

**POSTGRADUATE DIPLOMA IN EDUCATION
(PDE)**

MODULE 3

PROJECTED/ELECTRONIC MEDIA

UNIT 1: PROJECTED AND AUDIO MEDIA

INTRODUCTION

The instructional media that we will treat in this unit are those media that require power from electricity or other sources such as battery. They are projected or electronic media. They are also very powerful means for carrying out instruction. We will identify them; describe their characteristics and application in teaching and learning.

We are talking about: projection of transparencies, slides, filmstrips and opaque projection as well as audio tapes/cassettes and radio.

OBJECTIVES

At the end of this unit, you should be able to:

1. Define projected visuals.
2. Distinguish clearly between overhead transparency projection, slide projection, filmstrip projection and opaque projection.
3. Describe the attributes of slides including three advantages and three limitations
4. Describe ten characteristics of audio media including five advantages and five limitations.
5. Describe two types of audio media most often used for instruction including their advantages and limitations.
6. Explain how the audio cassette can help make up for some of the limitations of radio.
7. Describe five uses of audio media in instruction.

PROJECTED VISUALS

Another important class of instructional materials is the projected visuals. These are visuals that require the use of projectors and electricity for their projection for viewing. Examples of projected visuals include opaque projection, overhead projection, slides and filmstrips.

Projected Visuals

- * Opaque projector
- * Overhead projector
- * Slide projector
- * Filmstrip projector

Projected visuals are also called projected still pictures because they project one picture at a time during projection, unlike motion pictures. The principle of projection is to pass a strong light through transparent film (overhead transparencies, slides and filmstrips), magnify the image through a series of lenses and cast this image on a reflective surface. The opaque projection operates slightly differently in that projection involves reflecting light off the material rather than transmitting light through it. Light cast onto an opaque image is reflected from the material onto mirrors which transmit the reflection through a series of lenses onto a screen.

Overhead Projection

Overhead projectors are used to project transparencies. Transparencies may be composed of photographic type film, clear acetate or made from cellophane or polythene sheets. Although ready-made transparencies are available in the market, the teacher can make his transparencies.

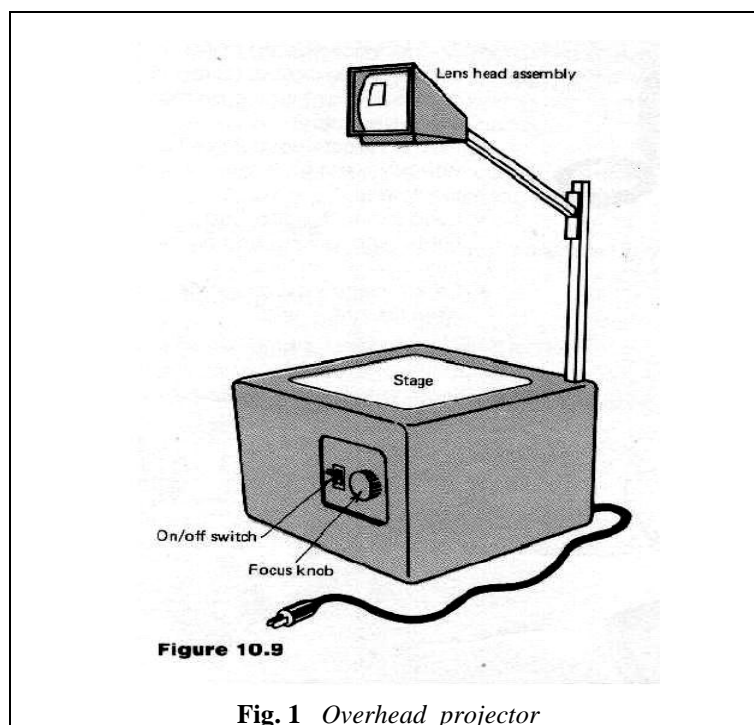


Fig. 1 Overhead projector

Advantages

- (a) They can be used as chalkboard substitute or written on directly.
- (b) The intensity of light from the overhead projector on the screen makes it more visible and legible than chalkboard and can be used in normal room lighting. Interaction is maintained and notes can be taken.
- (c) The presenter can face the audience thereby making interaction possible.
- (d) Transparencies can be prepared in advance and re-used.
- (e) Commercially produced transparencies are also available.
- (f) The presenter can manipulate the projected materials the way he wants while the lesson is going on - point to important items, add details like notes and diagrams, cover part of the message and progressively reveal information in a step-by-step procedure.
- (g) Most overhead projectors are light in weight and portable and simple to operate.

Limitations

- (a) Overhead projection cannot be programmed to operate on its own. A presenter must be there to operate it and so the effectiveness of presentation depends heavily on him.
- (b) It cannot be self-instructional as the projection system is designed for large - group

presentation.

- (c) Unlike the opaque projector, non-transparent materials cannot be projected immediately unless made into transparencies.
- (d) Electricity supply is a requirement. It cannot be used where electricity is not available.

Application

The overhead projector system is particularly suitable for large-group presentation. It enables the lesson to be developed progressively step - by - step. It is possible to lay one transparency over another making it possible to build up diagrams gradually. Transparencies on various subject areas are available. It is necessary to avoid the temptation of proceeding too quickly when using transparencies prepared in advance. The presentation should be paced to suit the learning rate of the audience.

Slides

Slide projection entails the projection of slide films with the slide projector. Slide refers to a frame of photographic transparencies bound by card mounts and designed for use with a slide projector or slide viewer. The 2" by 2" slides are most commonly used.

Slides may be commercially or locally produced. The teacher or student can make his own slides by taking pictures of the required concepts using the 35mm film camera. The exposed film is processed, cut and mounted in frames

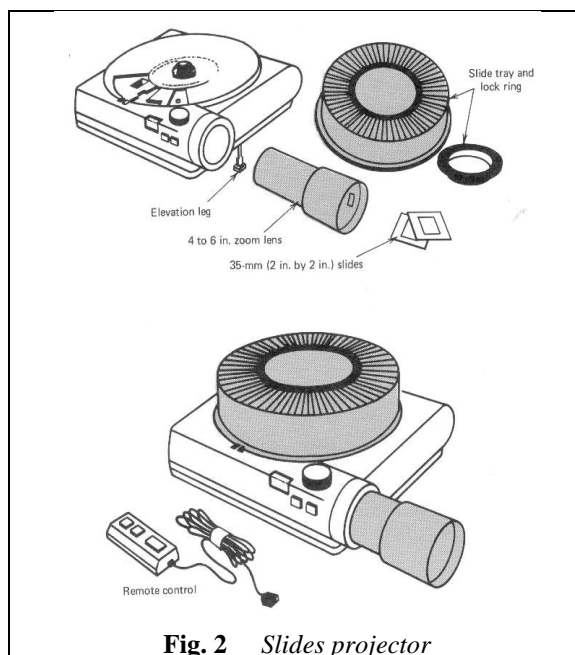


Fig. 2 *Slides projector*

Advantages

- (a) Since slides are single pictures, they can be arranged and rearranged to suit the audience and purpose for which they are being used.
- (b) Slides are used to present information in sequence.
- (c) Slides are preferable when only a picture or few pictures are to be projected.
- (d) Framing of slides protect them from damage during handling.
- (e) The fact that slides are generally available and easy to handle make it easy to build up

permanent collections of slides for instructional purposes.

Limitations

- (a) Slides can easily become disorganized since they are single pictures.
- (b) Slides can easily accumulate dust and fingerprints and get damaged if not carefully stored or handled.
- (c) Slides are likely to be more expensive compared with filmstrips.
- (d) They show only still pictures and therefore are not good for teaching concepts that require motion.
- (e) Electricity supply is a requirement.

Application

Like other forms of projected visuals, slides may be used at all levels and for all subject areas especially in fine art, geography and the sciences. Many good quality slides are available commercially, individually and in sets. Teachers and students can also produce them.

