learners mostly use television for the purpose of entertainment. Since it is different from educational television, students with some experience do better. This means the 3rd year student in a degree course could benefit more from television programme than a fresher. It also calls for teaching the learners how to learn from television.

- **Student control over media:** Broadcast television does not provide control facility to the learners, whereas video cassettes do. The control characteristics allow the learners to use a programme again and again, stop, think, reflect and analyse issues discussed in the programme.

- **Relevance:** The learner’s perception of relevance of the programme also affects learning from it. This is highly subjective in nature. But, if the instructional designer puts the subject matter in a relevant way along with relevant facts, it is definitely going to help the learners. Sometimes, the supplementary character of television programmes also affects additional learning from it. If the learners think assessment is not going to cover television viewing, then, it is not relevant. Therefore, telling learners what is relevant is very important.

- **Media Notes:** This is one of the key factors affecting learning from television. The design of media note should be such that it arouses interest, gives main points of the programme, indicates what are to be considered with higher emphasis, and what outcome is expected. The media note can also include the relevance of the programme.
6.2.5.4 Computer-based Media

The emergence of microcomputer has heralded a new era in the use of computers in education. Microcomputers allow users to process information locally with the potentiality to even connect to remote computers through networks. Microcomputers can be used for word processing, maintaining a database, desktop publishing, running computer-assisted learning packages, sending communication through e-mail, etc. From the view point of educational use of computer media, the other related developments are availability of Graphical User Interface (user friendly screens), higher storage capacity (CD ROMs), network ability of computers (Computer Mediated Communication) and the Internet. Computers are used in education for specific pedagogic purposes, some of which may relate to:

- increasing the learner motivation;
- helping recall previous learning;
- providing new instructional stimuli;
- activating the learner’s response;
- providing systematic and steady feedback;
- facilitating appropriate practice;
- sequencing learning appropriately; and
- providing viable source of information for enhanced learning.

In distance education, the computer is being considered a more open and flexible delivery media that can be adapted to varying individual needs in terms of time, place, pace and choice of content. The computer-based media in distance education are primarily available in three modes — Independent, Interactive and Communication. In the independent mode, it is the Computer and its various facilities that are put to use by the learner to use a word-processing software, to compute data using a spreadsheet or to develop a database. In a way the learner works on a computer system. Whereas in the interactive mode, the learner makes use of a pre-programmed learning package (e.g. Computer-Aided Instruction, Computer managed learning) to learn the skills, concepts and processes. The learning package provides opportunity for interaction and feedback for enhanced learning. The third role is communication, where the learner communicates with another learner or teacher using the computer to learn cooperatively. The different types of media available in all these modes are:

- Computer-based learning packages;
- CD-based multimedia packages;
- E-mail for computer-mediated communication; and
- The Internet and World Wide Web.

The development of WWW and its multimedia interactive capability have taken distance education towards virtual reality. As such, there are virtual universities on the Internet that deliver courses through WWW. It is because of these potentialities of computer media, the 4th generation of distance education identified by Taylor (1995) is termed as flexible learning model.
Check Your Progress

Notes:  
 a) Space given below the question is for writing your answer.
   b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

3) Identify the following statements as True or False.
   a) It is difficult to reach a large number of people through radio (T/F)
   b) Audio cassette gives learner the flexibility of time, space and pace  (T/F)
   c) Telephone is mostly used as a supplementary teaching device  (T/F)
   d) Video-based media are distributed only through satellite. (T/F)
   e) Television also allows the development of affective domain.  (T/F)
   f) The use of computer enables cooperative learning.  (T/F)

6.3 TECHNOLOGICAL APPLICATIONS IN ODE

As we have discussed above, different types of technologies are used in ODE keeping in view their nature, cost, availability, range of their applications, accessibility, extent of use, and effectiveness, among other things, in varied contexts and purposes of education. Let us discuss the applications of the technologies in ODE in greater details.

6.3.1 Applications of One-way and Two-way Technologies

We have already known about the differences between the technology and the media. In this sub-section we look at the technological applications that enhance the use of media in distance education. The applications of both one-way and two-way technologies are summed up in Table 6.8, to present a broader view of the same.

