Indira Gandhi
National Open University
Staff Training and Research
Institute of Distance Education

MDE-418
Educational Communication Technologies

Block

2

TECHNOLOGY PRIMER

MDE-418: Educational Communication Technologies

(New Course in place of ES-318: Communication Technologies for Distance Education)

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Note: Unit 9 is based on previous works of the author, including 'Designing Online Learning' published by the Commonwealth of Learning in 2001. Unit 10 is based on the work of the author entitled 'Mobile Technologies in Open Schools' published by the Commonwealth of Learning in 2009.

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MDE-418: Educational Communication Technologies

Course Outline

INTRODUCTION TO THE COURSE

In the previous courses you have studied that distance education is primarily a technology mediated system of teaching and learning. Media (especially electronic media) plays a significant role in the delivery of educational opportunities to people who need education at their door-step, study at their own pace, time and place. Educator's tryst with technology has been a story of evolution of the media itself. Starting from the use of blackboard and the printed textbook for mass education, educators have always experimented with the use of technologies to improve their teaching and learning at all levels. With the emergence of a variety of Computer and Communication Technologies, the process of adoption and adaptation of innovative technologies for the purposes of education and research has increased manifold. The use of technologies for teaching and learning has been broadly used as Educational Technology, which is the field concerned with the design, development, utilization, management, and evaluation of processes and resources for learning. The Association for Educational Communications and Technology (AECT) defined educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources"[1]. Historically the term educational technology has roots in audio-visual communication, systems approach, and educational technology as a process. In 1994, the AECT accepted 'educational technology' as synonymous with 'instructional technology'. We use the title of the course as Educational Communication Technologies to discuss the use of a variety of technologies for educational communication purpose. We would like you to have an overview of the field, and we are sure your engagements in the course would lead to your further exploration of the field through reading further literature given as references in the units throughout the course.

Course Objectives

At the end of the course, you are expected to be able to:

- Critically examine the process of educational communication to plan, design and use appropriate communication technologies in context;
- Identify the range of educational communication technologies, and their relative strengths and weaknesses;
- Use educational communication technologies confidently to create digital content and deliver these through new information technologies;
- Discuss and explain the general trends in the developments and use of educational communication technologies at national and international level; and
- Create engaging, collaborative, reflective and authentic learning environments for delivery of education and training.

Though the course is theoretical in nature, it has a lot of practical components, and we expect you to use this course to develop skills of using the technologies discussed in the course. We expect you to develop independent learning abilities to use computers and other technical hardware to create learning resources and environments that are interesting, motivating and engaging to the learners. So, you may need access to computer and Internet at home, office or in a cybercafé to practice the ideas and skill related inputs given in the course.

[1] Januszewski, Alan & Molenda, Michael (2008) *Educational technology: A definition with commentary,* New York: Lawrence Erlbaum Associates, p.1

We have also develop a short but interesting **Portfolio** that will give you instruction on how to practice the skill component, and record the outcomes. The portfolio shall be considered as the assignment component of the course and it would be evaluated at your study centre. You will submit the Portfolio at the study centre for evaluation after completing the activities mentioned there. You may like to discuss these activities in the counselling sessions with the available counsellor, who is trained to guide you to accomplish the tasks of the course. He/she will evaluate your engagements in the course through what you present in the portfolio.

There are **Check Your Progress** questions spread over in the course, and we expect you to do these before you actually check for the feedback given at the end of the units. These are opportunity for you to assess your own progress. These are places where you take pause in reading, and think, do, write, discuss and compare your answer with that of the one given at the end. If you check the response before you actually do the task, it would be cheating yourself, and we are sure you will not prefer to do so. If your response is different than the one given in the feedback, we advise you to re-check your own conceptions and thinking about the question/issue and read the topic again.

You may also like to highlight such areas for discussion in the **Counselling** sessions. Your interaction in the counselling session would make it more meaningful and lively. Counselling sessions are also the time when you can meet other learners, and see the diverse nature of the learner profile. It is encouraging to meet people with diverse background reading same subject and discussing and sharing ideas discussed in the course. If your learning style is more towards discussion and interaction, I suggest you must attend the counselling session. Even if, you are shy and like to study on your own through the materials supplied, counselling sessions provide you information about further readings and appraise you of the latest developments in the field. There is so much to learn form others, who are also seriously engaged in learning the same subject. Personally, I have benefited a lot by attending the counselling sessions, when I studied through distance mode.

Besides the counselling sessions, there are other media materials, and services available in this course, and you may like to take advantages of these by attending the teleconference session/virtual class as and when conducted. You will receive information about special arrangements regarding this from time to time.

What is covered in this Block?

This is the second block of the course, and we expect you to have detailed understanding about strengths and weaknesses of educational media used in education. We go from the basic audio to the latest m-learning in this block. Our intention is not to make an expert in online learning or mobile learning, but we certainly want you to have a critical understanding of the potentials of these technologies for improving the quality of education in general and distance education in particular. In Unit 6, we discuss audio and the radio broadcast. We describe the FA radio as the new movement in local content creation though community radio approach, and also the trends towards us of 'pdcasting'. In the Unit 7, we move to audio plus visual as the means of teaching and learning, and therefore discuss video and television in detail. We also discuss wave towards use of video on the net to deliver content. Television is mainly delivered these days through satellite, and in Unit 8 we

discuss ‘satellite-based education’, and the potential of satellite technology for making education at a distance interactive. We give you a snapshot of use of satellite for education in various parts of the world, and describe how you can organize interactive teleconferencing session. In Unit 9, we discuss ‘e-learning’ and give you the steps of designing online learning in your own institution. In the last Unit of this block, we discuss ‘mobile learning’ technologies and their application to provide teaching, learning and support to learners. We also discuss how a theory of mobile learning is emerging. While we expect you to critically go through the content of this block, we encourage you not to miss the Check Your Progress questions. Also, it is always useful to check online sources to know more about the subject, and therefore you should also read web-based information wherever possible.

UNIT 6 RADIO AND AUDIO

Structure

6.0 INTRODUCTION

Among the wide spectrum of communication options available, Radio continues to be a popular medium due to its wide outreach, low cost and versatility. It operates on simple technology and can make use of a variety of innovative formats. In the initial stages of broadcasting starting from 1920s, radio reigned supreme as a medium of mass communication for almost three decades. Since then, it has been extensively used for teaching, instruction and enrichment. The advent of television, with its inherent strength of audio-visual capacity, made impact on the listener-ship of radio and it was almost assumed that radio is dead and gone. However, after a brief lull, radio has reinvented itself with more innovative and interactive formats. The satellite technology, the Internet and the convergence of technology have further expanded the nature and scope of media for education. In the changed media scenario, radio continues to be relevant and useful for education.

In this Unit, we shall discuss the role and efficacy of audio/radio medium in relation to education in general and Open and Distance Learning (ODL) in particular.

6.1 LEARNING OUTCOMES

After working through this unit, you are expected be able to:

- *Describe* the strengths and limitations of radio and audio media in education;

- *Use* radio, audio, podcasting, satellite and internet radio etc. in distance education;
- *Analyse* the development of community and low-cost radio FM stations for distance education;
- *Discuss* educational audio programme production; and
- *Apply* radio/audio in the teaching-learning process.

6.2 RADIO-AUDIO MEDIUM

Radio/audio medium has always been at the heart of education. It has been often said that the history of educational broadcasts in India is almost as old as the history of Indian radio itself. This is because even before AIR came into existence there were occasional broadcasts for schools from Bombay and Calcutta. However, organised school broadcasting started in 1937 from Kolkata followed by other primary radio stations of AIR. These bi-weekly programmes were enrichment based and not strictly governed by curriculum. Over a period of time, efforts were made by AIR to make its radio broadcasts more curricula oriented but due to a number of factors, these could not achieve much success.

To appreciate the radio/audio medium in education, it will be pertinent to briefly trace the growth and development of broadcasting in India in this section. We shall analyse the characteristics and relative strengths and limitations of radio for education. Since, apart from broadcasting, audio cassette/CDs, interactive radio, audio conferencing and radio-vision are also being used for education, we shall take an overview of these formats. Then we shall examine some issues relating to learning from audio/radio.

6.2.1 Growth and Development

Broadcasting in India started in 1927 at Bombay (Mumbai) and Calcutta (Kolkata) by two radio clubs with privately owned transmitters. The first radio station of the Indian Broadcasting Company (IBC) came into existence on January 1927. The IBC was liquidated in 1930 paving the way for Indian Broadcasting Service which also closed down in 1931 due to financial constraints. All India Radio came into existence in the year 1936 as a government organisation with objectives to inform, educate and entertain. During the Second World War, radio emerged as a powerful and effective means of propaganda which led to an increase in the number of transmitters and transmission hours and greater variety in programmes.

At the time of Independence there were a total of six radio stations in the country and a complement of 18 transmitters. The coverage was 2.5 percent of the area and 11 percent of the population. Realising the potential of broadcasting for education and development, the policy makers placed a great deal of thrust on broadcasting leading to its rapid expansion. In 2009, AIR had a network of 232 broadcasting centres with 149 medium frequency (MW), 54 high frequency (SW) and 171 FM transmitters. AIR covers 91.79 percent area and 99.14 percent population and programmes are broadcast in 24 languages and 146 dialects.

Till the nineties, broadcasting in India remained a government monopoly and the demand to free AIR and Doordarshan from the government control was being expressed from time to time. Towards this, Prasar Bharti Bill was introduced in the Parliament in 1990 and in 1997, the autonomous

corporation of Prasar Bharti came into existence under which AIR and Doordarshan are presently functioning.

6.2.2 Characteristics, Strengths and Limitations

Like other media of mass communication, radio has its inherent strengths as well as limitations. Among its various strengths, radio has been found easily accessible among a large section of population located in remote rural and tribal areas and weaker classes. Being audio medium, it can overcome the barriers of literacy and can effectively reach out to the illiterate population. It has the inherent strength to overcome geographical barriers and difficult hilly terrains. It is relatively inexpensive and works on simple technology, hence it is quite economical to use both in terms of programme production and utilisation.