Filmstrips

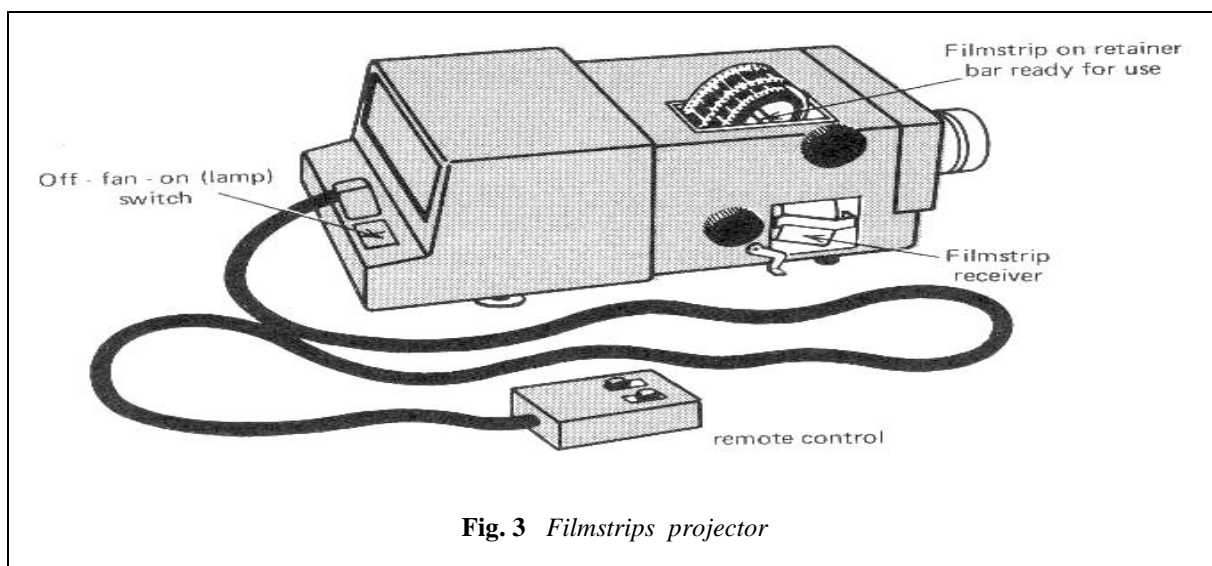


Fig. 3 *Filmstrips projector*

A filmstrip is a roll of transparent film usually 16mm or 35mm in size, containing images designed to be viewed frame by frame with a filmstrip projector. A filmstrip may contain from 20 to 60 frames depending on the number of visuals required in the concept being taught..

Like slides, filmstrips can be commercially made or locally produced. Most filmstrips were “silent”; they were not accompanied with audio recording. These days, we now have sound filmstrips. Filmstrips are being accompanied with recorded sound tracks or audio cassettes of narration, music or sound effects

Advantages

- (a) The filmstrip is compact, easy to handle, and can be teacher-made.
- (b) Film strips present information in sequential order and there is no fear of being disorganized as with slides.
- (c) The pace of viewing filmstrips can be controlled compared with audio and motion media.
- (d) This gives the viewer and teacher some control over the rate of presentation or pacing of his lesson.
- (e) Filmstrips can be used for independent study as self-contained learning package.
- (f) They can be viewed in lighted rooms.

Limitations

- (a) Because the frames are permanently fixed in a certain order, it is not possible to alter the sequence of pictures without destroying the filmstrips.
- (b) They can be used only where there is electricity.
- (c) It projects only still images
- (d) The sprocket holes can easily be damaged if not carefully handled.

Application

Filmstrips find application in a variety of subjects and classes. They are well suited for independent study. The filmstrip viewer is useful for teaching a small class while the projector is useful for a normal classroom presentation. During a classroom projection, the teacher presents the sequence step by step or frame by frame. He describes each frame before the next frame is advanced.

Opaque Projection

This is the projection of non-transparent (opaque) materials using the opaque projector. The opaque projector projects images from textbooks, newspapers, magazines, maps, illustrations, diagrams, photographs, specimens, objects, etc. by reflecting light off the material through a series of lenses onto the screen or white wall.

The opaque projector is very versatile as it can project a magnified view of any opaque material that can be accommodated in it. These can be two-dimensional materials and some three-dimensional materials.

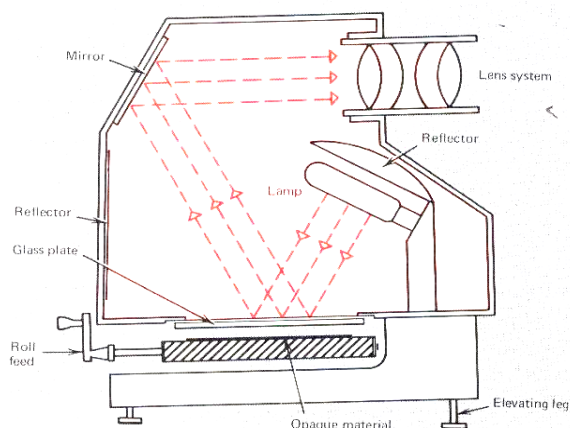


Fig. 4 Opaque projector

Advantages

- (a) Readily available classroom materials can be projected on the spot without being made into transparencies, slides or filmstrips.
- (b) It permits group viewing and discussion of student work.
- (c) Relatively flat three-dimensional objects such as coins, plants leaves, and insect specimens can be magnified for close-up inspection.
- (d) It saves the teacher the time for drawing on the chalkboard or cardboard sheets as materials can be projected directly.
- (e) The teacher can be trace (or adapt) the images projected by the opaque projector on the chalkboard or cardboard sheets easily.

Limitations

- (a) It projects clearly only in dark rooms.
- (b) The opaque projector is bulky, heavy and cumbersome to move.
- (c) The high-wattage lamp generates a lot of heat and may also damage the materials being projected if exposed too long to the projector's light.

Application

The opaque projector is useful for very small groups or classroom size group that need to view the enlarged form of some printed or visual material. It can be used in all curricular areas and at all levels

ACTIVITY 1

1. What do you understand by projected visuals?

2. Distinguish clearly between overhead projection, slide projection, filmstrip projection, and opaque projection.
3. Distinguish between still projection and motion pictures.
4. Discuss the attributes of each of the four kinds of projected visuals treated in this unit.

AUDIO MEDIA

Audio materials are those materials that rely solely on the sense of hearing for teaching and learning. By audio media is meant the various means of recording and transmitting the human voice and other sounds for instructional purposes. The audio materials and equipment commonly used for classroom instruction are: the phonograph or record player, the open-reel tape recorder, the cassette tape recorder, and radio. In this section only the tape recorder and radio will be discussed.

Audio Media

- * Record player
- * Tape recorder
- * Radio

Characteristics of Audio Media

Briefly put, audio media has the following attributes:

- (a) They are relatively inexpensive in terms of costs of production, distribution and use.
- (b) They are widely available and accessible to both teachers and students.
- (c) They are appropriate for a wide range of teaching and learning purposes.
- (d) They are simple to operate and are portable.
- (e) They speak directly to their audience in a personal, powerful and persuasive way.
- (f) They are very effective for teaching and learning especially when combined and integrated with print and other learning activities.
- (g) Audio materials can be adapted easily to any vocabulary level and can be used for group or individual instruction.
- (h) Literacy is not a requirement for using audio materials.

Limitations

- (a) They tend to fix the sequence of a presentation even though the user can remind, fast forward or stop it.
- (b) Students may 'hear' without 'listening' and comprehending the audio presentation. Hence there is need for someone to stand over the learners or speak with them face-to-face.
- (c) The initial cost of playback and recording equipment may be a problem.
- (d) It takes time to develop audio materials.
- (e) Storage and retrieval of audio materials (tapes and records) can also be a problem.

Audio Tapes/Cassettes

The tape recorder is the hardware used in playing the audio tape and cassettes. Many of the cassette tape recorders use electricity and/or ordinary torchlight batteries. Radio cassette recorders have radio components.

Audio tapes come in various formats: the reel-to-reel, the cassette tape, the micro cassette and the audio cartridge.

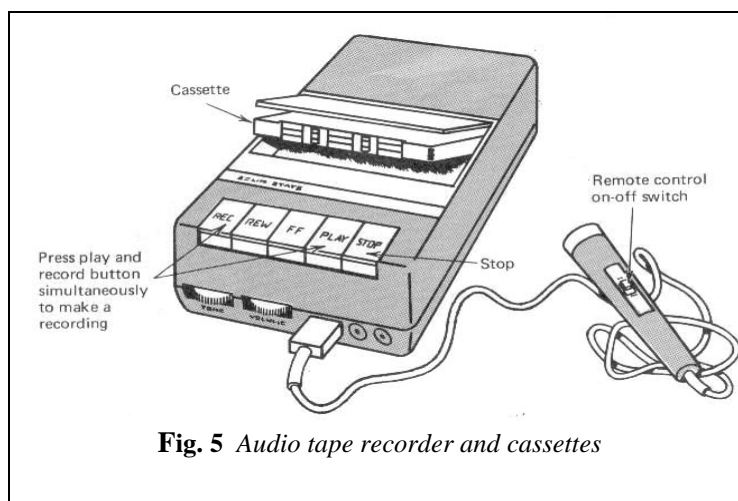


Fig. 5 Audio tape recorder and cassettes

Advantages

Audio cassettes have a number of advantages:

- (a) It is easy to record and erase when necessary.
- (b) They are durable and are easily stored.
- (c) Audio cassettes offer users a high level of control over the way they use the material. Users can listen to the cassettes when, where, how and as often as they like.
- (d) They are relatively cheap to produce, distribute and use.
- (e) It is easy to integrate the use of audio cassettes with other learning materials (e.g. printed texts) and learning activities (e.g. reading, writing, practice, etc) since it allows the user to stop, start, re-wind and fast-forward the tape.
- (f) Literacy is not a requirement
- (g) It is very useful for teaching language arts as in Oral English

Limitations

- (a) Background noise and hissing sounds may be recorded along with the intended material. This can ruin an otherwise good recording.
- (b) Tapes sometimes stick or get tangled in the recorder.
- (c) It may be difficult to edit or to locate a specific segment on an audio tape that you urgently need.
- (d) It is easy to accidentally erase useful material if you don't break out the small plastic tabs on the rear of the cassette.
- (e) Audio cassettes may deteriorate in quality when stored for a long period of time.
- (f) It deals with only the sense of hearing.