Table 6.8: One-way and Two-way Technologies

<table>
<thead>
<tr>
<th>Media</th>
<th>One-way Technology Applications</th>
<th>Two-way Technology Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>Course units; supplementary materials</td>
<td>Correspondence tutoring</td>
</tr>
<tr>
<td>Audio</td>
<td>Cassette programmes; radio programmes</td>
<td>Telephone tutoring; audio conferencing</td>
</tr>
<tr>
<td>Television</td>
<td>Broadcast Programmes; Cassette Programmes</td>
<td>Interactive television (TV out: telephone in); video conferencing</td>
</tr>
<tr>
<td>Computing</td>
<td>CAL, CAI, CBI, databases; Multi-media.</td>
<td>E-mail; interactive databases; Computer conferencing</td>
</tr>
</tbody>
</table>

Let us discuss some of the important applications that are more interactive and popularly used in distance education.

i) Interactive Radio Counselling (IRC)

Radio technology popularly came into use as one-way technology, but by combined use of it along with other technologies it can serve as an effective tool for interaction with the learners. Though Radio is not new generation technology it can be transformed into an effective tool for interaction in open and distance learning. However, it is possible only through systematic planning, designing, implementation and monitoring. For example in India, Interactive Radio Counselling is a recent concept in distance learning. Live counselling is provided on radio by invited experts. Students can ask questions right from their homes on telephone. These sessions are conducted for an hour on selected days from different radio stations in the country. A toll free telephone numbers are also provided for this purpose from selected cities.

ii) Teleconferencing (TC) and Videoconferencing (VC)

A teleconference or teleseminar or videoconference is the live exchange and mass articulation of information among several persons and machines remote from one another but linked by a telecommunications system. Terms such as audio conferencing and telephone (phone) conferencing are also sometimes used to refer to teleconferencing. The telecommunications system may support the teleconference by providing one or more of the following: audio, video, and/or data services by one or more means such as telephone, computer, telegraph, teletypewriter, radio and television. (https://en.wikipedia.org/wiki/Teleconference).

Internet teleconferencing includes internet telephone conferencing, video conferencing, web conferencing, and augmented reality conferencing. Internet telephony involves conducting a teleconference over the Internet or a Wide Area Network. One key technology in this area is Voice Over Internet Protocol (VOIP). Popular software for personal use includes Skype, Google Talk, Windows Live Messenger and Yahoo! Messenger (Ibid).

Videoconferencing (VC) is the conduct of a videoconference (also known as a video conference or video teleconference) by a set of telecommunication technologies which allow two or more locations to communicate by simultaneous two-way video and audio transmissions.

At IGNOU, two-way audio and one-way video live teleconferencing sessions have been initiated in 1990s, which are conducted via satellite through interactive Gyan Darshan Channel from the University studios at its Electronic Media Production Centre (EMPC) as per the schedule made available at the Regional and Study Centres. The learners will have to go to the nearest reception centre at the scheduled time for taking the benefit of this facility. Occasionally and recently it has been using two-way video conferencing and computer-based internet conferencing as well.
Check Your Progress

Notes:  
a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.

4) a) Describe the role of media in distance education in about 4 lines.

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

b) Listed below are a few media and technologies in distance education. Identify them as M for medium, and T for technology.

<table>
<thead>
<tr>
<th>Media</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
</tr>
<tr>
<td>Audio</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
</tr>
<tr>
<td>Cassettes</td>
<td></td>
</tr>
<tr>
<td>Broadcast</td>
<td></td>
</tr>
</tbody>
</table>

6.3.2 Generations of Distance Education

The use of media in distance teaching institutions has led to the evolutionary thinking on the development of distance education. Some scholars classify distance education into different generations based on the complexities of ‘media-mix’ used in teaching-learning. The very first such effort was that of Garrison (1985) who categorised the ‘two-way communication’ media / technologies into three generations — correspondence, teleconferencing, and computers. In addition to the three generations, Garrison created another ‘ancillary media’ category that included one-way communication media (Fig. 6.2).

DISTANCE EDUCATION TECHNOLOGIES

(Two-way communication)

1) Correspondence (First Generation)
   Message: Print
   Delivery Mode: Mail

2) Teleconferencing (Second Generation)
   Message: Audio / Video
   Delivery Mode: Telecommunication

3) Microprocessor Based (Third Generation)

ANCILLARY MEDIA

(One-way communication)

1) Print Materials
2) Audio /Video Cassettes
3) Audiographics*
Media and Technology for ODE

- Fascimile
- Slow-scan TV
- Compressed Video
- Tele-writing
- Videotext

4) Laser Video disc

5. Broadcast
- Radio
- Television

Note: * May support two-way communication
Source: Garrison (1989).