Radio is considered an intimate and personal medium. This implies that the listener can use it in the confines of one's room, office or even while moving around as it is convenient to carry. It performs on the canvas of mind of the listener, thus is also termed a 'blind medium'. In view of its capacity to evoke images, Marshal McLuhan, a well known media expert called radio a 'hot medium' and television a 'cold medium' which does not offer greater rein to imagination. Subjects and topics which lend themselves for ear such as language, phonetics, mathematics etc. can be effectively taught through radio.

The limitations of radio, however, are many -- it is a sound-only medium that can only be heard and not seen. Since the listener is required to use one's imagination this may lead to a gap between the reality and imagination. In sharp contrast, television, can take the viewer right at the actual spot through its visual element. Radio also cannot provide finer details of a topic, subject or an issue. Topics which require explaining complex issues, statistics and greater analysis are better suited for the print media. Similarly, subjects which offer scope for visual support and illustrations are better suited for television and cannot be effectively taught through radio. Thus Radio cannot be a substitute for all types of learning experiences.

Radio broadcasts have fixed schedule hence do not allow flexibility. Due to this ephemeral nature of the medium, the message once broadcast cannot be retrieved unless earlier recorded. Radio is essentially a one-way medium, however, lately interactivity has been infused in the programming through phone-in programmes. Yet another limitation of radio is that it is not useful for the hearing challenged.

Thus while using radio or audio for education, it is essential to keep in view the strengths and limitations of the medium to facilitate learning. However, with innovative use, some of the limitations of radio can be actually turned into its strengths.

Audio Cassettes/CDs

Some of the limitations of radio broadcasts can be overcome by using audio cassettes or audio CDs which can be used by the learner at one's own time, place and convenience. These are relatively inexpensive, simple and flexible to operate and allow greater control to the learner. The options to pause, replay, and rewind offer the freedom to the learner to use it as per one's learning style and pace. Audio cassettes/CDs require short lead time to produce as the equipment and tapes are easily portable and the duplication is also easy and cheap. In sharp contrast to radio broadcasts, audio CDs can

be used to impart in-depth content as it can be used any number of times until the content has been comprehended and assimilated. However, audio cassettes/CDs are essentially one-way in nature and if over used, the fidelity is likely to decrease.

Interactive Radio

We have already stated that radio was initially a one-way medium which placed a major constraint in its utilisation patterns. Bertolt Brecht, a well known German playwright observed that one-way nature of radio will condemn it to sterility. To overcome this limitation, two-way communication has been introduced in radio programming by way of **Phone-in** programmes**.** In phone-ins, a topic/subject is identified and telephone numbers are announced in advance on which listeners could call. The experts available in the studio provide real time advice, counselling and suggestions on the subject thus infuse two-way communication.

To draw upon this interactive element, the Indira Gandhi National Open University (IGNOU) is providing radio counselling to the learners on academic and administrative matters. This fully interactive facility allows the teacher to establish real time two-way dialogue with the learners and help address their queries and problems. This enables isolated learners to get in touch with the teacher as well as other learners. With increased access of telephones and mobile phones in both urban and rural areas, interactive radio is poised for greater use.

Audio Conferencing is an extension of the phone-in facility linking two or more radio stations through satellite or telephone lines. Invited experts discuss a topic in the studio of several cities and answer listeners' questions in live situation. Audio conferencing thus links teachers, groups or both via a two-way channel at study centres and also in homes.

Radio-vision was pioneered by the BBC in which the subject matter was presented combining the use of audio and the visual. The visual material which does not require motion is made available to the learners in the form of still filmstrips, slides, charts, models etc. along with audio cassette or CD which provides recorded narration. Audio vision is learner controlled and easy to use. It is less costly than video, and has been found particularly useful in talking learners step by step through a process. The limitation, however, is that it is essentially a one-way medium and greater time is required for producing the learning materials. In a study, Sreedher (2002) observed that groups exposed to radio-vision fared better as compared to other learner groups.

Radio-text is a value added facility which enables transmitting of data from radio transmitters along with audio programmes. To receive the text, a special receiver is required which has a built in monitor to display data. This data can either be related to the audio programme in which the programme/ course/unit title, names of the subject expert, producer, etc. can be transmitted. The data can also be totally unrelated to the audio programme such as stock market quotations, traffic details etc. In addition to text data, limited graphics can also be transmitted along with the audio programme from the transmitter.

In a study conducted at the Yashwantrao Chavan Open University, found that radio-text could create very effective learning environment at a distance. However, over a period of time, radio-text has not emerged as an effective

tool for education perhaps in view of its limited utility. Some private radio stations also tried to publicise the radio- text technology as 'visual radio' but with little success.

Ham radio Ham radio is used by amateur broadcasters known as 'hams' as both hobby and a service. One needs to obtain a licence for operating ham radio which works on a fixed frequency with simple equipment. It is also used for community service and in emergency situations such as floods, cyclone and disasters etc. and it is not meant for commercial use. Unlike other forms of broadcasting, ham radio is point-to-point, i.e., the message can be sent from one person to another – hence it has limited use for education.

6.2.3 Learning from Radio

For learning from any form of media – be it radio, television or any other medium, certain discipline on the part of the learner is required. First of all, the learner should have access to a radio set and if the programme is in broadcast mode, he/she should be aware of the schedule. Then he/she should listen to the programme attentively - ideally, the major points should be noted down while listening otherwise one tends to forget due to the ephemeral nature of the medium. The use of an audio CD, however, allows greater flexibility and control to the learner who can stop, play and rewind the programme at one's will.

Whether used in broadcast or CD format, it is desirable that the learner goes through the study material well in advance to optimally utilise the programme. If for some reason that is not possible, then the learner should try to go back to the relevant sections after listening to the programme. This helps to revisit the learning points and assimilate them. If the broadcast is in interactive format, then the learners should raise questions/queries requiring greater clarity or analysis. The questions need to be specific in nature, relevant and clearly articulated. At times, teachers may follow lecture format which may affect interactivity. It is useful to orient the teachers and learners in the art of raising and responding questions to learn effectively for interactive radio.

Although radio is being used all over the world, its use in education has been little researched. However many studies emphasise that given favourable conditions, students can learn effectively from any media available to them and radio supported with other media can teach effectively.

Check Your Progress 6.1

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

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

1) List five strengths of radio.

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2) List five limitations of radio.

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3) List five points which need to be kept in mind for learning effectively from radio?

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6.3 EMERGING TRENDS

The satellite system and the convergence of technology has revolutionised the state of broadcasting the world over. These developments have led to the advent of Internet radio, Satellite radio, Podcasting and more recently WiFi radio. Let us look at some of these emerging trends.

6.3.1 Satellite Radio

Satellite system has provided an alternative for the transmission of radio programme as against terrestrial broadcasts. Satellites have transponders to carry television and radio programmes. Radio stations which originate programmes uplink them to the satellite and these are simultaneously down-linked by the relaying stations. As the satellite remains geostationary in the orbit, i.e., relative to any point on the earth's surface, the ground based antenna is aligned to it for receiving programmes. Satellite radio covers a much wider geographical range as compared to the terrestrial radio signals. However, in areas with a relatively high population density, terrestrial broadcasts have been found easier to use and less expensive.

6.3.2 Internet Radio

The Internet, as you may be aware is 'a network of networks' in which a large number of computers are connected through various means such as satellites, fibre optics, microwave signals, telephone lines and so on. You may be using the Internet for sending and receiving emails, browsing sites and accessing information. Apart from these, the Internet is also being used for audio broadcasts in which audio signals converted into digital form are transmitted. This allows world-wide 24x7 broadcasts of news, talk, and music programmes on a large number of channels. Internet radio has been in existence for a while, however, WiFi radio is the latest addition making foray in the broadcasting scenario. A WiFi radio requires broadband and WiFi connection. It offers a wide range of choice as the Internet Radio Receiver device seeks out radio stations on the Internet and plays them at the click of a remote. At present, the cost of WiFi radio is high, however, in view of the technological advancements the cost is likely to come down over a period of time.

6.3.3 Podcasting

Podcasting is a new trend using the Internet and MP3 players. The term Podcast is derived from a combination of words 'broadcast' and 'iPod' - Apple's MP3 portable music player. It also draws upon '**P**ersonal **O**n **D**emand broad**CAST**'. Podcasting offers an option to those listeners who have access to computers. It started in early 2004 and toward the end of 2005. Enhanced podcast includes simple animation and chaptering navigation which can be exploited in distance learning for mobile viewing.

Podcast is a series of digital audio or video files that can be downloaded by the user usually in MP3 format. These files can be saved and used in both online and offline modes. This implies that podcast users do not have to be connected to the online programming schedule after downloading the audio file. They can rewind, fast forward and listen to a programme at their own time and pace. Podcasting can be compared to blogging in an audio format. For downloading the file one needs a computer with Internet connection and software that plays MP3 files which usually come pre-stalled. One can also download free podcasting clients such as iPodder and Apple's iTunes to download the podcasts from the Internet and transfer them to MP3 player. However, due to intellectual property rights (IPR), commercial music is not placed on podcasts and most podcasts presently available are created by amateurs.

Podcasts offers an alternative to the people on the move and educational institutions need to explore its potential to reach out to diverse learner groups. Some Internet observers find great potential in podcasting and term it as the radio of the future and an alternative to broadcasting.

Check Your Progress 6.2

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

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

Fill in the blanks:

1) In areas with a relatively high population density ..... broadcasts have been found more useful.

2) A WiFi radio requires ..... and ..... connection.

3) For podcasting, one needs a computer with Internet connection and ..... files

4) Podcast users do not have to be connected to the ..... after downloading the audio file.

6.4 COMMUNITY RADIO AND LOW COST FM RADIO

A historic judgement of the Supreme Court of India on February 5, 1995 stating that "airwaves constitute public property and must be utilised for the public good", brought abut a major shift in the government policy. It paved the way for opening up the radio sector for private radio stations and setting up of community radio stations. These developments brought about a sea change in the growth and utilisation patterns of radio.

For community radio broadcasts in India, the Frequency Modulation (FM) transmission has been allowed which can reach upto 60-70 kms and is based on the principle of 'line of sight' path. FM broadcasts have much better signal quality and better reception; however, the signals get obstructed if there are tall structures and high rise buildings.

6.4.1 Concept and Evolution

Community radio is people's radio which reflects the hopes, concerns and aspirations of a community. The concept has its roots as an alternative to the mainstream radio to provide a voice to the voiceless. It is non-profit in nature and thrives on community participation. Covering a small geographical area of not more than 15-20 km. radius, it aims to initiate development from the grassroots and provide a forum of expression to those at the periphery.