- (g) It requires power source such as electricity or batteries.
- (h) Need to be integrated with other media especially print.

Radio

There are large radios and pocket size transistor radios. We have car stereo, and radios in the living room, in the bedroom, in office and even in kitchen. You can see that the radio is a popular and powerful mass media which can reach even the remotest parts of the country. It can reach a large number of listeners, spread over a large area, more or less simultaneously. Not only is radio being used in many countries of the world for direct instruction, schools and colleges can always integrate radio programmes into the school activities. Such programmes help to enrich instruction. Radio is a type of wireless communication device in which sound wave are transmitted from a broadcasting studio and received by radio sets.



Fig. 6 Radio

Advantages

It is very accessible as it can reach large numbers over a large area at relatively low cost.

Literacy (ability to read and write) is not a requirement.

Radio sets are relatively low cost and portable.

Radio can be used to motivate and mobilise learners. It can provide encouragement at a time when students need it most.

Radio helps to disseminate up-to-date news and information about issues of common

educational, political, economic, social, moral or even religious interest.

Radio can provide tutorial support to students such as guidance, counseling, new ideas, introduce new areas of study, etc.

Radio can offer listening and learning experiences that are not readily available through print or face-to-face contact e.g. bringing into the classroom the voices of experts, politicians, resource persons; it can take listeners to places and situations beyond their reach, etc.

Radio can be used for direct teaching i.e. as a substitute for print or face-to-face contact. This is particularly so in a situation where sounds are central to instruction as in language or music teaching.

Radio serves as a source of entertainment. It provides music, stories and jokes.

Limitations

Broadcast times may be inconvenient for the user because of other activities.

Reception may be poor in certain places.

Not every one can afford the cost of batteries.

The user has no control over pace and time of broadcast.

Radio is an audio media and so may require accompanying visual materials.

Radio is a one-way medium making feedback difficult and lessons cannot be interrupted.

Recording radio programmes on cassettes can help check some of the limitations of above.

Application of Audio Media

According to Heinich R. et al (1982:147): “the uses of audio media are limited only by the imagination of teachers and students”. In other words, there is virtually no limit to which audio media could be used.

Audio media can be used as follows:

1. **Teaching of Listening Skills:** Audio recording can be used in training children to acquire listening skills. By playing back to them several times, recordings of songs, fairy tales, folk tales that are interesting, children can become interested and eager to learn. With time they can be asked to sing with the tape or recall the stories. This training can be carried over unto listening to radio broadcasts.
2. **Language teaching:** Audio media are very useful for developing creative expression, oral language exercise, poetry, creative dramatics and vocabulary practice.
3. **As support to visual materials:** Silent films, slides and filmstrips and print materials are enhanced when they are accompanied by audio recordings.
4. **Direct instruction:** Audio media can be used in all phases of instruction from introduction

to evaluation of a lesson. According to Heinich, R. et al (1982:147): “Perhaps the most rapidly growing general use of audio media today is in the area of self-paced instruction and in “mastery learning”. Pre-recorded audio materials are available in a wide variety of subjects. In Music, various applications can be found. In nursery and primary classes, tapes and records can be used to present rhymes, drama, story telling, songs, etc. In social studies and some other subjects, voices or resource persons (experts, politicians, authors, businessmen, artisans, traditional rulers, historical figures, etc) sounds from the environments can be brought into the classroom. There are “talking books” for blind and visually impaired students. Other applications are use in drills such as in practising the multiplication table, spelling, pronunciation, dictation etc. Information from field trips to places like the museum and interview with resource persons can be recorded on tapes and played and reviewed in class.

5. Evaluation: Audio media can be used for evaluation of student’s achievements. In the TCII Oral English Examination of the NTI, examiners use audio tapes to record the student’s speech. Audio tapes can also be used for micro- teaching, although video recording may be preferred.
6. Audio media for open and distance education: Radio and audio tapes have been used to broadcast programmes that aim to teach directly and indirectly. They have also been used for both formal and non-formal learning, whether in the classroom, factories, community centres or at home. Thomas, John (2001:7) gives five main roles of the radio in distance education as:
 - ◆ news and information
 - ◆ motivation and mobilization
 - ◆ tutorial support
 - ◆ resource material
 - ◆ direct teaching

ACTIVITY 2

1. Explain with examples the various kinds of audio media used for instructional purposes.
2. Describe attributes (six advantages and four limitations) of audio media
3. Compare and contrast the attributes of audio tapes/cassettes with those of the radio.
4. Explain how the limitations of radio can be overcome.
5. Discuss the statement: “the uses of audio media are limited only by the imagination of teachers and students”.
6. Prepare an audio tape. Purchase educational audio materials. Use the criteria in section 2.3 Unit 2 Module 2 to assess each of the materials. Take your findings to your course facilitator.

SUMMARY

- Projected visuals are visuals that require the use of projectors and electricity for their projection for viewing.
- Examples of projected visuals are: opaque projection, overhead projection, slide projection and filmstrip projection. The advantages, limitations and application of each was described.
- Audio media are materials that rely solely on the sense of hearing for teaching and learning.
- The audio materials and equipment commonly used for classroom instruction are: the phonograph or record player, the open-reel tape recorder, the cassette tape recorder, and radio.
- The characteristics, advantages and limitations of the tape recorder and radio were described.
- The use of audio media in the classroom was highlighted.

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UNIT 2: MULTIMEDIA SYSTEMS

INTRODUCTION

In the units above, we saw the strengths and weaknesses of the various types of instructional media. It is clear that we need to combine various media so that we can get maximum benefits from them. The use of two or more media in instruction is referred to as multimedia.

In this unit, we will describe the attributes of sound-slide, sound-filmstrip combinations as well as multimedia kits. We will also look closely at the instructional attributes of motion pictures such as film, television and video.

You will agree with me that the television in particular is becoming a familiar and powerful medium of education.

OBJECTIVES

At the end of this unit, you should be able to:

1. explain the concept of multimedia;
2. describe the sound-slide combination and give any three advantages;
3. briefly describe the 8-mm film-audio cassettes, sound-slide and sound –filmstrip combinations;
4. describe the characteristics, advantages and use of multimedia (or learning) kit;
5. identify the various types of motion pictures;
6. explain the term film and describe five of its attributes and five uses of film for instructions;
7. identify five advantages and five limitations of television as an instructional medium;
8. discuss the use of television in formal and non-formal education;
9. distinguish clearly between educational television (ETV) and instructional television (ITV); and
10. describe the following instructional television delivery systems: (a) broadcasting, (b) closed-circuit television, (c) cable television systems (d) micro wave transmission and (e) portable video.

CONCEPT OF MULTIMEDIA

Multimedia simply means a combination of media for a given instructional purpose. In units 6 and 7, we discussed various types of instructional media. For more effectiveness, it is often necessary to combine two or more media for instruction. Such combination helps them to complement one another. The advantages of one help to make up for the limitations of the other. Media combinations are generally referred to as multimedia systems.

Multimedia systems have become very useful in current educational practice. In the first place, there is a trend towards individualization of instruction and promotion of active learner participation. Secondly, learning in the real world involves more than one sense. In other words, it is multi-sensory. Learning takes place from various sources discussions, radio, television, newspapers, pictures, bill boards, etc. Multimedia systems are therefore useful in making learning more meaningful, exciting and enjoyable.

In this unit, we will discuss the following:

- ◆ Sound-slide combination
- ◆ 8-mm film – audio cassette system
- ◆ Multimedia (Learning) kits



SOUND-SLIDE COMBINATION

The slides and filmstrip projectors are silent unless combined with audio tapes or records. Sound-slide combination combines the two components of sound and visuals either in the same machine or a tape recorder may be used separately from the slide or filmstrip projector. The machines in which the visual and audio components are combined (sound-slide sets) often have automatic mechanism for showing the visuals along with the sound. Where the slide projector is separated from the tape recorder, the visual and audio components are operated manually.

Sound-slide combination is easy to use and effective both for group instruction and independent study in the classroom and in the media resource centre. Filmstrips may be combined with audio tape in the same way as slide and tape. Sound-slide presentation may be used in almost any instructional setting.

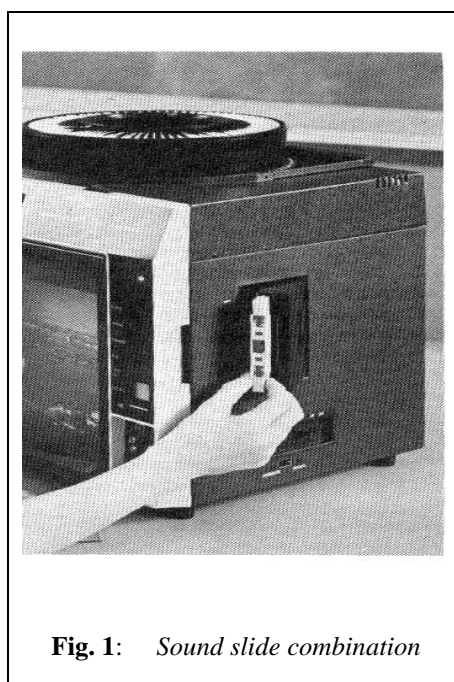


Fig. 1: *Sound slide combination*

MM FILM - AUDIO CASSETTE SYSTEM

The 8-mm film-audio cassette combination is similar to the sound-slide and sound-filmstrip combination. In this case, the 8-mm film is accompanied with an audio cassette. Whereas the standard motion picture carries the sound and picture together, in the 8-mm film-audio cassette system, the sound and picture are separated into two individual packages. The audio tape moves at a constant speed, but the film can be programmed to move at variable speeds. The 8-mm film-audio cassette system is particularly useful when we need to integrate still visuals with moving pictures.