Fig. 6.2: Garrison's Taxonomy of Media

Garrison's generation of distance education has been further modified and illustrated by Nipper (1989), Bates (1991) and Taylor (1995). Taylor’s generations given in Fig. 6.3 are comprehensive and encompass even those illustrated by Nipper and Bates.

First Generation — The Correspondence Model
- Print

Second Generation — The Multimedia Model
- Print
- Audio tape
- Video tape
- Computer-based learning (e.g. CML / CAL)
- Interactive video (disk and tape)

Third Generation — The Tele-learning Model
- Audio teleconferencing
- Video conferencing
- Audiographic communication
- Broadcast TV / Radio

Fourth Generation — The Flexible Learning Model
- Interactive multimedia (IMM)
- Internet-based access to WWW resources
- Computer mediated communication


Fig. 6.3: Taylor’s Four Generations of Distance Education

Later, Taylor (2001) improved it to include one more generation. For detail of all the five generations, along with details of the utility characteristics of each of associated delivery technologies, see Table 6.9.
Table 6.9: Models of Distance Education: A Conceptual Framework

<table>
<thead>
<tr>
<th>Models of Distance Education and Associated Delivery Technologies</th>
<th>Characteristics of Delivery Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flexibility</td>
</tr>
<tr>
<td></td>
<td>Time</td>
</tr>
<tr>
<td><strong>FIRST GENERATION: The Correspondence Model</strong></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>SECOND GENERATION: The Multimedia Model</strong></td>
<td></td>
</tr>
<tr>
<td>Print</td>
<td>Yes</td>
</tr>
<tr>
<td>Audio tape</td>
<td>Yes</td>
</tr>
<tr>
<td>Video tape</td>
<td>Yes</td>
</tr>
<tr>
<td>Computer-based learning (e.g. CML/CAL/IMM)</td>
<td>Yes</td>
</tr>
<tr>
<td>Interactive video (disc and tape)</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>THIRD GENERATION: The Telelearning Model</strong></td>
<td></td>
</tr>
<tr>
<td>Audio teleconferencing</td>
<td>No</td>
</tr>
<tr>
<td>Video teleconferencing</td>
<td>No</td>
</tr>
<tr>
<td>Audio graphic communication</td>
<td>No</td>
</tr>
<tr>
<td>Broadcast TV/Radio and audio teleconferencing</td>
<td>No</td>
</tr>
<tr>
<td><strong>FOURTH GENERATION: The Flexible Learning Model</strong></td>
<td></td>
</tr>
<tr>
<td>Interactive multimedia (IMM) online</td>
<td>Yes</td>
</tr>
<tr>
<td>Internet-based access to WWW resources</td>
<td>Yes</td>
</tr>
<tr>
<td>Computer mediated communication</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>FIFTH GENERATION: The Intelligent Flexible Learning Model</strong></td>
<td></td>
</tr>
<tr>
<td>Interactive multimedia (IMM) online</td>
<td>Yes</td>
</tr>
<tr>
<td>Internet-based access to WWW resources</td>
<td>Yes</td>
</tr>
<tr>
<td>Computer-mediated communication, using automated response systems</td>
<td>Yes</td>
</tr>
<tr>
<td>Campus portal access to institutional processes and resources</td>
<td>Yes</td>
</tr>
</tbody>
</table>

6.3.3 **Technology-enhanced Learning**

Application of advanced technologies in ODE has made its access wide-open and ubiquitous in its reach. Given below are some important current developments in the field of ODE.

6.3.3.1 **Open Educational Resources (OER)**

A radically new approach for providing knowledge is through Open Educational Resources (OERs). The MIT Open Course Ware project is credited for the germination of the Open Educational Resources Movement in 2002 by putting MIT’s entire course catalogue online. The term OER was first adopted at UNESCO 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries. The forum defined OER as “the provision of educational resources, enabled by information and communication technologies, for consultation, use and adaption by a community of users for non-commercial purposes” (UNESCO, 2002). Thereafter, there has been no looking back on it.