In India, even before a comprehensive policy for community radio came into existence, some media groups were experimenting with community participatory programmes using AIR facilities. Notable among these are Voices in collaboration with MYRADA in Budhikote, Karnataka, Deccan Development Society in Pastapur, Andhra Pradesh and Kutchch Mahila Vikas Snagthan in Bhuj, Gujarat.

In 1999 the radio sector was opened up and a network of 40 radio stations was allotted to IGNOU as Gyan Vani channel. In 2003 the Ministry of Information and Broadcasting decided to grant licence to well established educational institutions to set up community radio stations with the mandate of broadcasting programmes on education and development within a radius of 15-20 kms. Under this scheme Anna University established the first community radio in Chennai which started operating since February 1, 2004. In November 2006, the policy was expanded to include Krishi Vigyan Kendras, Civil Society Organisations and Non-Governmental organisations (NGOs) with proven record of community service.

Every radio station is allocated a fixed frequency within the range of 90.4 MHz to 107.8 MHz. by the Ministry of Communication which needs to be strictly adhered to. Frequency is number of sound waves per second given out by source of sound. It is expressed as Hertz or cycles per second (written Hz).

Realising the potential of community radio, some educational institutions in the country have established campus radio stations to broadcast educational programmes for the student community which serve as useful forums for information, education and development.

6.4.2 Technology

A community radio station works on simple technology and equipment. The minimum technical requirements for a community radio station include a broadcast studio, transmission equipment and working space for the staff.

Broadcast Studio: Studio is a place where programmes are produced. An existing room in a building can be suitably modified to convert it into studio. Appropriate acoustic conditions are created for recording and transmission and for this special treatment of walls and the roof of the room are done. The transmitter, tower and antenna are the basic transmitting equipment required for a community radio station. Let us look at them in some detail:

Transmitter: The transmitter constitutes one of the most important equipment in the community radio set up. It is tuned to the specific frequency allotted to the radio station. It transforms the audio signals into modulated radio frequency (RF) power for sending the programme to the listeners. The present policy allows 100 watt transmitter for community radio. However, it has been found useful to plan two 50 watt transmitters, so that even if one transmitter fails the other keeps the broadcast on air.

Tower and Antenna: Antenna is the device which radiates the RF power received from the transmitter. The location and height of the transmitting antenna are very important factors hence antenna is mounted on the top of a tall tower. The maximum antenna height has been fixed at 30 metres by the government policy. The antenna is located at a distance from welding shops, factories, power plants, airport etc. so that the radio reception does not get affected due to audio noise generated by these sources. The antenna system usually consists of a folded dipole. For better gain and propagation, instead of a single dipole, a 2 bay or 4 bay antenna system can be employed. A feeder coaxial cable of 10-15 metres connects the transmitter RF output to the antenna.

Outdoor Broadcasting (OB): Community radio thrives on community based programmes and for producing such programmes, outdoor broadcasting (OB) is used. OB constitutes an important segment of broadcasting- it can be live (real time) as well as recorded. For such recordings, a simple portable recording set up consisting of Microphones, Portable audio mixer, Portable digital audio recorder, microphone stand, spare batteries, extension cords and audio cables is required. It has been found useful to test the equipment beforehand to avoid failure at the time of recording.

The equipment for community radio station is likely to be used by community members and less trained volunteers. Unlike professional broadcasting studio, the studio may be susceptible to dust and rough handling. Hence it is important that the equipment selected is durable, rugged and user friendly so that it can be easily handled.

6.4.3 Management

The management of a radio station involves management of programmes, finances, technology and personnel. All these areas are applicable to community radio as well though at a smaller level.

Once a community radio station has been set up, regular programmes need to be broadcast, hence a proper planning for software generation has to be made. As mere broadcast is not enough, the programmes should address the needs, concerns and aspirations of the community. For producing such programmes, regular interactions with the community members need to take place and feedback obtained to develop a sustainable strategy for content generation.

Management of finances and revenue generation is crucial for a community radio station for its survival. The management also involves that the conditions included in the licence agreement are adhered to. A community radio station gives ample scope for local talent in its content planning, hence talent scouting and involvement of the teaching and student community is equally important. In addition, publicity, compliance with broadcast requirements, accountability to the stake holders and maintenance of infrastructure constitute some other areas of community radio station management.

Check Your Progress 6.3

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

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

1) Describe the concept of community radio in your own words.

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2) What is Frequency Modulation?

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3) For OB programmes what equipment would be required?

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6.5 PRODUCING EDUCATIONAL AUDIO PROGRAMMES

The production of audio programme involves four stages: conceptualisation, script writing, recording and editing. We shall discuss the technical production process in detail in Block 3 Unit 11 in this Course. In this section we shall take an overview of these stages to acquaint you of the production process.

6.5.1 Conceptualisation

The first stage of programme production is the selection of an idea, topic or concept on which a programme needs to be produced. While selecting the concept, you will have to keep view the relative strengths and limitations of the medium as discussed in sub-section 6.2 of this unit. Once the topic has been selected, you will have to define the objectives and scope of the programme to keep the content of the programme focused and specific.

The next step is research which comprises both library and field research. Library research, as you are aware, involves collection of material from books, journals, documents, reports, periodicals, the Internet and so on. Field

research includes consulting persons connected with the subject, experts and agencies to elicit specialized in-depth information. Depending upon the nature of the programme, you will have to undertake research.

In the process, you may come across a whole body of materials from different aspects and angles. However, you need to include only relevant information by sifting and sieving otherwise you are likely to be laden with unnecessary information which will make script development an arduous task. The overall objective should be that the information selected should meet the defined learning objectives and offer something new to the learner. If the subject is vast, you may plan a series to do justice to the topic instead of cramming all the information in a single programme.

6.5.2 Basic Formats

Format is the broad structure or framework within which content elements are organized and presented. Formats for audio programmes can be placed in two broad categories – basic and complex formats. Straight talk, interview, and panel discussion can be placed under basic radio formats; while features, documentaries, drama, docu-drama, talk shows and quiz etc. may be categorised as complex formats. Each format has its own specific requirements and uses and the process of production is directly linked with the format chosen.

Talk is a straight delivery of words by one speaker and it is one individual's presentation of views. It is often called as lecture format.

Panel discussion gives different perspectives of a given issue and brings forth more than one opinion on a given subject. The role of moderator is crucial for the success of a discussion.

Interview: As compared to a speech delivered by a single person, a conversation between two persons is more absorbing. Interview format makes use of this strength and elicits the views, opinions and information from expert from the perspective of learners.

Drama format engages the learners by way of dramatization of a situation or ideas. Music and sound effects play an important role to create the characters and the time frame.

Documentaries present a factual, balanced and truthful account of actualities concerning an event, place or a person.

Magazine includes a variety of items such as an informative talk, interview, quiz, music item and so on in one programme and offers these as sections.

Talk show is an extension of interview in which two or three speakers to discuss a given topic and the audience present in the studio questions them.

Quiz programmes are generally studio based. Quiz master puts questions to the participants who are invited according to the topic selected for the quiz.

Reports are generally based on excerpts of speeches, account of actuality, interviews and statements of subject experts which are linked up with appropriate narration. Reports are treated as news-based programmes.

The format selection is made on the suitability of the topic rather than on novelty factor. While selecting the format, the objectives of the theme, the

composition of the target audience and the nature of programme and availability of resources need to be kept in mind. At this stage it is also useful to consider whether the programme will be completely studio based or include OB recordings also.

6.5.3 Script Writing for Radio

The next stage is script writing for radio which is slightly different from writing for the print media. For writing for audio medium you need to write for the 'ear' instead of the textbook approach of writing for the 'eye'. This is because, while reading the printed text if you come across a difficult word or expression, you have the option of consulting a dictionary or a reference book. However, in case of radio if you are unable to follow a difficult word or expression, you cannot go back in time. Hence, you need to use simple language and used to suit the audience. You need to avoid written bookish language, complex sentences idiomatic expressions and difficult literary words — the simple rule is to write the way you would say it aloud to a group of people. Since time is the biggest constraint in audio medium, emphasis needs to be placed on brevity. The script should be properly summed up to bring out the essence of the issues discussed.

Each medium has its own specific design elements which need to be kept in mind, e.g. for audio it would be useful to consider how the elements of spoken-word, sound and music effects and silence will be woven in the script.

Once the script has been developed, it needs to be read and re-read so that complex sentences, difficult and jarring words can be substituted with simple sentences and words.

6.5.4 Recording and Editing

Once the script has been developed, the programme is recorded. Depending upon the format selected and whether it is studio-based or requires outdoor recording, appropriate recording is made. A well written script does not require much effort at the time of post production. However, if some unwanted sounds, fumbles etc. creep into the programme, the same are edited for a smooth flow of the programme. You will read more about this in Unit 11 of this Course.

Check Your Progress 6.4

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

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

1) What are the elements of a radio programme?

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2) While writing script for an audio programme what care would you like to take?

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6.6 RADIO IN EDUCATION: IGNOU EXPERIENCES

In this section, we shall examine the experience of the Indira Gandhi National Open University - one of the premier institutions in distance education which has been pivotal in using radio/audio for education.

Audio CDs

The University has been using audio CDs (earlier cassettes) as these are relatively inexpensive and have been found convenient and effective for learning. The CDs are made available to the learners at the Study Centres and can also be purchased at a nominal cost. The audio programmes are largely supplementary in the nature, however, efforts are being made to integrate them with the learning package.

Broadcasting

In addition to audio cassettes/CDs, radio broadcasting is being used by the University form select stations of All India Radio. AIR Hyderabad broadcasts programmes of 30 minutes duration every Tuesday, Thursday and Saturday from 6.00 am to 6. 30 am and AIR Mumbai broadcasts for the same duration every Thursday and Saturday from 7.15 to 7.45 am.

Interactive Radio Counselling (IRC)

Several studies highlighted the one-way broadcast mode quite limiting in the context of education. To overcome this limitation, two-way live phone-in programming was introduced to infuse interactivity and the response was found quite encouraging. At present, Radio Counselling is being provided for one hour from 186 radio stations of All India Radio every Sunday including two Sundays on the national hook-up. Toll-free telephone facility is made available from 80 cities enabling the learners to interact with experts and seek clarifications on academic as well as administrative matters.