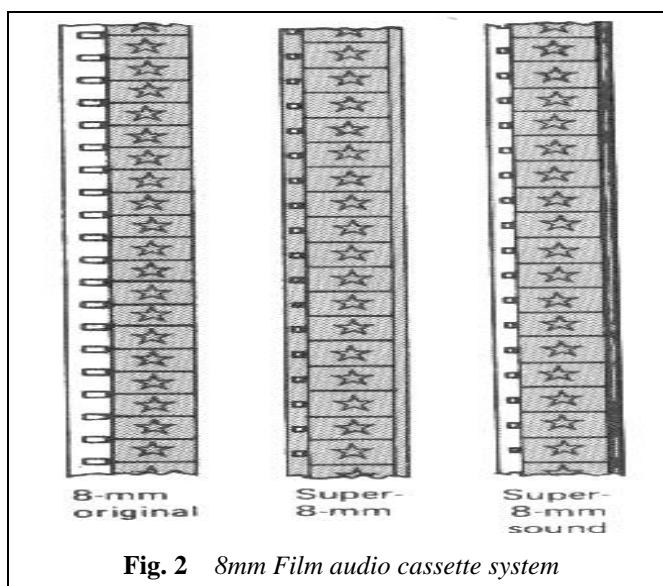


Fig. 2 8mm Film audio cassette system

MULTIMEDIA (LEARNING) KITS

As already noted, use of more than one medium for instruction facilitates learning. The various media used help to complement one another. A multi-media or learning kit is defined by Heinich, R. et al (1982 : 174) as:

a collection of teaching/learning materials involving more than one type of medium and organised around a single topic. The kits may include filmstrips, slides, audio tapes, records, still pictures, study prints, overhead transparencies, single-concept films, maps, worksheets, charts, graphs, booklets, read objects and models.

The multimedia or learning kit has the following characteristics:

1. It is a collection of learning materials, methods and activities that is integrated in such a way as to achieve the specified objectives.
2. It involves more than one medium.
3. It is organised around a learning experience, topic, unit or module.
4. It can be used with or without the teacher.
5. It could be used for a whole class or for group or independent study.
6. The components of the learning kit may be used together at the same time or one after the other.
7. The multimedia kit may be teacher-made or commercially-made.
8. The learning kit may contain clearly defined objectives that are stated and supported with

suggested teaching strategies for using the materials in the kit.

- Multi-media (Learning) kits stimulate active participation, encourage individualized, multi-sensory learning and help to make learning meaningful, exciting and enjoyable.

ACTIVITY 1

- What do you understand by the term “multimedia”? Describe any six of its characteristics.
- Describe how you might use a multimedia approach in teaching a topic of your choice.
- Produce a multimedia kit in your teaching subject area. Prepare a report on the possible applications and relative merits of the kit.
- Does accompanying the slide or filmstrip with sound enhance its effectiveness in instruction? Justify your answer.

MOTION PICTURES (FILM)

According to Dike (1999.66):

motion pictures refer generally to those media that have the attribute of presenting moving images. The term is often used for films but also includes, at least for our purpose, television and video because they also present moving images. Film and television (including video) belong to that select group of media that appeal to both the audio and visual senses.

Motion Pictures

- * Films
- * Television
- * Video

Thus, the attributes of the film and their application in instructional situations, in most cases, also apply to the television and video.

What are Films?

Films are motion pictures. A film is simply a long strip of film that consists of a sequence of still photographs each of which is called a frame. Films carry sound, pictures and motion. The film is therefore a very powerful instructional medium. It is capable of holding the attention of learners, providing realistic experiences and creating in learners the emotional impact that facilitate learning. Film gives a sense of participation and broadens the learners’ experience.

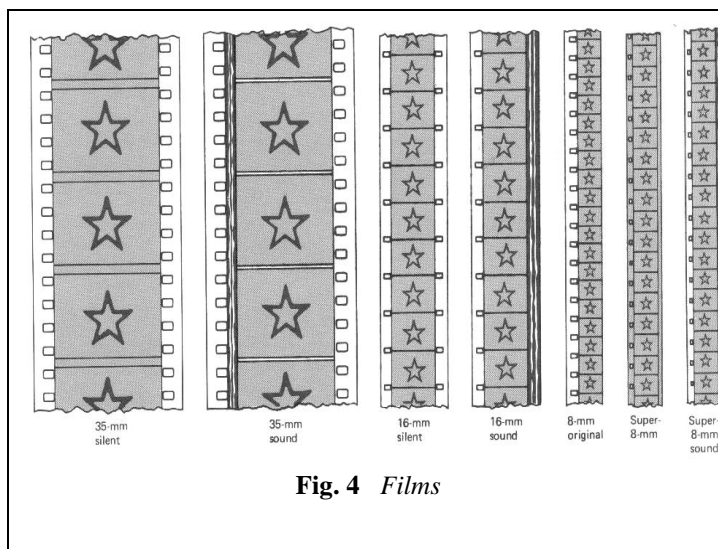


Fig. 4 Films

Films come in three sizes: 8-mm, 16mm and 35mm. The 8mm type is the simplest and is particularly suitable for home use, small group or individualized instruction. The ideal film for classroom instruction is the 16mm. The 35mm film is most commonly used for commercial purposes such as in cinema houses. Films demand complete darkness.

Attributes of the Film

1. The film can provide intensely realistic experiences.
2. They help to reveal the remote, the inaccessible, the invisible, the inaudible and take the viewers to the historic past.
3. It blends motion, sound and realistic image so well as to break the barriers of communication.
4. Viewers are able to respond emotionally as if they are experiencing a real situation rather than its representative.
5. The film can manipulate to advantage time and space. The film can compress the time that it takes for an event to occur. For example, an event that spanned a century can be shown in a matter of minutes or hours. Conversely, through slow motion, a film can capture events that are too fast and show them at normal speed. The film enables us to view things at extremely close range or from a vast distance.
6. The film through various devices can “freeze” action, give illusion of movement to objects that would otherwise not move. This means it is capable of animation.
7. They are useful for large classes, small group or individual instruction.

However, film can be expensive to purchase and to produce. Most are foreign produced and may create language difficulties. They require electricity and need to be viewed only at night or in darkened rooms.

Use of Film for Instruction

The film can be used for instruction in the following ways:

1. Concepts that involve motion and processes are better taught with the film. For example, industrial operations, manufacturing processes, scientific experiments, can be observed and studied through use of film.
2. Teaching of skills requires certain repetitive activities for mastery to take place. The film can repeat the skills being taught over and over again for observation and practice.
3. Films are very useful in teaching and learning in the affective domain because of their great emotional impact.
4. Film can present intricacies of other cultures. They dramatize events and situations. They are particularly useful for teaching social studies and cultural studies.
5. Films help to bring events, people and places in the outside world into the classroom. Hazardous occurrences such as volcanic eruption; violent or disruptive events such as

wars, strikes, terrorist attacks etc. can be safely presented on film.

6. Films are useful in all areas of the curriculum. In social studies, the film helps to recreate the past and show how people live. The film's ability to dramatize events and situations can promote the study of language and literature. Films help to make processes and relationships clear. This makes them useful in the teaching and learning of science and mathematics.
1. The film's ability to use animation (giving illusion of movement to objects that would not otherwise move) helps in explaining complex process.

ACTIVITY 2

1. Differentiate between still pictures and projected still pictures.
2. "The term motion picture is often used for films but also includes television and video". Discuss
3. Describe any five attributes of film
4. Discuss any five uses of film for instructional purposes.
5. Briefly describe how you can convert a slide presentation into an audio visual presentation.
6. Visit a film library or educational resources centre. Obtain a film, view it, summarize the content and write a critique in the light of what you intend to use it for.

TELEVISION

The television is like the film except that it is electronically operated whereas the film is mechanically operated. Television and video share all the advantages of motion pictures and have an additional advantage of needing no operator.

Today, the television has become not only a mass medium but also fast becoming an individual medium. The home video recorders have taken the television to schools, workplaces, commercial houses, etc. Television is becoming nearly as available as audio tapes and has become a rich resource for instruction and training. Availability of video tapes and video recorders make it possible for teachers and the students to have control of the time when a programme of interest is used or viewed, when it can be stopped and repeated.



Fig. 5: *Television sets*

Attributes of Television

Advantages:

The television has so many advantages as an instructional medium.