OER movement was started to speed up the development of new learning resources, stimulate internal improvement, innovation and reuse and help the institutions to keep good records of materials and their internal and external use. Educational institutions should leverage taxpayers’ money by allowing free sharing and reuse of resources developed by funded institutions. The review of the OER literature shows that there are three types of open resources:

1) **Open Source (OS):** Open source refers to both the concept and practice of making program source code openly available. Users and developers have access to the core designing functionalities that enable them to modify or add features to the source code and redistribute it. Extensive collaboration and circulation are central to the open source movement (Lakhan & Jhunjhunwala, 2008). Open source applications in the educational context can be categorized as knowledge ware and courseware. On the knowledge ware front, LMS and CMS applications like Moodle, ATutor, etc. are becoming very popular and many ODL systems are adopting them. On the courseware front, the concept of open access is gradually gaining ground. It is gradually being felt that to facilitate and nurture flexible learning communities, education system needs to draw on the collective intellectual capital and wisdom (of educators). Based on this premise, many innovative projects like MIT’s Open Course Ware or the MERLOT projects were initiated.

- **Open source learning management system (Open knowledge ware):** Another aspect of the impact of the open source movement on education is the rapid proliferation of open source learning management system (LMS) tools and other learning applications. LMS manages, primarily, the delivery of self-paced online (e-learning) academic programs. Flexibility in qualification, in duration for completing the course, and in age bar are some parameters which provide good opportunity for knowledge enhancement. Hence LMS for ODL has to address all such requirements intelligently managing both learners and learning. Moodle is an open source LMS tool. Moodle integrates pedagogical features missing in many LMS tools, allowing instructors to construct customizable, online courses or a wide range of course modules on a
flexible platform. Moodle can be downloaded to any computer and used to support a single instructor site or a system of thousands of students. It is licensed by the Open Source Initiative under a general public license (GPL). Students contribute in their own learning using a Moodle. The features of Moodle are such that students actively participate in Moodle (Lakhan & Jhunjhunwala, 2008).

- **Open Course Ware (OCW):** It is a free and open digital publication of high quality university level educational materials. These materials are organized as courses, and often include course planning materials and evaluation tools as well as thematic content. Open Course Ware are free and openly licensed, accessible to anyone, anytime via the Internet — MIT Open Course Ware, Kyoto-University Open Course Ware, Tokyo Tech Open Course Ware, Utah State University Open Course Ware. Many ODL institutions are also developing their own digital repositories of learning objects and resources. IGNOU has developed national digital repository eGyanKosh as an open resource even with facility of video streaming of its video programmes. It is being hyperlinked to the Sakshat portal of WIRD, Government of India.

2) **Open access concerned with journal articles:** Readers can retrieve articles without financial or access barriers. No fees, registration, or membership is required. The research community has long recognized the opportunity that immediate, barrier-free, online access presents to researchers to world faster by enabling them to get to research articles and incorporate new findings into their research more rapidly.

3) **Open Educational Resource (OER):** Use of OERs by the teachers of the ODL institutions can help them in saving their time. This time can be used by teachers for engaging with the learners and helping them to complete their courses. It is also cost effective to use already existing materials and reduce the developmental time of courses. Usually course development in open universities takes 12-18 months and this can be significantly reduced.

The teachers in ODL institutions can also be encouraged to contribute to OER movement by developing OER materials: The access to good quality OERs is the first step to improving access to quality learning. But availability of these materials is not sufficient to render OER usable in all contexts. Education is always contextual and therefore, OERs will require adaptation to make these relevant to the target group. Institutions need to create conducive environment for the use of OERs.

**Use of OERs:** As mentioned in this unit, OERs can be used extensively by the ODE institutions. ODE teachers can save their time by using them and they can instead use this time for engaging with the learners and helping them to complete their courses. It is also cost-effective to use already existing materials and reduce the developmental time of courses. ODE teachers can also be initiated into creation and development of good quality OERs in different languages. The users can further adapt them as per their needs. But teachers may not put in needed time and energy in the development of quality OER materials. Therefore, proper reward systems need to be put into place for encouraging them. Another important issue here is integration of OERs in teaching-learning process and certifying students based on learning from OERs. Another important consideration is support and guidance needed by learners to study from media enabled OER materials.
6.3.3.2 Massive Open Online Courses (MOOCs)