Gyan Vani

In addition to above, the University has been running a radio cooperative known as Gyan Vani dedicated to education and development. Under this initiative, a network of 51 radio stations is being implemented by the Electronic Media Production Centre of the University in a phased manner. As of now, 26 stations have become operational, six are coming up shortly in the North East and the remaining are at various stages of setting up.

Each radio station has a range of about 70 kilometres and serves the social and educational needs of the people living in that geographical area. The station functions independently guided by a local steering committee and central linkages in terms of policy planning, budgetary and administrative support. The stations undertake considerable quantum of educational programming in the regional languages supplemented by agencies in the public, private and the NGO sectors.

6.7 LET US SUM UP

In this unit you studied various uses of radio/audio for education. We traced the growth and development of broadcasting in India and analysed the characteristics and relative strengths and limitations of radio medium. We

also discussed various forms and technologies of radio such as broadcasting, audio cassette/CD, interactive radio, radio-vision, audio conferencing, radio-text and so on. Each of these has been used for education in different settings with varied results.

You also learned at the impact of satellite system and the convergence of technology leading to the advent of Internet radio, Satellite radio, Podcasting and more recent WiFi radio. In addition, the efficacy and use of community radio and low cost FM radio as viable options for education was also examined.

While discussing the production process, we traced four stages - conceptualisation, script writing, recording and editing. We briefly outlined various formats such as straight talk, interview, discussion, features, documentaries, drama, docu-drama, talk shows and quiz etc. which may be used for educational audio programmes. We also briefly looked at the IGNOU experience of using radio in education.

To sum up it can be said that radio medium offers immense possibilities in education, hence there is a need to be creative and innovative- away from the class room teaching approach. An effective audio programme has the capacity to take the learner outside the classroom - to bring in actuality and thus make the entire learning experience enriching as well as rewarding.

6.8 KEYWORDS

Antenna: the device which radiates the RF power received from the transmitter.

FM: Broadcast technology that uses frequency modulation (FM) to provide high fidelity sound over broadcast radio. The FM band refers to frequencies within the range of 87.5 to 108.0 MHz. (in the VHF range)

Format: a broad structure or framework within which content elements are organized and presented.

Frequency: the number of sound waves per second given out by source of sound, expressed as Hertz or cycles per second

Transmitter: a device that transforms the audio signals into modulated radio frequency (RF) power for sending the programme to the listeners.

6.9 REFERENCES AND FURTHER READINGS

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6.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 6.1

1) Five strengths of radio are:
   - Easy access among a large section of population;
   - Overcomes the barriers of literacy;
   - Economical to use both in terms of programme production and utilisation:
   - Convenient to carry; and
   - Has capacity to evoke images.

2) Five limitations of radio are:
   - Sound-only medium that can only be heard and not seen;
   - Cannot provide finer details of a topic, subject or an issue;
   - Radio broadcasts have fixed schedule hence do not allow flexibility;
   - Ephemeral nature - message once broadcast cannot be retrieved unless earlier recorded; and
   - Essentially a one-way medium.

3) Five points which need to be kept in mind for learning effectively from radio:
   - Radio should be accessible
   - The schedule of the programme should be intimated
   - Attentive listening
   - Noting down of the major points
   - Going through the study material in advance/after listening to the programme.

Check Your Progress 6.2

1) Terrestrial broadcasts
2) Broadband and WiFi connection
3) Software that plays MP3 files
4) Online programming

Check Your Progress 6.3

1) The community radio is a people's radio which reflects the hopes aspirations, problems and concerns of a community drawing upon their active participation. It is non-profit in nature and covers a small geographical area of not more than 15-20 km. radius.

2) Frequency Modulation (FM) is a mode of transmission which can reach up-to 60-70 kms and is based on the principle of 'line of sight' path. FM broadcasts have much better signal quality and reception, however, the signals get obstructed if there are tall structures and high rise buildings.

3) For OB recordings, a portable recording set up consisting of microphones, portable audio mixer, portable digital audio recorder, microphone stand, spare batteries, extension cords and audio cables will be required.

Check Your Progress 6.4

1) The basic elements of audio are speech, sound effects, music and silence. However, these elements need to be used judiciously as using too many effects may sound jarring and restrict the flow of the message.

2. Radio thrives on live and familiar words with conversational ring which inspire imagination in the mind of the listeners, therefore simple language which conveys the subject matter, emotions and feelings effectively should be used.

UNIT 7 TELEVISION AND VIDEO

Structure

7.0 INTRODUCTION

By now you are exposed to the concept of communication technology and its various aspects. You have studied in the preceding units about pedagogical designs for communication technology and managing the technological change. Learning through information and communication technology (ICT) is evolving rapidly and is becoming a global phenomenon these days. It allows the learners to overcome many of the constraints of conventional methods of learning. It also enhances teachers' capability and effectiveness by highlighting the learning points visually.

ICTs can be used to provide flexibility for catering to different learning needs and learning styles (aural, visual, pictorial, etc.) of the learner. The learner who uses ICTs learns more quickly, retain knowledge for a longer time and feel better about the content learnt.

In the previous unit, you have studied in detail about the audio medium. Historical development, and strengths and limitations of the audio medium for the teaching learning purposes have been discussed there. We therefore assume that you have developed fair understanding of the various applications of radio broadcast and audio tapes both in the face-to-face (classroom–based) and open distance learning environments.

The audio medium, as the term indicates, caters to only one of your senses that is hearing / listening. You can hear / listen to information / content delivered through a source but you cannot see the events happening or taking place. Neither you can see the teachers / experts nor can they see you as learners. Educational television can provide an opportunity whereby the learner can hear and see the events happening or taking place. You can see the teacher while making presentation on a topic or demonstrating experiment. We therefore can say that the limitations of the audio medium can be overcome to a great extent by the use of the video medium. In this unit you will study an overview of the historical expansion and types of television broadcasts, strengths and limitations of television as a tool, channel or medium of learning, etc. You will also study the strengths and

limitations of television broadcasts vis-à-vis the cassette technology. You will also study the emerging trends in the visual medium, such as webcasting, YouTube, TeacherTube, etc. Television has the potential to be a valuable tool in enhancing the quality of teaching and learning at all the levels of education. It is, therefore, widely used for dissemination of information to its users. We hope that you will find the unit interesting and useful to improve your teaching or learning through television.

7.1 LEARNING OUTCOMES

After going through this Unit, you are expected to be able to:

- *Describe* the historical development of educational television;
- *Describe* the advantages and disadvantages of television broadcast and video cassettes in education;
- *Discuss* different applications of television and video media in distance education; and
- *Examine* the use of webcasting and other tools in the open and distance learning system.

7.2 TELEVISION: A MEDIUM OF EDUCATION

Television has pervaded the society to the extent that it has become part of day-to-day life of people all over the world. It has been entertaining, informing and educating them through a variety of programmes. It provides unique opportunity to learners to learn as per their convenience. According to Lesser (1975) the television's greatest power is its capacity to transport, to show the world to children, to display people, events, ideas that they have never encountered before and are unlikely ever to have the opportunity to confront. We shall discuss the development and potential of television as a medium of education in the following sub-sections.

7.2.1 Historical Perspectives

Television has a history of about seven decades when it was started on an experimental basis in developed countries as a medium of entertainment. As per the literature available the television industry was born in the years immediately preceding World War II. Television was exhibited at the 1939 World Fair as a show case for the first US Presidential speech on television. After the war was over television has clearly proved its greater capacity and a period of its intense growth took place. Its popularity can be judged by the exponential growth of television centers all over the world. Between 1945 and 1948 the number of television centers in America grew from 9 to 48. By 1960 about 85 per cent of US households had a television set. In late 1940s some American Universities started experiments for establishing studios, producing and broadcasting television programmes for their students. Recognizing its potential and wide reach some educational institutions had started using it as tool for imparting education to learners in early 1950s. The Federal Communications Commission (FCC) of USA In 1952 established television stations and broadcast programmes for educational institutions. The use of television grew slowly in the beginning. Its use however grew rapidly in 1960s and by 1972 more than two hundred television centers were established in US alone.

Television was used for educational purposes by different institutions/ countries in different ways. For example, the following two models of utilization of television programmes for educational purposes were used at the initial stage:

- **Extension of classroom**: Initially teachers started using television as an extension of classroom teaching by making the content available to a large number of learners outside the classroom. In this model presentations of experts are recorded in the lecture format and made available to educational institutions and learners. In other words, the functions of a live teacher are performed by the television teacher/ presenter/expert who could be available to a large number of students in both the classroom and off campus situations. As a result a large number of video lectures presented by eminent experts are available for use by teachers, scholars ad learners.
- **Exploitation of potential of television**: After the establishment of the British Open University in UK, and subsequently other open learning institutions in different parts of the world the specific functions and potential of television were exploited to achieve learning objectives effectively and efficiently. British Open University took into account the specific strengths and weaknesses of television as a visual medium and used it extensively for learning situations where visual support was needed to comprehend the content or accomplish specific learning objectives. Television programmes were designed by a team of experts based on the principles of effective teaching and learning. In this model, media experts gave importance to instructional design for developing educational television programmes. The need for media selection and integration caught the attention of teachers.

Both the models are being used these days by educational institutions in most of the countries, including India. For example, a series of lectures of eminent scholars / experts on various topics related to higher education have been produced by the Consortium of Educational Communication, University Grants Commission (CEC / UGC), New Delhi. These programmes are being telecast nation-wide (known as country-wide classroom) for the teachers and students at the tertiary level education. Besides, Indira Gandhi National Open University (IGNOU), for example, has produced a large number of television programmes based on the specific potential of the visual medium for its learners. Such programmes are specifically designed taking the strengths and weaknesses of educational television into consideration. The visual medium is selected based on the various factors / criteria, with more emphasis on the learning objectives to be achieved by the learners.

History of Educational Television in India

The history of television in India goes back to September 15, 1959 when the first experimental television service was started in Delhi with the noble cause of social and educational development of the people. Unlike most of the developed countries, India started the television service for empowering school teachers in their teaching and children in their learning. With this objective in view, a series of especially designed and produced television programmes were telecast by *Doordarshan* Kendra (government run television centre), Delhi for secondary school children in and around Delhi in October 1961 under the aegis of 'Delhi School Television Project'. These programmes were syllabus-based and telecast during the school hours as part of the school activities. The aim of introducing the television service in

school system was to overcome the shortage of qualified science teachers and improve the standard of teaching science in secondary schools. Research studies found positive contribution of the television programmes on the quality of teaching and learning.