1. Like film, television is particularly useful in areas in which sound and moving pictures and models are needed to enhance understanding.
2. Television brings the real world experiences to the classrooms, homes, workplaces and everywhere. Television has high visual impact as it presents life-like and realistic experiences.
3. Television stimulates interest and motivates learners to learn.
4. Unlike film, television can be utilized or viewed in daylight or in any open or bright place.
5. Television programmes can be recorded on video-tapes and utilized at a convenient time or stored away.
6. Television is increasingly becoming a familiar medium, portable and easy to operate.
7. Television broadcasts can reach people spread across a wide geographical area. For example, world cup finals can be viewed all over the world at about the same time.
8. Television conveys a sense of immediacy and a feeling of participation. Events can be transmitted live.
9. In micro-teaching, the students-teacher can observe his teaching on television and make self-evaluation with a view to improving on his skills.
10. Close circuit television is useful in extending a class or lecture to a wider audience in different classrooms.
11. Television makes multi-media approach to instruction possible as it can incorporate and distribute other media such as demonstration, chalkboard presentations, charts, models, specimens, motion pictures, still pictures, diagrams, filmstrips, photographs, etc (Dale 1969).

Limitations

1. Television technology is complex and may develop technical difficulties, such as poor signals, production problems, etc.
2. Television can be an expensive form of educational media. Cost of purchase of the television and its accessories such as video recorder, video tapes, etc may be high. The human labour needed in production, distribution, maintenance and utilization of television, apart from spare parts can add to costs.
3. A large audience may need the larger screens used for viewing in films.
4. The television is essentially a one-way medium of communication. The viewer cannot

interact with the speaker. He cannot stop the speaker in a television programme to ask questions. The speaker also moves at his own pace.

5. Lack of infrastructure in schools such as electricity supply hinders the use of television.
6. Television broadcasts tend to be at times that are inconvenient to learners.

Use of Television in Education (Formal and Non-Formal)

Essentially, television broadcasting aims at informing or entertaining the target audience. Even as it entertains, a lot of learning can take place, whether intended by the designer of the programme or not. For educational purposes, television is used for either enrichment or direct teaching. Television broadcasting and videos provide formal, non-formal and/or informal education.

In formal education, learning is carried out in specially built institutions such as schools and colleges. The curriculum is highly structured with syllabuses and timetables. Successful completes are awarded certificates.

Non-formal education, on the other hand, is any organised learning activity outside the formal education system that is aimed at meeting specific learning needs of particular groups of children, youths or adults in the community. This type of education is more loosely structured than the formal system but less flexible than the informal education.

Non-formal educational television programmes include various kinds of adult literacy campaigns on health, agriculture and family planning, agricultural extension, skill training, etc. There is more flexibility as to the places and methods of training.

Information education, on the other hand, is not structured. Much of the learning goes on unconsciously, through observation or mere imitation. It is more haphazard.

It is necessary to emphasize that in reality each of the forms of education described above do not have clear line of distinction between them. They form a continuum, each merging into the next.

As a teaching tool, Bate (1982) cited by Burke (1992:75) suggests that television can be used to:

- demonstrate experiments or experimental situations.
- illustrate abstract principles through the use of specially constructed physical models.
- illustrate principles involving two, three or n-dimensional space.
- use animated, slow-motion, or speeded up film or video tape to demonstrate changes over time (including computer animation).
- teach certain advanced scientific or technological concepts.

Educational Television (ETV) and Instructional Television (ITV)

Educational television is a broad term used to cover all television programmes aimed at educating rather than entertaining the public. The target audience do not aim at passing any prescribed examination after listening to the programme. The programme may not cover any laid out

syllabus.

Instructional television, on the other hand, is defined by Heinich (1989:215) as: “any planned use of video programmes to meet specific instructional goal regardless of the source of the programmes (including commercial broadcasts) or the setting in which they are used (including business/industry training)”. In ITV, the broadcasts or videos are related directly to an organised programme of formal instruction and directed to specific learners. These may be school and college students, distance learners, industry trainees, etc. In instructional television programme, a specific body or topic of a formal course of study is broadcast to a particular group of students in the school, at home, in the workplace, etc. The target learners may use the programme to pass a prescribed examination as a syllabus may be covered

Heinich (1982:218), identifies five delivery systems through which instructional television programmes reach viewers. They are:

1. Commercial and non-commercial broadcasting.
2. Closed-circuit television
3. Cable television systems
4. Microwave transmission.
5. Portable video.

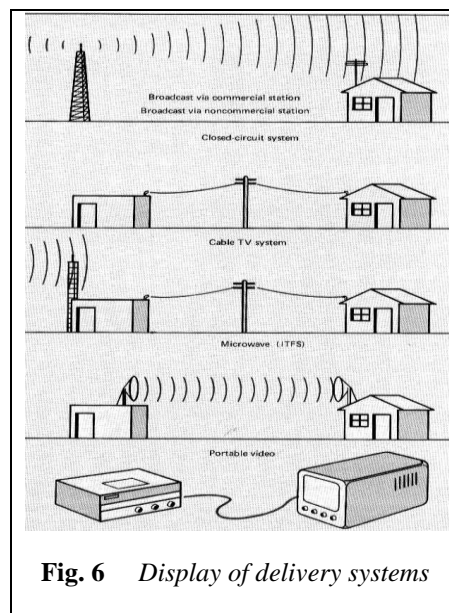


Fig. 6 Display of delivery systems

Educational or Instructional Television Programmes can be transmitted from broadcasting houses through terrestrial transmitters to television sets located in schools, homes, business premises, factories, religious places, etc. In Nigeria, the Schools Broadcast Units of States and the National Educational Technology Centre distribute and transmit instructional television programmes. Sesame Street is a very popular children’s television programme that has been broadcast from several television stations. Many similar programmes are broadcast regularly.

Closed-circuit television, according to Heinich, R. (1982:222) is a television distribution system in which the sender and the receiver are physically linked by wire. Classrooms, whole campuses, even districts could be linked by closed circuit systems. The closed-circuit television uses a network of cables or wires through which the television signals are distributed from a source to the reception points such as classrooms.

Television programmes are also delivered through the cable television system, the microwave and video. The cable television allows transmission on multiple channels.

The Video

Videos can easily be obtained. They are portable and flexible. More and more homes own or have access to video cassette players. Video can be used to tape instructional television (ITV) programmes and put away for use at just the right time to suit specific learning objectives and particular teaching/learning situations.

Video cassettes are relatively cheap and the cost of the machines are dropping. Learners have control over the machine as they can pause, rewind, fast forward and replay. The video is therefore supplementing or even replacing broadcast television as mode for delivery of instructional television.



Fig. 7 Video recorder and video cassettes

ACTIVITY 3

1. List and explain six advantages and four limitations of television as a medium of instruction
2. Discuss the use of television in formal and non formal Education
3. Distinguish clearly between educational television and instructional television.
4. Compare and contrast television broadcast with video recording as instructional media.
5. Differentiate between the following delivery systems:
 - (a) television broadcast
 - (b) closed circuit television,
 - (c) cable television
 - (d) microwave television
 - (e) portable video
6. Obtain an instructional television broadcast recording from a television or a video shop and write a report on: the target audience, the instructional objectives it can achieve and state how you can use it in your classroom.

SUMMARY

- Multimedia simply means a combination of media for a given instructional purpose. When two or more media are combined, they are expected to complement one another.

- The sound-slide combined on 88mm film-audio cassette system and multi-media kits were described.
- Motion pictures include films, television and videos. They blend motion, sound and realistic image.
- The attributes of the film and their application instructional situation also apply to the television and video in most cases.
- Television (broadcasting or videos) provide formal, non-formal and/or informal education.

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UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY

INTRODUCTION

We are in a new world of globalization. Whatever happens in one part of the globe is transmitted very quickly to other parts through the mass media and the internet. This is made possible by new technologies such as telecommunications, computers and electronics.

It is only a few years ago that we started hearing about internet, e-mail, satellite, computer, GSM, etc. Now we use them in various ways. Older technologies such as the typewriter, landline, post office, library, etc. are being enhanced or replaced with newer technologies.

We can no longer ignore the new information and communication technologies especially in education. This is the topic treated in this unit.

OBJECTIVES

At the end of this unit, you should be able to:

1. define information and communication technology;
2. identify the characteristics of ICT;
3. describe the four categories of ICT;
4. describe the contributions of telecommunications, computers and micro-electronics to the rapid technological development of ICT;
5. list and discuss ten uses of ICT in education;
6. define computer and describe the main components; and
7. identify and explain with examples the following computer resources: (a) instructional software, (b) software tools (c) multimedia/hypermedia software, and (d) internet resources.

WHAT IS ICT?

ICT stands for Information and Communication Technology. There is no generally acceptable definition of the term ICT. We will therefore present below the following definitions.

According to Wali (2001:1),

information technology or IT comprise of various kinds and sizes of computers. The computers are connected via telephones to facilitate the storing of the data they house. The data comes in many forms: texts, sounds and pictures.

This definition places much emphasis on computers as information technology.