Due to emergence of MOOCs, connectivism and its principles now find a testing ground. Connectivism defines learning as a continual process which occurs in different settings including communities of practice, personal networks and work place task. Ability to see connections between fields, ideas and concepts is a core skill. This proposed online learning environment would incorporate any number of students, content sources, and content delivery options (real and virtual), limited only by the capacity of the technologies and associated costs (Siemens and Downes, 2008). The components of a MOOC system include any combination and permutation of teachers, students, information (topic and related content), and context. The first MOOC class, in 2008, consisted of 2,300 students, and was sponsored through Manitoba University, Alberta, Canada. As per MOOCs, the paradigm of tightly controlled learning processes needed to be re-evaluated in a manner that opened up learning networks, allowing students to customize their learning experiences within a loosely designed framework. This framework looked at information resources as content clusters that surrounded a topic, from which students could sample content while adding to and discarding from it according to their own needs and goals. (Ibid).

**Concept and features**

The concept of MOOCs can be understood by its following features:

- **Open access:** A MOOC participant does not have to be a registered learner in an educational institution to take a MOOC, and are not required to pay a fee. Participant gets access by logging in and signing up.

- **Scalability:** It means the ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth. Many conventional courses depend upon a small ratio of students to teacher, but the word ‘massive’ in MOOC suggests that the course is designed to support an indefinite number of learners.

MOOCs can be included in the ODL system for mainstreaming non-conventional groups in education (low income, employed). MOOCs can make ODL system more efficient by providing high quality education at lower costs. If more institutions participate and collaborate with ODL institutions then choices of courses for learners will broaden. These collaborating educational institutions can accept each other’s courses and credits. However, though openness may be taken as equivalent to free, it will still demand a lot of effort (and costs) to develop good quality ODL.

**Types**

Currently, the MOOC concept is so new that there has been little agreement as to what actually constitutes a MOOC and what educational or other objectives they can and should address. The vast majority of existing MOOCs are xMOOCs. The structure and pedagogical philosophy of the open online courses offered at Stanford University in 2011 were quite different from the connectivist MOOCs (cMOOCs). To differentiate between the two educational approaches, the terms “cMOOC” and “xMOOC” were coined, “c” denoting the focus on connectivism and “x” denoting “extension,” for example, HarvardX as an extension of the Harvard campus, and MITx as an extension of MIT (Downes, 2008).
• **xMOOCs**: Most of the MOOCs created at present are xMOOCs. xMOOCs are generally delivered via third party platform providers such as Coursera, edX, and Udacity. Most are “cohort-based” in that they are offered over a fixed period of time, with participants being expected to complete activities within set windows of time. These courses and their associated materials often become unavailable for non-registered participants not long after their conclusion. Some xMOOCs are self-paced, remaining open indefinitely to participants (Hollands, and Tirthali, 2014).

• **cMOOCs**: Connectivist MOOCs (cMOOCs) are characterized by a more fluid structure that addresses an overarching instructional goal or question but is less directive with respect to process. Siemens describes the cMOOC experience as the exploration of a topic area and creation of artifacts in an “atelier” environment. Instructors may pose initial or weekly questions and challenges, and provide a variety of text-based or media resources. The success of the cMOOC is highly dependent on participant interaction, for example, via discussion forums, Diigo groups, or Twitter. Course outcomes are often unique products, such as blog posts, images, diagrams, or videos generated by participants using a variety of social media. The role of the instructor is to act as a facilitator by aggregating, reviewing, summarizing and reflecting on participant activity in a daily or weekly newsletter. cMOOCs are usually delivered using easily available course delivery platforms, such as Blackboard Collaborate, enhanced with collaboration tools. The question for MOOCs over the longer term is whether variable costs can be contained by automating functions and substituting instructional support provided by expensive faculty members with less costly teaching assistants, part-time instructors, or peer-to-peer learning and assessment. Many MOOC developers anticipate that the costs of re-running a MOOC will be substantially lower than the costs of initial development (*Ibid*).