In spite of its educational and developmental uses, in the beginning, television was treated as an extravagant item by the government. Hence its expansion could not get precedence in comparison to developments in other areas. After a gap of about 13 years the first major expansion of the television service in India began when the second television station was commissioned in Mumbai in 1972. This was followed by commissioning five more television stations one each at Srinagar, Amritsar, Calcutta (Kolkatta), Madras (Chennai) and Lucknow by 1975. Till 23 long years the television transmission was in black and white. During Asian Games (1982) which India hosted, the colour transmission of television programmes was introduced. Thereafter the television industry in India did not look back. Starting with 41 television sets in 1962, now there are over 130 million homes with television sets covering viewing population more than 400 million individuals through more than 150 channels. Similarly, beginning with one hour broadcast in 1980s now television programmes are being transmitted round the clock. Besides introducing colour television, the Govt. of India installed nationwide a large number of high and low power terrestrial transmitters which increased the reach and accessibility of television programmes to viewers across the country. Easy access to relevant technology, variety of programmes and increased transmission hours were some of the factors for rapid expansion of the television service in India (Vyas, Sharma & Kumar, 2002).

Till the early nineties Indian television was directed towards education and development. Entertainment programmes were few which later on occupied more time in the transmission schedule. When a few melodramas / soaps like *Hum Log* (1984) and mythological dramas: *Ramayan* (1987-88) and *Mahabharat* (1988-89) were broadcast, millions of viewers in both the urban and rural areas became devoted users of television programmes. This brought sparkle in the television service in India. Similarly when urban viewers learnt that it was possible to watch live events from any part of the world on television they brought dishes for their home to watch television programmes telecast by the various broadcasters. At this stage, the use of the television programmes moved from cities to smaller towns and thereafter to villages. As a result, entertainment and commercial programmes occupied more chunk of the television transmission these days. Let us explain the development of television in different words. In the early years television was considered as a medium of facilitator of the development process and its launch was justified by the role it was supposed to play in educational and social development of the people. However, by 1991 television's earlier mandate to aid the process of educational and social development had been diluted. Entertainment and commercial programmes had begun to take the centre stage in television programming strategies. Educational programmes which could not attract advertisers and hence were not able to fetch money for the broadcasters shifted to the back bench. Sensational programmes became popular and occupied foremost place in the transmission schedule of majority of broadcasters.

SITE (Satellite Instructional Television Experiment)**:** SITE (1975-76) was a landmark in the history of the educational television service in India. It was designed to test whether satellite-based television services could play a role

in socio-economic and educational development of rural masses. Using American ATS-6 satellite and uplink centers at Ahmedabad and Delhi, developmental television programmes were beamed down for about four hours a day to about 2400 villages in six educationally backward States. The programmes dealt with in and out of school education, agriculture and allied subjects, health and family welfare, national integration, etc. Thus the programmes based on both the developmental and school education were broadcast through the satellite, which were viewed by the villagers (including adults and children) through direct reception television sets installed in primary schools and / or community centers in the villages. Besides school children, programmes for school teachers were also telecast. During SITE a large number of primary school teachers were trained in innovative teaching-learning methods. The experiment was conducted for one year. Research studies on SITE found the experiment successful in demonstrating the effectiveness of satellite-based television programmes for development and education in Indian villages. The role of television was appreciated by the viewers and it was accepted in primary schools as an educational force for teaching and learning effectively.

Post-SITE Project (1977): After the SITE was over, the broadcast of television programmes continued through terrestrial transmitters installed at Jaipur (Rajasthan), Raipur (Chhatisgarh), Muzaffarpur (Bihar), Cuttack (Orissa), Gulburga (Karnataka) and Kheda (Gujarat). Community television sets were installed in primary schools or community centres in the villages within the effective range of the respective terrestrial transmitters. You would like to note here that in place of communication satellite, terrestrial transmitters were used to broadcast television programmes. The broad objectives of the post-SITE project were to familiarize the rural masses with improved and scientific knowledge about agriculture and allied subjects, health and hygiene, national and emotional integration, etc. and hence to facilitate their socio-economic development. It was also aimed at making rural children in the age group 6-11 years aware of the importance of education and healthy environment. The enrichment educational television programmes based on primary school curriculum / syllabus was broadcast during the school hours. One day in a week was earmarked for primary school teachers in which programmes related to new pedagogy, content and contextual issues were broadcast for their professional growth. The primary school teachers otherwise did not have opportunity to keep themselves up dated about the recent developments in the area of education. The post-SITE centres were later on converted into full-fledged television centers to broadcast national as well as regional television programmes.

INSAT Project (1982): Indian National Satellite (INSAT) system has been a major catalyst in the rapid expansion of terrestrial television coverage in India (Mehta, 2005). The launch of a series of indigenous communication satellites boosted broadcast of television programmes in India. Started with INSAT 1A, launched in 1982 with the national coverage, television programmes were used for socio-economic and educational development of rural audience. The television broadcasts covered various areas of developments, such as education, agriculture, social education, health and hygiene, etc. The main objective of the INSAT supported television service was to bring people residing in the rural and backward areas into the national main stream, by quickening the developmental activities in these areas with mass media support (IGNOU, 1995). Developmental programmes for community and educational programmes for primary school children were telecast in different languages.

***Gyan Darshan* channels:** Various indigenous satellite-based television services were started in 1990s in the country. With INSAT in the geostationary orbit of the space, it could be possible to network all the *Doordarshan Kendras* located in different parts of the country and broadcast programmes. Besides the use of television programmes for commercial, entertainment and information purposes, INSAT is being used for educational television services at all the levels: from primary school education to higher education, including professional courses and lifelong learning. With the liberalization policy of India, the television scenario has changed dramatically in the recent past. IGNOU in collaboration with Ministry of Human Resources Development (MHRD), Indian Space Research Organization (ISRO) and Ministry of Information and Broadcasting (MI&B) has established a bouquet of *Gyan Darshan* Channels — dedicated to education. It beams educational television programmes produced by various institutions in the country, such as IGNOU, University Grants Commission (UGC), National Council for Educational Research and Training (NCERT), Indian Institutes of Technology (IITs) and so on. These channels provide round the clock service to learners at primary, secondary and higher education levels. The following three GD channels are functional:

GD 1: This channel is devoted to educational and developmental needs of the learners. A variety of educational and developmental programmes for a variety of learners are broadcast through this channel.

GD 2: This is an interactive channel for education and training. GD 2 as the Training and Development Communication Channel (TDCC) provide one-way video and two-way audio interactivity between the teaching and learning ends. This system is also known as teleconferencing which can be received across the country with the help of direct reception television set and the learner can interact with experts / resource persons through telephone. Live teleconferencing is an innovative intervention to learning at a distance. It provides the much needed human touch to the otherwise remote and distance learners who can directly interact with experts / teachers located at any teaching ends in the country, seek guidance, can express their views and clear their doubts regarding the topic being discussed. In the existing arrangement of teleconferencing the learners can see the teachers but the teachers cannot see the learners. It, however, does not mean that two-way video conferencing cannot be organized. If needed technological infrastructure at both the ends (teaching and learning) is available, the teachers and learners can see and interact with each other (you will read more about teleconferencing in Unit 8).

GD 3: This channel, launched on January 26, 2003, is known as *Eklavya* which is aimed at imparting quality education to students pursuing engineering education. GD 3 telecast curriculum-based programmes for undergraduate studies in engineering and technology. Any educational institution in the country can have access to this channel with some basic infrastructure. It is estimated that the channel is being watched by nearly 1.5 million learners studying in about 1500 engineering and technology institutions across the country. Many of the programmes are found useful by the general public as well.

Ministry of I & B has placed two channels of Gyan Darshan: GD 1 and GD 2, on Direct-To-Home (DTH) platform which, besides reducing costs of the system, has enhanced viewership of the programmes. You may be aware that DTH is a technology to receive satellite television programmes with a

personal dish (small in size and less in cost) in an individual home. DTH is wireless (unlike cable television) reaching directly to the learner's place of study or work. It is satellite-based and is often called satellite TV.

Check Your Progress 7.1

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

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

Briefly discuss the common objectives of the projects and initiatives discussed above.

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7.2.2 Potentials and Limitations of Television

As you might be aware, every medium and method has its strengths and weaknesses. The usefulness of the medium depends on the fact that how systematically it has been selected and utilized. In this section we shall discuss important strengths and limitations of television as a medium of education and training.

Potential of educational television: By now you might have realized that educational television has incredible potentials to facilitate both teaching and learning at the various levels of education. If designed creatively and utilized successfully, educational television programmes can make learning well-organized, productive and imaginative. Through television-supported learning we can reach educationally deprived learners, including those who cannot attend regular classes due to one or the other reason, all over the country with uniform quality content. Television as a medium of instruction therefore has to be selected scientifically and used imaginatively so that its potential is exploited most favourably. You have to make sure that you have made right choice by selecting the video medium to achieve your learning objectives. Our experience reveals that television for that matter any technology, is not a barrier, it is an advantage to both the teachers and learners. The general advantages of educational television are as follows. The television:

- Supports education both in the face-to-face classroom and distance learning environments. Under favourable environment, educational television can be used to support a large number of learners.
- Can facilitate synchronous and asynchronous interaction between the teacher and learner when used in teleconference situation. Active participation of the learner in the learning process is a pre-condition for optimum learning.
- Motivates learners to overcome many psychological problems hampering their learning. Educational television, with its usual impact, creates interest in learners to enjoy learning as per their convenience. It, therefore, can be effectively used as a motivational tool.
- Provides high quality education to all the learners irrespective of their location, caste and creed. Thousands of learners spread over different

geographical regions can receive same programmes at the same time. The educational television broadcast help overcome problem of inequality and imbalance among regions by providing equal opportunities.

- Provides more cost effective education when it is used on a large scale and repeated over a period of time. Though production and transmission of television programmes is a complicated and costly process, the cost per learner is low.