To Laudon, K. C. et al (1994:67),

information technology and systems include all the different means, methods and tools that humans have used throughout history to help manage information, conduct business, communicate with others and better understand the world.

This definition is very elastic. It incorporates virtually every kind of device used in gathering and disseminating information.

According to Liverpool (2002:1);

ICT is a generic term referring to technologies that are used for collecting, storing, editing and passing on information in various forms.

This definition is precise.

Butcher (2003:10) citing Gunton (1993:150) defines ICT as:

Electronic technologies for collecting, storing, processing and communicating information. They can be separated into two main categories: (1) those which process information, such as computer systems, and (2) those which disseminate information, such as telecommunications system.

From the definitions above, we can make the following deductions:

1. Information and Communication technology carry out the following functions:
 - collecting information
 - storing information
 - processing information
 - communicating information.
2. ICT are technologies, equipment and methods used to handle information. These include computers, telecommunications and electronics.
3. ICT may cover both 'old' and 'new' technologies used for handling information from paper, pencils, books, cameras to computers.

Essentially, a modern information system follows the same pattern as the communication cycle or process. It is an input-process-output cycle. It involves taking in data (such as raw scores, names, pictures and sounds, information, etc) (input), analysing this information using computer to process (store, manipulate, rearrange and analyse) the data and finally displaying this processed information to users usually on computer screens, television screens, printers, or even through loud speakers (out put). The information supplied as output can then be used as a basis for acting on the data that was input (feedback).

ICT TECHNOLOGIES

Although a large assortment of information and communication technologies exist, Laudon, K. C., et al (1994:6) categorized the different kinds of information and communication technologies

into five basic types:

1. Sensing Technologies
2. Communication Technologies
3. Analysing Technologies,
4. Display Technologies, and
5. Storage Technologies

1. **Sensing technologies** are devices that help us to gather information from the environment and translate that information into a form that can be understood by the computer. Examples are: data collection, devices, sensors, scanners, computer keyboards, computer mouse or trackballs, electronic pens, touch screens, etc.

Sensing Technologies

- * Sensors
- * Scanners
- * Keyboards
- * Mouse
- * Electronic pens
- * Touch screens etc

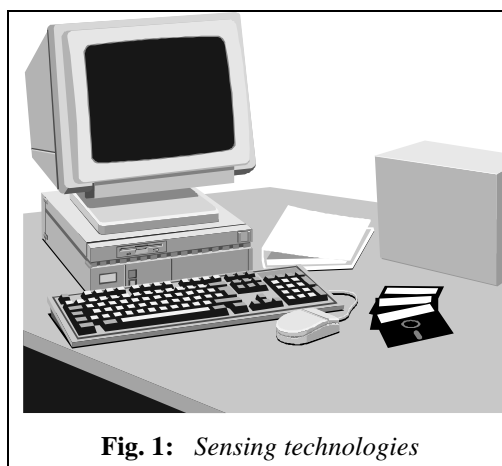


Fig. 1: Sensing technologies

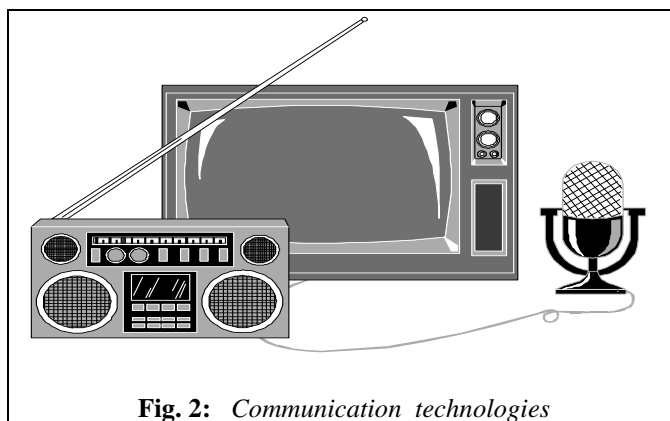
2. **Communication Technologies:** These are technologies that tie together and communicate information between the various kinds of technologies. Examples include fax (facsimile) machines, cellular telephones, computer networks, telecommunication networks, etc.

A network is a group of devices that is linked together. The private branch exchanges (PBXs) is a local area network that helps to connect individual telephone lines within an office. Offices with more than one computer may link them together with or without cables. Such linked or networked computers can share data, programmes and printers. A local area network (LAN) may cover several floors within a building, an entire building, or even a campus. Many LANs also feature devices that allow them to communicate with other LANs.

For a larger geographical area, a wide area network (WAN) is needed. The WAN uses telephone lines, microwaves and satellite communication networks. The Internet is perhaps the most famous and largest wide area network. It connects thousands of smaller networks and millions of users all around the world. It provides access to a vast array of information stored in computer systems throughout the world. With a PC (personal computer), a telephone line, and modem, anyone can get Internet access in one form or the other.

Communication Technologies

- * Fax
- * Cellular telephone
- * Landline
- * Television
- * Radio
- * Video
- * Computer

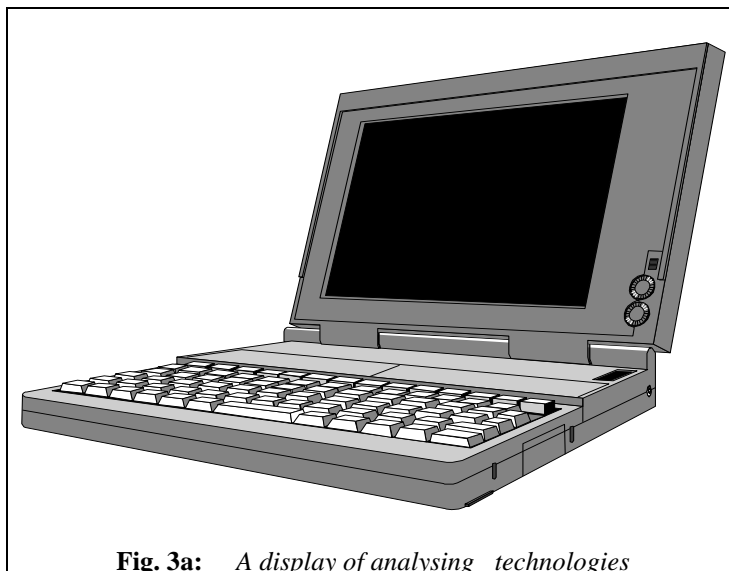
**Fig. 2:** *Communication technologies*

3. **Analysing Technologies:** The computer hardware and software come within this category. Computers take in information from sensing and communication devices and then store and process the information. There are various kinds of computers. According to size, Laudon K. C. (1994:8) makes the following classification:

- Small (Micro computers) - PCs - desktops, Laptop and notebook, handheld or Palmtop computers.
- Medium (Workstations and Minicomputers)
- Large (Mainframes, and supercomputers).

Analysing Technologies***Small size computers***

- * Micro computers
- * Personal computers (PCs)
- * Desktops
- * Laptop
- * Notebook
- * Handheld
- * Palmtop

**Fig. 3a:** *A display of analysing technologies*

Analysing Technologies***Medium size computers***

- * Workstations
- * Mini computers

Large size computers

- * Mainframe computers
- * Super computers

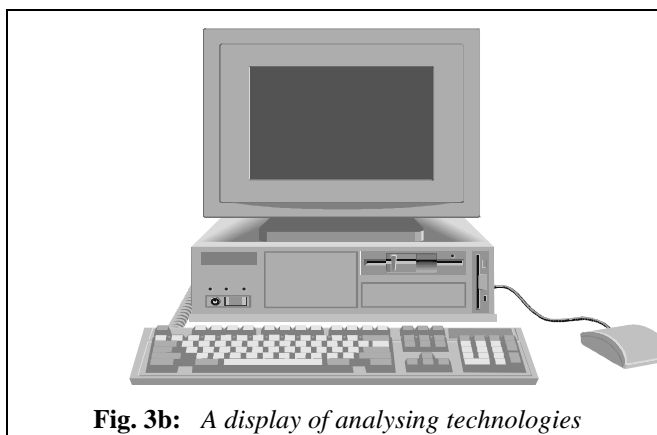


Fig. 3b: *A display of analysing technologies*

4. **Display Technologies:** These are essentially output devices. They make processed data available to human users, either through sight or sound. Examples include display screens, printers, audio output devices such as loudspeaker, etc.

Display Technologies

- * Display screens
- * Printers
- * Loudspeakers, etc.