**Prospects**

Hollands, and Tirthali (2014) identified six major goals for MOOC initiatives: i) Extending the reach of the institution and access to education; ii) Building and maintaining brand, iii) Improving economics by lowering costs or increasing revenues; iv) Improving educational outcomes for both MOOC participants and on-campus students; v) Innovation in teaching and learning; and vi) Conducting research on teaching and learning. They found that many colleges and universities have adopted several different stances towards engaging with MOOCs and are using them as vehicles to pursue multiple goals mentioned above. They termed those institutions actively developing MOOCs as “producers”, those using MOOCs developed by other institutions in their programs as “consumers”. While there are a few institutions doing both, others are adopting a “wait-and-see” approach, or have considered MOOCs and have decided against any form of official engagement. There is no doubt, however, that the advent of MOOCs has precipitated many institutions to consider or revisit their strategy with respect to online learning, whether at large scale or small.

**Scope of OERs and MOOCs in ODL System**

The idea behind the concept of OER is to promote access to education to a wider audience, especially those from deprived regions of the world, where the open resources can be freely reused, improved and repurposed to fit into different...
contexts. Currently most OERs are generated by educational organizations, usually Universities, using new or existing grant funding to do so (Lane, 2008). The philosophy of OER conceives of educational materials as common public goods from which all should benefit, but especially those who receive the least benefit and support from current systems of education, whether publically or privately funded. This view is supported by the idea that knowledge itself is a collective social product, one that naturally forms a common pool that needs to be accessible to all. The view is strongly aligned with the financial reality of educational funding, since the vast majority of educational materials are funded in diverse ways, directly or indirectly, but the view is not aligned with the reality of the materials distribution, which is frequently non-public, closed, and tightly controlled (Rossini, 2010).

6.3.3.3 M-Learning

M-learning or mobile learning is a subset of eLearning whereas e-Learning is a subset of distance education. M-Learning addresses the learning needs of those learners who are always on the move. Landline telephones and wired computers are beginning to be replaced by wireless technologies (Santosh Kumar, 2013).

The move to offer more mobility and access to education is now occurring at a speed that was difficult to predict just a year or two ago. Increased use of mobile telephones and their convergence with Personal Digital Assistants (PDAs) and similar devices has created new possibilities for providing learning and the development of education on the go that offers just-in-time learning moments in synchronous mode. The strength of the mobile phone is that it is the tool par excellence for social connectivity. If students are truly able to study anywhere, anytime, while actively moving around, for example, waiting for or sitting on the bus or doing housework, simultaneously receiving and providing information, and interacting wherever they may be, educational and social communications are inextricably intertwined.

Learners can be presented with advanced organizers. As mentioned in Unit-5, an advance organizer is information that is presented prior to learning and that can be used by the learner to organize and interpret new incoming information. To facilitate constructivist learning, the posting of, for example, an abstract of a new text or new chapter so that learners are aware of the overview of the text or of a list of concepts is valuable. Furthermore, learner support systems such as instant connectivity with teachers, and peers, and learning management systems (LMS) that give information on assignment submission dates, examination results, changes of meeting times and locations, and similar short information blogs can efficiently be transmitted through SMS. Theoretically, when appropriately designed and well managed, m-learning can improve pedagogy by timely learner support systems that provide an extra communications channel for learners and teachers, and between and among learners.

Check Your Progress

Notes:  a) Space given below the question is for writing your answer.

b) Check your answer with the one given at the end of this unit under “Answers to ‘Check Your Progress’ Questions”.
5) What is open source? How do you categorise the applications of open source?

6.4 LET US SUM UP

In this unit we have discussed the taxonomies of media as proposed by Romiszowski, Sparkes, Laurillard, Bates, Idrus and Chen. In reference to the taxonomies, the propositions by Garrison, Nipper, Bates and Taylor on media use in distance education vis-a-vis the generations of distance education have also been discussed. Based on all the above taxonomies and propositions, we have provided a simple classification of media as: text and graphic-based, audio-based, video-based and computer-based media. Each of these categories has also been discussed in detail. We have also discussed the merits and demerits of various media, including their pedagogical utility based on the criteria of interactivity, instructional strategies, motivation and feedback / evaluation.

The terms ‘media’ and ‘technology’ as found in the literature is very often interchangeable. However, we made a distinction between these terms based on Bates’s one-way and two-way technology approach, among others. However, these distinctions will be blurred in the days to come with the development of more integrated media like the computer and mobile phone. The development of distance education itself is due to the emergence of different media. Different media use different symbol systems to represent knowledge. The Symbol system could be digital, iconic, analogic or a mix of more than one of these three. A judicious use of ‘media-mix’ could increase student motivation, supplement the main medium, and enable the learner control over his / her learning. We also discussed some of the strengths of non-print media in motivating, involving, activating the learners, improving the learning atmosphere and acting as supplementary media to the master medium — print. Some media provide opportunity for better interaction at a distance, which is essential for effective learning.