Besides the general advantages stated above educational television, as a visual medium, has certain specific strengths. They are as follows:

- Television demonstrates experiments, experimental situations or principles involving dynamic change or movement
- It demonstrates abstract concepts through the use of especially constructed physical models.
- It can be helpful in learning abstract ideas directly. Making the abstract concepts concrete, the role of animation and visual experimentation is very important. Complex / abstract concepts can be illustrated through visual simulation also.
- It can facilitate animated, slow motion or speed-up video tapes/ videodisc.
- It presents objects in the animated format, such as cartoon films.
- It illustrates principles involving two, three or multidimensional aspects of a learning object/concept.
- It brings primary or unique resource materials, case studies, etc., directly to the learner.
- It can take the learners to unique learning environments, such as launch satellite, to moon or even to a forest, etc., which is otherwise not possible to create in a classroom situation.
- It records special events, experiments, places, people, monuments, etc. and make available to learners as and when they need.
- It influences learners' affective aspects of personality, such as, attitude, interest, value system, etc. It has positive motivation effects by attracting and sustaining learner's attention to main learning points and arousing attention with the movements of camera (through different types of shots, zoom in / zoom out, camera panning, etc.) or visual effect.
- It condenses or synthesizes range of information into a coherent whole
- It demonstrates as to how instruments or tools are played, arranged and used.

All these merits of educational television point out its superiority in the presentation of content.

Limitations of educational television: We have discussed the strengths of educational television in the preceding sub-section. We have categorically stated that if planned and implemented effectively, educational television can facilitate the learning process. In spite all these advantages, television has some limitations too which however can be overcome to a great extent by adopting certain measures. The main limitations of educational television are as follows:

- It cannot provide instant feedback. It is difficult to capture the learners' reactions / views about the programmes.

- Video production is a costly and time consuming affair. It requires sophisticated production facilities and equipments.
- Television programmes are aimed at the average learner. Hence they may not be very effective for learners with special needs, below and above average learners. Such programmes may not pose any challenge to brilliant learners.
- Television broadcast is a passive technology; hence its pedagogical effectiveness can be limited. To make it interactive we need sophisticated technology at both the teaching and learning ends.
- Unless produced professionally based on an effective instructional design and by a team of experts, the television programmes cannot be effective in facilitating learning. As a result, educational programmes produced by various institutions are not pedagogically sound / effective.
- Once produced, it is difficult to revise and update the educational television programmes.
- Television programmes restrict the learners to view the visuals shown by the producers. Hence the learners get limited perspective of the concept(s) being taught / learnt.

7.2.3 Utilization of Educational Television

Research studies conducted in India and elsewhere by individuals and institutions have revealed that educational television is not being used to its full potential in improving the quality of teaching and learning. There are various reasons that have become stumbling blocks in the utilization of television programmes for educational purposes. The main reasons for underutilization of television are as follows:

- **Accessibility and availability**: A large number of learners do not have easy access to different types of information and communication technologies, including television, video cassettes and videotape recorders. There are areas where television broadcast is not available. There are many villages where schools are not equipped with computers, television sets, etc. We would like to state here that even if television is available in schools it is not easily accessible to teachers and learners to use. The television remains either under lock and key of the head of the institution / learning centre or out of order. Not only television should be available in the school, but it should be easy accessible to those who want to use it.
- **Attitude of teachers and learners**: The attitude of teachers and learners towards television as a medium of instruction plays an important role in its utilization. It has been observed that those teachers who have positive attitude toward educational television are innovative in their approach to teaching and learning. They use more effective methods and strategies to enhance learning of their students. There are some teachers and learners for one or the other reason, such as ignorance about the potential of educational television, etc., avoid its use. They are averse to alter their methods of teaching / learning to accommodate ICTs.
- **Support of administrators**: The support and encouragement of the head of the institution or the coordinator of the learning centre in case of distance education system is essential for effective use of television programmes. It has been observed that due to one or the other managerial problem teachers/counselors are not provided easy access to ICTs, including television. Some of the coordinators may not have been

oriented in the use of television for group learning situations. Hence they do not support teachers/counselors to utilize the potential of television.

- **Viewing facilities**: The supportive environment (either in classroom, workplace, home or learning centre) is most advantageous for learning through television. The learning environment should motivate learners and build self-confidence in them for optimum learning. Poor learning environment results in reduced learning. This is more so in situations where the learner uses television without external support or guidance.
- **Maintenance**: To keep all the electronic gadgets functional is an essential condition for optimum utilization of television programmes. There must full proof mechanism for maintenance of television set and other accessories. Provision for financial and technical support should be ensured by the distance education institution. If the television and other accessories remain out of order for long time the learners get demotivated and gradually forget the very existence of the electronic gadget.
- **Poor integration with main learning materials**: It has been observed that in most of the cases the television programmes are being used in the supplementary mode to provide additional support to the learner. They are not integrated, for example, with print medium which is prime medium of learning at a distance. The learners find television programmes dispensable to successfully pass their term-end examinations. Hence they avoid the use of television programmes and study the printed text materials only.
- **Training of teachers and producers**: The teachers (tele-teachers/ presenters/anchors) and producers of television programmes should be thoroughly trained in the philosophy and practices of distance education system, designing and producing ICT-enabled learning materials, learning through ICTs and so on. It has been observed that media producers are trained in producing general television programmes and not educational programmes. They may not appreciate the importance of instructional design, learning environment, etc., in preparing television programmes.
- **Enabling policies:** In order to exploit the potential of educational television as a tool for enhancing learning it must be integrated into pedagogical processes which of course require a deliberate attempt by teachers, educators, curriculum developers, policymakers and learners. Relevant policies, norms and guidelines should be in place to assist teachers and academics to use television in teaching and learning.

Field Work

Undertake the following small survey on television broadcasts. Take an appropriate sample of ten respondents and ask them the following three questions:

i) What is the most suitable time for you to view the educational programmes?

ii) In which language would you prefer to view the educational television programmes.

iii) What are the weaknesses of the television as an educational medium?

Analyse the responses and discuss your findings with those of other students during a contact programme.

7.3 VIDEO

You might have used both the modes of educational television technologies: broadcast and cassette technology. Both the modes have their strengths and limitations too. The video is considered a more effective medium of learning than the television broadcast. In other words the video has certain advantages over the broadcast. They are more flexible and convenient in their use because you, as learners, have full control over the pace of your learning in terms of the time and place of using video tapes. Additionally, the replay facility has made them more flexible to individualized learning. However, some learners do not agree with argument. Nevertheless the main differences between the video tape and the television broadcast are given in Table 7.1.

Table 7.1: Video and Television Broadcast: A Comparison

Video	Television broadcast
Available as and when needed	Fixed viewing/broadcast time
Repetition, search and mastery learning is possible	Repetition, search and mastery learning not possible
Can be reviewed	Cannot be reviewed (ephemeral in nature)
Individualized pace of learning (pause, forward, rewind possible)	Fixed pace for all students
Integration with other media easy	Integration with other media difficult
More flexible and decentralized systems of delivery of content	More rigid and centralized system of delivery of content
Allows the students control over the learning process	Students have little control over the learning process
Allows interaction / discussion as and when required	Discussion during transmission is difficult
Distribution is difficult (through mail)	Distribution is easy (through transmission)
Easy to take notes while viewing	Difficult to take note during transmission
Activities / exercises possible while using video tapes	Activities / exercises not possible
Can cater to the need of specific target group of learners	Cater to a large group of learners, including general public

Source: Adapted and updated from IGNOU (1995)

Strengths of video tapes: From Table 7.1 we can infer that the use of the video tape technology has its advantages for the distance learning as compared to television broadcasts. Let us discuss, in brief, the practical advantages and weaknesses of the video tapes (IGNOU, 1995). Video can be delivered through tape, Compact Discs and Flash Disks.

i) **Optimum learning:** The video provides planned learning and saves a lot of study time. It is systematically planned and produced based on effective instructional design. The required knowledge can be imparted / gained within a short time. The control on its use also enables us to study the desired content / information as many times as we need it and / or we achieve our learning objectives. Learning through the video tape thus saves time, money and resources.

ii) **Multiple mode communication:** The video programmes can be

presented in several modes. To hold attention and motivate the learners, the content can be discussed in more interesting formats, which can help the learners retain and recall information presented through the programmes. Also unlike the television broadcast, video can be viewed in various ways and / or situations that are independent of the fixed viewing timings and places.

iii) **Standard content:** The video programmes are prepared with systematic planning by a team representing different areas of expertise. Selection, analysis and sequencing of content are decided based on effective pedagogy. All the learners receive the same quality content in the same style of delivery. This is not otherwise possible in face-to-face teaching arrangements in which only a few learners get opportunities to have high quality education as not all the teachers everywhere are equally effective and not all teachers teach with full preparation.

iv) **Flexibility:** The video technology caters to the need of individual learners. You have control over the use of medium and hence on the pace of your learning. A tape can be stopped and replayed as many times and as long as required by you. The flexibility ensures effective learning by the learners.

v) **Learning through case studies:** A case study can be recorded on the location. Each step of the process of the case can be demonstrated through the video. Learning through case studies has proved quite effective for adult learners and this can be done effectively with the help of video tapes.

Besides, the video has all the educational advantages that the television broadcast has.

Weaknesses of video: The video has some weaknesses too, particularly in the Indian context. The use of the video depends on the availability of the video player equipment and we cannot ensure each distance learner has easy access to the replay equipment. It is therefore, not advisable to exclusively depend upon the video tape technology to deliver content for all the learners across the board. The cost of a cassette replay equipment and lack of its availability in many learners' home or work place may be handicaps for its wide use. To overcome this problem we can opt for study centre-based rather than home-based learning. In other words, through study centre-based learning we can use video programmes in a group. The video players can be made available at the study centres for viewing the programmes. You may argue here that it is not simple to provide easy access to every learner at the study centers in a large country, like India. The use of the video through the study centre network has, therefore, its own limitations. Experience shows that large number of learners prefer to study independently at their home or work place. Small number of them makes use of the facilities at the study centers. Moreover, in group learning the individual learners may find difficult to learn their pace of learning.

An argument generally being used against learning through videotapes is that it makes the learners lazy and indiscipline as a result they fail to stick to the study schedule. On the other hand the broadcast mode makes the learners disciplined and forces them to strictly follow the broadcast schedule and hence they pursue the schedule of their study.