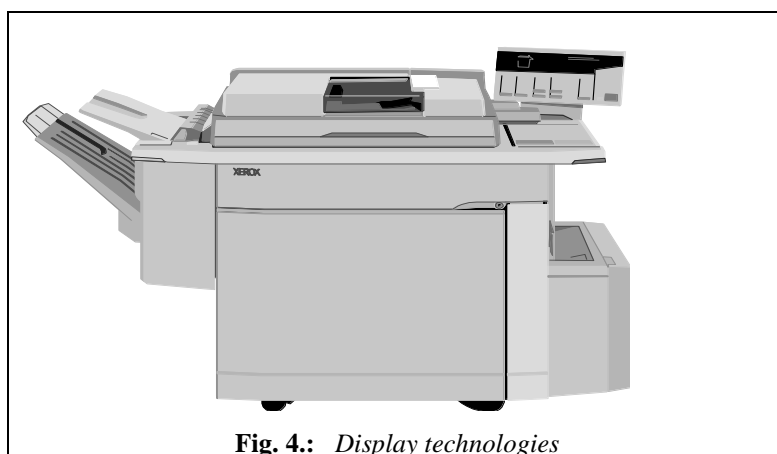


Fig. 4.: *Display technologies*

5. **Storage Technologies:** Another important category is the storage technologies. They help to store large quantities of information in a form that can be easily accessed. Apart from the primary memory in the computer, we have other secondary storage devices such as:
- Magnetic Tape
 - Floppy disc or diskettes and hard disc),
 - Magnetic Disc
 - Optical disc (CD-ROMs, read only memory, VCDs video compact discs, WORMs, etc).
6. According to Dictionary of Information Technology, an optical disc is a thin, circular disc which can store information. Laser light is used to read data from and write data to them. Data is stored digitally. An optical disc can store much more data than a magnetic disc of

the same size. The optical disc technology is very useful for multimedia delivery of material and have a huge capacity for data storage.

Storage Technologies

- * Magnetic tape
- * Magnetic discs
- * Floppy discs
- * Optical discs
 - CD Roms
 - VCDs
 - WORMs, etc.

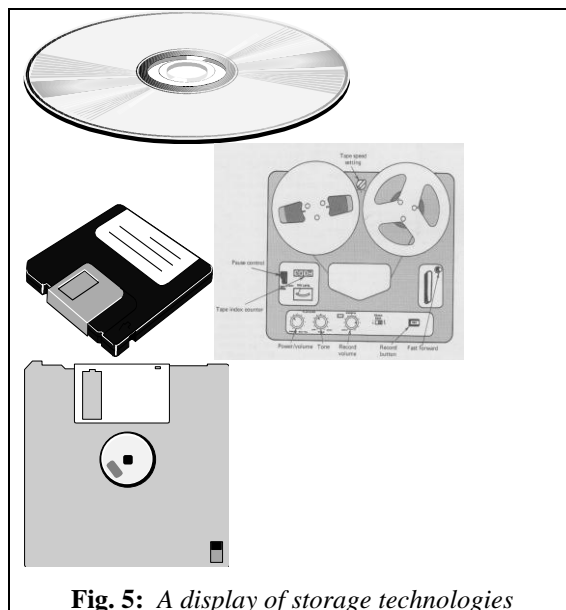


Fig. 5: A display of storage technologies

ACTIVITY 1

1. Explain in your own words what ICT means.
2. What are the characteristics of ICT?
3. Describe the various kinds of ICT technologies highlighting relevant examples.
4. Describe the functions of ICT.

TELECOMMUNICATIONS, COMPUTERS AND MICRO-ELECTRONICS

New versions of older technologies are emerging on a daily basis. For example, the typewriter has given way to the computer, the telephone landline is fast losing its place to mobile telephones, the post office is giving way to the e-mail, the library is transforming into the virtual library. The Internet which stores and sends messages in any mixture of media (voice, data, and image) has virtually 'swallowed up' other media of communication and instruction. However, both old and new media are still coexisting and are being combined in various ways

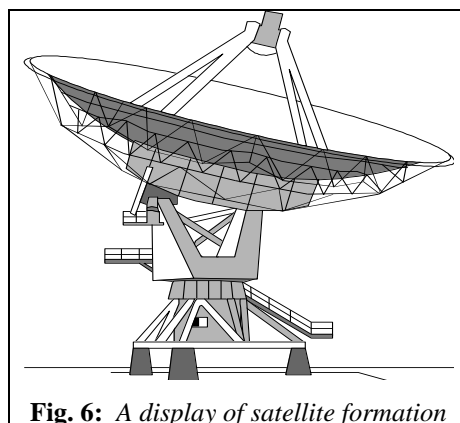


Fig. 6: A display of satellite formation

These rapid technological changes in the area of Information and Communication Technologies

(ICT) have been brought about by the combined contributions of telecommunications, computers and micro-electronics. Telecommunications networks have turned the world into a global village. Through terrestrial cables or satellite, networks have linked users in all kinds of location and enabled them to communicate with each other. Large amounts and varieties of information can be carried over long distances.

Computer technologies have created new ways of accessing, storing, editing, retrieving and exchanging information. Computers have become more powerful (faster with large memories), as well as smaller in size and cheaper.

Laudon, K. C. et al (1994:206) have drawn attention to the “ever-increasing convergence of computer and communication technologies”. This has not only affected information delivery but has also transformed the telephone and the ways we communicate. There is no doubt today that telecommunications, computer technology and microelectronics are intertwined with one another like a cobweb.

USES OF ICT

Robinson (1991:100) says that the use of new information technology can serve three main functions:

- ◆ to deliver all or part of the learning content to learners.
- ◆ to supplement and extend content provided in a different form (e.g. print); and
- ◆ provide a two-way channel of communication for exchange between tutors and students with their peers for feedback or for learning problem-solving, advice, debate and support.

ICT can be used in education in the following ways:

- (a) To support conventional classroom work. The teacher could ask his students to use ICT facilities in school work.
- (b) The computer can help in the design and development of learning materials. So much material can be downloaded from the Internet. Such material must however be adapted to suit the specified instructional objectives.
- (c) Electronic teaching materials such as books, journals, newspapers, magazines etc. can be exchanged through ICT.
- (d) The virtual library “stocks” electronic versions of books, journals, etc. Through ICT, we can access, store, analyse information in electronic form.
- (e) ICT is particularly useful in research as it gives access to a world of resources, especially in electronic form.
- (f) ICT can play a key role in administration. Students’ data, personnel administration, purchasing and supplies, advertisement, etc. can be handled with ease using ICT.
- (g) Independent study and individualized instruction are facilitated by ICT.
- (h) ICT makes learning more vivid and engaging.

- (i) ICT can assist the teacher in assessment and testing.

MEDIUM/TECHNOLOGIES FOR DELIVERY AND EDUCATIONAL APPLICATIONS

Medium	Technologies for Delivery	Educational Application
Face to face contact	<ul style="list-style-type: none"> · Overhead projector (manual or electronic) · Specialist technologies · All of the below 	<ul style="list-style-type: none"> · Seminars, tutorials, classes, workshops, and lectures. · Learner study groups or self-help groups · Conferences · One-to-one interaction, either between educator and learner, learner and learner, or learner and mentor (especially in workplace). · Drama-in-education or theatre-in education sessions. · Practical demonstration and activities.
Text (including graphics)	Print	<ul style="list-style-type: none"> · Books, booklets, and pamphlets, (either already published or written specifically for a course) · Study guides, written either as stand-alone material or as 'wrap-around' guides to already published material. · Workbooks intended for use in conjunction with other media materials (for example, audio or video cassettes or computer-based learning). · Newspapers, journals, periodicals, newsletters, and magazines. · Printed learner support materials (for example, self-tests, project guides, notes on accreditation requirements or other aspects of courses, bibliographies, and handwritten/typed materials or comments passing between learners and educators) · Maps, charts, photographs, and posters. · Written/printed correspondence. · Learner support material (for example self tests, project guides, notes on accreditation requirements, or other aspects of courses, bibliographies, and materials or comments passed between learner and educator).
	Facsimile	<ul style="list-style-type: none"> · Written/printed correspondence · One-multi point distribution

Medium	Technologies for Delivery	Educational Application
	Computers (including a range of applications such as e-mail, electronic databases, World-wide Web hypertext documents, FTP, or ASCII documents, CD-ROM)	<ul style="list-style-type: none"> Electronic publishing Study guides, written either as stand-alone material or as wrap-around guides to already published materials. Instructional material intended for use in conjunction with other technologies (for example, audio or video cassettes or printed material) Newspapers, journals, periodicals, newsletters, and magazines. Learner support material (for example, self-tests, project guides, notes on accreditation requirements, or other aspects of courses, bibliographies and materials or comments passed between learner and educator)
Audio	Audio cassettes	<ul style="list-style-type: none"> Audio programmes (music, talk radio, documentary, literature review, lecture, panel discussion, news, current affairs, debate, drama etc).
	Audio Compact Disc	<ul style="list-style-type: none"> Audio programmes as for above
	Radio broadcasting	<ul style="list-style-type: none"> Radio programmes as above. Radio phone-ins, talk-back radio)
	Telephone	<ul style="list-style-type: none"> Telephone tutoring Information or enquiry service Telephone conferences
	Computer with related applications (including CD-ROMs)	<ul style="list-style-type: none"> Multimedia sound (audio files) Voice communication
Video	Television broadcasting (terrestrial, satellite or cable, digital or analogue transmission, including narrowcast educational television)	<ul style="list-style-type: none"> Video programmes (music, talk shows, documentary, literature review, lecture, panel discussion, news, current affairs, debates, game shows, drama, films etc). Lectures Simulations of procedures and processes
	Video cassettes	<ul style="list-style-type: none"> Video programmes as above Lectures
	Video discs	<ul style="list-style-type: none"> Video programmes as above Instructional material (for example, art pictures or biological photographs)
	Video Conferencing	Video conferences (with two-way audio and video or one way audio).Point-to-multi-point classes with interactive video and audio
	Computers/Internet	<ul style="list-style-type: none"> Video graphics See-You-See-Me conferences
Integrated multimedia	Stand-alone Computer-based workstation, CD-ROM/DVD, CDI, etc.	<ul style="list-style-type: none"> Presentation of information/knowledge Simulations

		<ul style="list-style-type: none"> · Interactive exercise and assessment.
	<p>Networked Computer-based workstation, CD-ROM/DVD, or Set-Top Boxes to public (Internet) or private (Intranet, LAN, WAN) networks.</p> <p>Linking CD-ROM/DVD, or Set-Top Boxes to public (Internet) or private (Intranet, LAN, WAN) networks.</p>	<ul style="list-style-type: none"> · Presentation of material and /or resources integrating all above media (text, audio and video) and possible applications. · Simulations · Assignment submission, assessment and feedback. · Conferencing data, audio, video.