In the last section, we have highlighted how the teaching-learning methodology is changing with the adoption of new technologies and demonstrated possible paradigm shift in the ODL system that is rooted in the shift from mass production economy to an information technology-based economy. In this background, the new ICT supported emerging pedagogical models such as OER and MOOCs have been identified and briefly discussed with a view to highlight the scope of OERs and MOOCs and their impact on the ODL system. In this context we have also touched upon the role that M-learning or mobile learning can play as a subset of eLearning, which plays its role as a subset of ODL.
6.5 ANSWERS TO ‘CHECK YOUR PROGRESS’ QUESTIONS

1) a) **One-way Technologies**
   - Textbooks
   - Audio cassettes
   - Broadcast TV
   - Radio
   - Stand alone multimedia

   **Two-way Technologies**
   - Self-instructional materials
   - Audio conferencing
   - Interactive TV
   - Telephone tutoring
   - E-mail

   b) Laurillard categorised media into different types based on their level of interactivity, role in the learning process and provision for dialogue between teacher and student. The types of media are: discursive, adaptive, interactive and reflective.

   c) The Indira Gandhi National Open University uses multimedia approach to distance education. But, in fact, it could be said to be an institution in all the generations. The reasons are:
   - It makes large use of print medium. Some programmes don’t have audio-video programmes.
   - It is now using teleconference widely for teaching. Broadcast TV and Radio is also a common component of teaching.
   - Recently it has started using Internet for delivery of computer programmes and uses computer mediated communication as well.

2) a) The four criteria used by Chen to identify pedagogical utility of media are:
   - Interactivity, instructional strategies, motivation and feedback/evaluation.

   b) **Column A**
   - Print
   - Television
   - Videotape
   - Radio
   - Computer

   **Column B**
   - Cheap
   - Rich in meaning
   - Stop and repeat facility
   - Fixed Schedule
   - Interactivity

   c) Factors affecting successful learning from television include:
   - Delivery, prior experience of learning from television, student control over media, perceived relevance, and media notes.

3) a) F; b) T; c) T; d) F; e) T; f) T

4) a) Distance education developed primarily because of the emergence of printed media. Media plays the role of teachers in distance education. Media create an environment for learning, comparable with that in conventional system, through the use of symbol systems — digital, iconic and analogic — which also provide for the much needed interactivity for learning.

   b) **Text** — M
   - Computer — M
   - Print — T
   - Telephone — T
   - E-mail — T
   - Cassette — T
   - Audio — M
   - Broadcast — T
5) Open source refers to both the concept and practice of making program source code openly available. Users and developers have access to the core designing functionalities that enable them to modify or add features to the source code and redistribute it. Open source applications in the educational context can be categorized as knowledge ware and courseware. On the knowledge ware front, LMS and CMS applications like Moodle, ATutor, etc. are becoming very popular and many ODL systems are adopting them. On the courseware front, the concept of open access is gradually gaining ground. It is gradually being felt that to facilitate and nurture flexible learning communities, education system needs to draw on the collective intellectual capital and wisdom (of educators). Examples of this courseware include the projects like MIT’s Open Course Ware or the MERLOT.

6.6 REFERENCES


IGNOU. (1995). ES-318: Communication Technology for Distance Education. New Delhi: IGNOU.


Suggested Readings


### 6.7 UNIT END EXERCISES

**Unit End Questions**

You may write brief notes or full-length answers to these questions in your own interest. It might help you during your preparation for examination.

1) Discuss different classifications of media (1000 words).

2) What are the merits and demerits of print, electronic and educational media? (500 words).

3) Explain the pedagogical utility of print, audio, video and computer based media. (1000 words).

4) What are one-way and two-way technologies? Explain their applications in distance education. (500 words).

5) What do you understand by technology-enhanced learning? Explain, with examples, the recent trends in this regard. (1000 words).

**Questions for Critical Reflection**

1) Although there are five generational models of distance education, which of these models, in your opinion, are more pervasive and truly massive? Give reasons.

2) Do you think MOOCs can be equally effective in all countries of the globe at time in future? Justify your answer by comparing the concept with global realities.