Check Your Progress 7.2

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

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

List at least four advantages which recorded programmes have over live television broadcasts.

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7.4 EMERGING TRENDS

The emergence of powerful ICTs such as computers and multimedia, digital compression, satellites, fibre-optics, wireless networks, artificial intelligence, virtual reality, etc., have expanded our options for engaging in learning and teaching. Opportunities are also emerging for making effective use of ICTs that have been previously under-utilized in supporting the learning process both in campus-based education and open learning. Now-a-days new possibilities in information processing and communication networks are making open learning increasingly value alternative to facilitate learning (UNESCO, 1997).

7.4.1 Webcasting

Webcasting is the Internet broadcasting of streaming audio and/or video presentations. The learners can view them through a Web browser on a personal computer (Baecker, Moore and Zijdemans, 2003). Webcasting use grows as Internet broadband communications becomes more available and more affordable. Webcast is the transmission of live or pre-recorded audio/ video to computers that are connected to internet (Bell, 2003). Webcast is an interactive online broadcasting service that enables online events, videoconferencing and web-seminars through protected network. While discussing the integration of webcast as a teaching tool Bell (2003) focused on webcast-supported pedagogy.

According to Schneider (2001), "Webcasting can mean a lot of things, but if you can produce sound or video over the web and make it available as a live, real-time recording, or provide it for download latter, it is webcast. The difference is whether you experience the webcast while it is happening or whether you are able to download it latter" (p. 1). Webcasting is typically live presentation in which the distance or classroom-based learners can participate. Several converging technological and social factors contribute to the growth of webcasts.

In webcast we transmit rich media to learners and facilitate interactivity among them. The main objectives of the webcast are to increase the potential for collaborative learning and to support the development of a learning society.

Webcast presentations can provide various kinds of interactivity (Baecker, Moore and Zijdemans, 2009). Some of them are as follows:

i) **Interaction between expert and distance learners*:*** A distinguishing feature of the webcasting for distance learners is that they can ask questions to the experts and resolve their queries. For this we however have to design our presentations such a way as not to distract the expert or make him/her lose concentration. We have to use techniques to engage learners in classroom and ODL environments.

ii) **Interaction among distance learners*:*** Distance learners can communicate via an integrated chat subsystem and can also send private messages to one another. Unlike learners at a traditional lecture, they can do this without disturbing other learners and without distracting the expert.

iii) **Interaction between expert and classroom learners:** The expert can argue traditional verbal and nonverbal communication with the learners by allowing those who have mobile wireless devices to ask questions and achieve mastery in learning.

iv) **Interaction among classroom-based learners:** Classroom-based learners who have mobile wireless devices would be able to participate in the chat and private messaging. An open question is the effect of this capability on the concentration and understanding of the learners, on the ambience in a lecture hall, and on the concentration and effectiveness of the expert.

v) **Interaction between classroom and distance learners:** Classroom-based and distance learners are also able to communicate with one another via chat and private messaging capabilities of webcast technology.

vi) **Interaction among the retrospective learners viewing the webcast presentation:** The interaction can continue (or start) anytime after the event has taken place/happened while viewing the webcast presentation.

7.4.2 Video on Web

Due to recent developments in ICTs learning through web is getting impetus these days. Various types of web-based learning are being utilized by teachers and learners as well. We shall discuss three emerging trends in ICT-enabled learning: YouTube, TeacherTube and National Programme on Technology Enabled Learning (NPTEL), in this sub-section:

YouTube: YouTube is a video sharing reservoir of learning/training content in which anyone can upload videos for sharing for free. YouTube is a system where the learners can acquire free higher learning or spend free time for developing their capacity for better life. It has to rescue too many learners who cannot afford regular colleges or devote time to attend regular classes due to one or the other reason. YouTube has for the last few years been forging partnerships with universities and colleges in the developed countries. You might have seen some promotional videos like campus tours on websites of some universities, particularly in developed countries. The content is uploaded on YouTube straight form classroom. In the recent past many universities have posted videos of guest lectures, introductory classes and even a full course. IGNOU has a tie-up to host all its video programmes on the YouTube servers.

YouTube is gradually becoming popular among learners of formal and lifelong education. In the recent past some leading universities/institutions

such as Massachusetts Institute of Technology launched OpenCource Ware (OCW) with a plan to make virtually all the school's courses available for free online. As a user you almost would feel like you are being taught by or are learning from eminent experts. There is no registration and within a minute you can be watching demonstration of an eminent expert.

TeacherTube: Based on the needs of the teachers, TeacherTube, a video sharing website, is building capacity in teachers. The system generates a customized study plan that is tailored for the need of individual learner. This leads to faster assimilation of learning and superior understanding of concepts. Thus YouTube and TeacherTube can be integrated into lesson plan as both the sites offer a variety of useful video for teaching and learning. You therefore can use them for your learners. These are excellent resources for teaching/learning. They can motivate you to learn and have mastery over the topic.

To make use of YouTube and TeacherTube you have to search for the subject/ topic you are going to teach/learn. You will find various videos on YouTube and TeacherTube. These videos discus the topic you want to study and they generate interaction / conversation with you and your class (in case you are teaching in a face-to-face situation).

NPTEL: You would have realized that technology has an important role in enhancing quality of education. Hence besides physical infrastructure, the quality of education depends on quality of faculty whose empowerment in the design and use of technology can bring qualitative improvements in education. With this back drop the Ministry of Human Resource Development (MHRD), Government of India has designed National Programme on Technology Enhanced Learning (NPTEL), an important intervention on the lines of Massachusetts Institute of Technology' Open Courseware (The Hindu, 2009). The main objective of the NPTEL is to enhance the quality of engineering education in the country by developing curriculum based video and web courses. Funded by the MHRD the project is conceived to pave the way for introducing multimedia and web technology to enhance learning of basic sciences and engineering concepts. This project is being carried out by Indian Institutes of Technology (IITs) and Indian Institute of Science (IISc), Bangalore as a collaborative project. Sufficient infrastructure has been created for production of video based learning materials by IITs and National Institutes of Technical Teacher Training and Research (NITTTRs). The concept of multimedia-based courses with high potential for interactivity has become popular and a viable option for educational institutions. In the first phase of the project, supplementary content for 129 web courses in engineering/science and humanities have been developed. Each course contains materials that can be covered in depth in 40 minutes or more lecture hours. In addition 110 courses have been developed in video format, with each course comprising approximately one hour lecture. In the next phase other premier institutions would participate in the content creation and access to quality education will be provided to all without any barrier. The NPTEL aims to increase the competitiveness of Indian industry in the global market by improving the quality and reach of engineering education. It envisages forging of strong ties with major academic initiatives worldwide for developing new technological tools for learning and dissemination in order to benefit all students (http:// nptel.iitm.ac.in). Engineering colleges, learners and even industry across the country have stated taking advantage of NPTEL's resources. Any learner with poor instructional facilities can learn from professors in this way (Jebaraj, 2008). The NPTEL videos are also available on YouTube.

Web Search

Go to YouTube (http://www.youtube.com) and find out videos related to Education, Distance Education, and any other discipline of your choice.

7.5 LET US SUM UP

We hope that you enjoyed reading this Unit. Let us now summarize the main learning points to help you recapitulate what has been discussed in the Unit. We discussed, in brief, the historical development of television service. The history of world television is about seven decades old while it came in India in 1959 as a medium of social and educational development. Various projects such as SITE (1976), post-SITE (1997), INSAT (1982) and *Gyan Darshan* (2000) were discussed as examples of successful utilization of television for educational purposes. We have discussed in this Unit that educational television has certain strengths and weaknesses as well. We therefore should select television, as a medium of teaching and learning, in such a way that its potentials are exploited optimally. Television programmes, designed and implemented systematically can have desired impact on education and training.

Research studies conducted in India and abroad revealed that television programmes are not being fully utilized in educational institutions. The main reasons for its under-utilization are as follows: poor availability and accessibility to quality television programmes, lack of positive attitude among teachers and learners towards teaching or learning form television, lack of adequate support from educational administrators / managers, poor viewing environments / conditions, poor maintenance of equipments, lack of integration with other media, lack of training of teachers and programme producers, etc.

We have also discussed the pedagogic differences between video tapes and television broadcast. For further clarity we have also discussed, in brief, the strengths and weaknesses of video tapes for teaching and learning purposes.

There are some emerging trends in the use of information and communication technologies which have influenced the way we teach and learn. To expose you to recent developments in ICTs we have also discussed webcasting and video on web in this unit.

7.6 KEYWORDS

Gyan Darshan is a series of television channels used for transmitting educational programmes. It is managed by the Indira Gandhi National Open University, and has national reach through satellite transmission.

INSAT is a series of satellite launched by the Government of India.

NPTEL is a programme initiated by the Ministry of Human Resource Development, Government of India to provide video and web-based material in Science and Engineering subjects. It is managed by a consortium of IITs and Indian Institute of Science, Bangalore. Similar programme in Humanities and Social Sciences are in the offing.

SITE is the first experiment of satellite use in education. It stands for Satellite Instructional Televison Experiment. It was initiated in 1975.

Webcasting is the distribution of video programmes over the Web using streaming media technology. It is also referred as broadcasting over the Internet.

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7.8 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 7.1

The common purpose behind the various television projects can be formulated as: the use of television for the social, economical and intellectual growth of the country and for an attempt towards improving the quality of education in the country.

Field Work

While you ask these three questions to different people, you may analyse their preferences for languages, timings on the basis of gender, in job/without job, age etc. Also see the limitations they express of television through these lenses. You may also consider to know how they would like to use video, such as available in CD or through Web.

Check Your Progress 7.2

ii) Recorded programmes are produced and can be broadcast as per the convenience of the producers and the students respectively.

iii) Recorded programmes are based on specific objectives.

iv) Proper editing and addition of music and sound effects are possible in recorded programmes.

v) Formative evaluation can easily be carried out in recorded programmes.

Web Search

The Website of IGNOU YouTube is http://www.youtube.com/user/egyankoshIGNOU. Go to School of Education to find videos related to education.