Source: *Butcher, Neil (2003: 26) Technological Infrastructure and Use of ICT in Education in Africa: An Overview*

ACTIVITY 2

1. Discuss the contributions of telecommunications, computers and micro-electronics to the rapid development of ICT.
2. “Older technologies are being reformed into newer technologies” Discuss.
3. List and explain any six uses of ICT in education.

COMPUTERS AND THE TEACHERS’ ROLE

What is Computer?

At its simplest, a computer is a machine for counting and doing calculation. According to Roblyer M. D. (2003:356), a computer is “a set of devices designed to work together to accomplish input, processing, and output functions in order to accomplish tasks desired by a user”. Thus, the computer operates on the basis of input-process-output. It is common to hear garbage in, garbage out. If you input garbage, the computer will process it as such and give you garbage as output.

The computer has the following components:

- **CPU** (Central Processing Unit) - the “brain” or “heart” that carries out all the manipulations.
- **Memory** which stores information for manipulation by the CPU. There are two types of memory - the ROM (Read-Only memory) which carries control instructions that are permanently built into the computer and the RAM (Random Access Memory) which temporarily holds the programme or set of data being manipulated by the user. Programme that is not immediately being used could be stored in magnetic tapes or in discs (floppy discs or hard discs).
- **Input Devices** include the keyboard, the mice and trackballs. The keyboard is a typewriter- like unit used in entering information or instructions. The mouse enables you to control the movement of the cursor (a line, arrow or box) on your display screen. A trackball is simply a mouse turned upside down. It is also possible to have pen-based input systems.

Output devices display processed data in a form that we can understand and use. They include the monitor, the printer and the audio output devices (such as loudspeaker). The monitor displays data both as it is being input and after it has been processed. The printer enable material displayed on a computer screen to be transferred to and displayed on paper.

The Computer in Education

Broadly speaking, computers have been applied in two main ways in education: as computer-managed instruction (CMI) and as computer-assisted instruction (CAI).

Until microcomputers entered schools, classroom computing resources usually were classified under three general headings: computer-assisted instruction (CAI), computer-managed instruction (CMI), and others. CAI usually referred mainly to drill-and-practice, tutorial and simulation software; CMI encompassed testing, record-keeping and reporting software. During the 1980s, other authors began using many more inclusive terms to refer to instructional uses of computers such as computer-based instruction (CBI), computer-based learning (CBL) and computer-assisted learning.

Thus, there is no consensus about the terminology and classification of computer resources in education.

Roblyer M. D. identifies the following:

1. **Instructional software:** These are software that fulfill the following roles:
 - (a) **Tutorial Activities:** Here, the course ware teaches directly. It enables the students to learn the topic without any help or other materials from outside the courseware. It is self-contained. This kind of software will require the learner to be able to read and do independent study. Even with this courseware, the human teacher can still assist slow learners.
 - (b) **Drill and Practice Activities:** The software provide exercises in which students work examples, one at a time and receive feedback on their corrections. Drill and practice software can help save the teacher time as students work on their own. The student can get immediate feedback. It can motivate students to do the practice.
 - (c) **Simulations:** These software model real or imagined systems to show how those systems or similar ones work. Simulations give students access to experiences which would otherwise be impossible. Simulation can show students what it would be like to walk on the moon or to build their own cities, create a budget for them, populate them and run them, including responding to intermittent disasters.
 - (d) **Instructional Games:** These courseware increase motivation by adding game rules to learning activities. They give fun and entertainment to the students because of the challenge of competition and the potential for winning. Teachers need to intersperse games with other activities and use them to foster cooperation

and group work.

- (e) **Problem-Solving Courseware:** They teach directly, through explanation and/ or practice, the steps involved in solving problems or help learners acquire problem-solving skills. These software provide the student with opportunities to solve problems. The problem solving may be specific to teaching content area skills or focus on general, content-free skills.

2. **Software Tools:** These are software that support students with their work.

- (a) **Word Processing:** software allows you to create, edit, format, print and save documents like letters, memos, reports, and other text with much greater efficiency than using a typewriter.
- (b) **Spreadsheet software** helps you organize and manipulate numerical data. A spreadsheet helps users manage numbers in the same way that word processing helps manage words. It is useful for developing a budget, statistics, keeping a roster, tracking grades, calculating GPAs, analysing scientific data, etc.
- (c) **Database software** helps you to store, organize and retrieve information much more efficiently than using paper file folders stored in file cabinets.

Apart from the “basic three” tools described above, there are other software tools that support teaching and learning tasks. Roblyer (2003:85) gives the followings:

- (d) **Materials Generators**
- Desktop Publishing Software
 - Test Generators and Test Question Banks
 - Worksheet and Puzzle Generators.
- (e) **Data Collection and Analysis Tools**
- Grade books
 - Statistical packages
 - Data management (CMI) and Testing Tools
- (f) **Graphic Tools**
- Print Graphics Packages
 - Draw/Print and Image Processing Programmes
 - Charting/Graphing software
 - Clip Art Packages, Video Collections, and Sound Collections.
 - Digitizing Systems and Video
 - Development systems

- (g) **Planning and Organizing Tools**
 - Outlining Tools and other Writing Aids
 - Brain storming and Concept Mapping Tools
 - Lesson Planning Tools
 - Schedule/Calendar Makers and Time Management Tools.
- (h) **Research and Reference Tools**
 - Electronic Encyclopedias
 - Atlases
 - Dictionaries

3. **Multimedia and Hypermedia Software**

Multimedia, according to Roblyer (2003:164) simply means “multiple media” or “a combination of media”. The media can be still pictures, sound, motion, video, animation, and/or text items combined in a product whose purpose is to communicate information.

Hypermedia, on the other hand, is “linked media”. In this system, items of information from all over the world are logically connected with hypertext links. The combination of media such as video and audio with text makes them multimedia; the ability to get from one media/information element to another makes them hypermedia. Multimedia and hypermedia systems come in various forms such as:

- IVDs: Interactive Video discs
- CD-ROMs: Compact Disc-Real-Only
- DVDs: Digital Versatile Discs
- CD-I: Compact Disc –Interactive
- DVI: Digital Video Interactive
- Photo CDs: Photographic Compact Discs.

In recent years, CD-ROMs and DVDs are replacing computer discs and video tapes.

INTERNET RESOURCES

The Internet according to Roblyer (2003: 197) is the “mother of all networks”, because it is a network of networks. It enables people to communicate between or among networks. Although the World Wide Web (WWW) is often thought to be synonymous with the Internet, WWW is a subset of the Internet system.

A major benefit of the Internet is the wide range of information available and services provided. Once connected, users can use the Internet to exchange messages and files among themselves and with others anywhere in the world. The Internet can be used to locate information from virtually any place in the world. The Internet is widely available, easy to use and highly visual and graphic.

Roblyer identifies the following resources:

- **Web Browsing and Searching Resources**
 - Web browsers
 - Search engines
 - Gophers and digital resource centres
- **Communicating in writing on the Internet**
 - E-mail
 - Listservs
 - Bulletin Boards
 - Chat Rooms
 - Instant Messaging (IM)

ACTIVITY 3

1. What is computer?
2. Briefly describe any four components of a computer system.
3. Distinguish between “Computer Assisted Instruction” (CAI) and “Computer Managed Instruction” (CMI).
4. Identify four computer resources.
5. Write short notes on the following:
 - (a) instructional software
 - (b) software tools
 - (c) multimedia/hypermedia software, and
 - (d) Internet resources.

SUMMARY

- ICT stands for Information and Communication Technology. There is no generally acceptable definition.
- ICT technologies may be classified into:
 1. Sensing technologies
 2. Communication technologies
 3. Analysing technologies
 4. Display technologies

5. Storage technologies

- Telecommunications, computers and micro-electronics have combined in various ways to promote rapid technological advances in ICT.
- ICT has been used in education for various purposes. A table showing the technologies for delivery and their educational application was used to summarise the use of ICT in education.
- The computer is made up of various components.
- In education, computers have been applied for instruction, as tools for processing information and for multimedia functions. The Internet presents virtually limitless opportunities for instruction.

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