You may also like to see the NPTEL YouTube channel at http://www.youtube.com/user/nptelhrd

UNIT 8 SATELLITE-BASED EDUCATION

Structure

8.0 INTRODUCTION

Educational media has been one of the major issues in contemporary world education. Radio and television broadcast has been extensively used for more then 75 years now in the developed countries. It is not only the television, radio or other small media like films or film stripes that are being used, but satellite communication for education is used world over. Though satellite communication is of recent origin, it has shown significant promises. It is an extremely resilient medium, and has been adapted in the business and industry. People world over are exposed to this media and witness its live demonstrations everyday.

This unit will take you through the development of satellite education. The focus is on the satellite, and its types. It will present the experiences of the use of satellite in education emphasizing the various experiments of use of satellite in education in India and in the developed and developing countries. The experiments described are not the *only* experiments, but a few important ones are described. You will also learn about the talk back device-teleconference, the potential of this medium and how to design teleconference sessions.

8.1 LEARNING OUTCOME

After reading this unit, you are expected to be able to:

- *Compare* satellite and terrestrial communication;

- *Describe* the strengths of satellite communication;
- *State* some national and international experiments in the use of satellites in education;
- *Describe* the use of teleconference in distance education;
- *Outline* the technological set up for teleconference;
- *Identify* three different types of teleconference; and
- *Design* the teleconference sessions.

8.2 SATELLITES

Satellite is a spacecraft that receives signals from a transmitter on earth and amplifies these signals, changes the carrier frequencies, and then retransmits the amplified signals back to the receivers on earth.

The space age and launch of satellites started in 1957 with the launching of Sputnik by the former USSR. Since then, a number of satellites have been launched for various purposes like telecommunications, meteorology, remote sensing, disaster warning, defense and so on.

Till date, thousands of satellites have been launched into orbit around the Earth. These originate from more than 50 countries. Moon is a natural satellite on earth and the rest are artificial (man made) satellites.

8.2.1 Satellite Orbits

One of the important factors making the communication satellite useful for specific purposes is the orbit into which the satellite has been fixed. Various authors have categorised the satellite orbits into various types but there are four types of orbits available for positioning satellites in space (Nicholson, 1976). You will read a brief description of each of them just to have an idea of the basics of the communication satellite.

i) **Low orbit**: In the early stages of the development of satellite technology, the orbits were close to the earth surface (called 'low' in space technology). In the absence of sophisticated satellite launching equipment, the satellites could not be launched very far into space. Satellites in low orbits pass very rapidly from horizon to horizon and can be used for communication only for a short period. As the speed of the revolution does not match with that of earth, satellites in low orbits are not very useful for telecommunication purposes.

ii) **Medium orbit**: As space science progressed, more powerful satellite launching vehicles (SLV) were designed and developed which made it possible to place the satellite in a higher orbit. Satellite orbits ranging from a few hundred to a few thousand kms above the earth's surface is classified as the medium altitude orbits. Satellites in such orbits also revolve rapidly and we need to move earth station antennas to chase the satellite in space. In such cases, at least two antennas are installed: one antenna follows a setting satellite and the other follows a rising one.

iii) **Geo-synchronous orbit**: At a distance of about 36,000 kms from the earth's surface, an orbiting satellite can move at such a speed that it appears to be stationary to the people on the earth. This orbit is known a geosynchronous or geo-stationary orbit. These days most of the new communication satellites, both at national and international platform, operate in this orbit which is useful for communication purposes. Geo-synchronous orbit satellite systems offer advantages in cost and complexity when compared with the low and medium altitude systems.

iv) **High Earth Orbit:** A High Earth Orbit is a geocentric orbit whose high point lies above that of a geostationary orbit.

8.2.2 Types of Satellite

Satellites can be categorised into different types. The basic types are:

- Communication
- Weather
- Navigational
- Reconnaissance
- Application
- Research

In the Table 8.1 you will read about the three important types.

Table 8.1: Types of Satellite

Type of Satellite	Description
Communication Satellite	The first communication satellite was Echo 1 launched in 1960. Relay 1 and Telstar 1, both launched in 1962, were the first active communications satellites. INSAT - 4A was India's first communication satellite. Communication satellites provides worldwide linkup of radio, telephone and television. They beam signals around the world.
Weather Satellite	Tiros was the first weather satellite launched in 1960 from Florida USA. These satellites provide continuous, update information about large scale atmospheric condition such as cloud cover and temperature profile. It also gives information of hurricanes and cyclones. There are two basics types of meteorological satellites. These are: Geostationary and Polar orbit. Geostationary type send weather data and pictures that cover a section of the United States, China, Japan, India, and the European Space Agency.
Navigation Satellite	Navigational satellites provide data to ships, aircrafts and submarines. The recent development is the Global Positioning System (GPS). GPS provides reliable location anywhere on or near the earth. It is maintained by the United States and any one can access it. It is a useful tool for map making, tracking and surveillance besides the military and civilian uses.

8.2.3 Characteristics of Satellites

The characteristics of all communication satellites are similar. These are:

i) **Power**: A live satellite does not require conventional power to maintain its position in space, except tiny amounts of energy necessary to correct its position occasionally. The power for receiving and transmitting signals comes from the solar batteries built into the satellite. These batteries are recharged. Solar panels, which convert sunlight into electrical energy, are used for the functioning of the satellite system.

ii) **Large coverage**: Satellite-based communication is independent of distances and serves the rural and urban, central and far flung areas simultaneously. It can cater to very widely dispersed populations at a time. This characteristic of the satellite is particularly useful for education at a distance. Space scientists claim that three satellites in the geo-synchronous altitude orbit can provide communication services to the entire earth on a full time basis, except for the Polar Regions, which are not visible from this orbit (Nicholson, 1976).

iii) **Multi-purpose uses**: Satellites can be used simultaneously for the radio, telephone, television and data traffic. Multi-purpose satellites offer a wide variety of combinations. Besides serving communication purposes, the satellites are also used for remote sensing, such as is required in soil surveys, flood (assessment of area under water, etc.), forestry (tree resources, tree diseases, etc.), oceanography, etc.

iv) **Cost:** The initial investment in the development and launching of a satellite is very high, especially for the third world countries. A multipurpose satellite such as INSAT, needed a huge financial allocation in its fabrication and launching. But when INSAT-IB was launched and became operational, all demands for communication were met without adding new investment. On the other hand, the terrestrial system, including the microwave, needed additional infrastructure to meet the increasing information needs of a country. Expanding telecommunication infrastructure to provide communication services to different parts of the country is not always an economically rational thing to do. Because telecommunication for educational purposes cannot produce sufficient revenue to cover capital and operational costs, the costs in this case should be counted in terms of social and economic benefits, such as roads, water supply systems, schools, etc.

v) **Planning**: The implementation of satellite-based communication requires advance planning. It needs more lead time than terrestrial communication does. Therefore, the use of satellites should be linked to the overall socioeconomic and educational development of the country. Since it (satellite based communication) is closely linked with the educational development and economic growth of the country, it should have a base in long term planning.

vi) **National and area specific communication**: Satellite-based communication has the capability to cater to both the national and the area specific needs of a country. It can be regionalised as well which can provide area-specific service.

vii) **Life of a satellite**: The use of solar panels/cells describe the life of a satellite. The electrical energy output from a solar cell will decrease with age: after 8 to 10 years, the electrical output from a solar cell will decrease by about 20 per cent. The communication satellite is generally replaced after about 10 to 12 years of continuous service. For example the life span of Indian satellite- INSAT-1A and IB was seven years. Launched in August, 1983, INSAT-IB completed over 108 months of operational service in August, 1992.

Check Your Progress 8.1

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

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

1) Which orbit in space is most suitable for communication satellites and why? Give three reasons.

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2) Describe any three characteristics of a satellite.

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8.2.4 Satellite and Terrestrial Communication

Right from the advent of the communication satellites, it has been recognized that communication through satellite has unique benefits such as long distance, quality of performance, networking, including one point to multi-points to one-point transmission capabilities. Yet non-satellite systems have a significant role to play in meeting the communication needs of a country. The fact is that the satellite and terrestrial systems supplement each other to make communication more effective. Now let us compare the satellite-based communication and the terrestrial systems of communication.

Satellite and terrestrial communication: A Comparison

Satellite and terrestrial systems - as modes of communication - are not opposed to one another. Both systems supplement each other's potential' to make communication more accessible and economical. Table 8.2 gives a detailed comparison of both the system.

8.3 INDIAN EXPERIMENTS IN USE OF SATELLITES IN EDUCATION

India launched its first satellite Aryabhatt in 1975. Since then number of satellites have been launched for various purposes. India has come to the center stage in the satellite technology and hence pushed the developed countries to the periphery.

Number of experiments has been conducted in various sectors. In the following section a few important experiments in the field of education are described.

Table 8.2: Satellite Vs. Terrestrial Communication

Satellite Communication	Terrestrial Communication
• Does not require ground-base, high-power, high-tower systems.	• Needs high-power, high-tower systems, (The height of the transmitter at Pitarnpura, Delhi, India is 235 metres).
• Does not need much ground equipment; direct reception television sets can receive signals directly from the satellite.	• Needs a number of transmitters for wide coverage (at present Doordarshan India has a network of 529 transmitters spread all over the country).
• Being a highly-centralised system it provides more positive pacing and control over the developmental process.	• Cost of equipment is low.
• Use of satellite technology could inspire the teachers, students, and parents for modernization because it brings the whole world together into a remote village.	• At times difficult because of technical and managerial hindrances in systems coordination. Further, because of the position taken by the local authorities controlling the flow of information at the regional level, it becomes difficult at times.
• Planning and implementation require more lead time.	• Because of limited coverage, it has some drawbacks.
• Planning and implementation require more lead time.	• Needs comparatively less time.
• Effective for a large country or a group of countries.	• Suitable for a small country or a part of the country.
• Independent of distance.	• Limited coverage area.
• Independent of the nature of terrain.	• Difficult in mountainous and sea areas.
• Can meet the increasing demand of communication without additional cost.	• Communication capacity is bound to the regional system installation and requires additional cost.
• More effective in meeting the overall needs of people at the national level.	• Serves regional information needs better.
• A satellite failure can result in the entire system being inoperative which might pose severe readjustment strains on the communication.	• Systems failure would not be as disastrous as in the case of the satellite system; readjustment and repair of damage is manageable.
• Needs parking spaces for the geo-synchronous satellite which is becoming more and more scarce.	• Does not need parking space.
• Worldwide network connections via satellite can resolve the problem of unequal educational opportunities and can provide a truly world-wide sharing of educational, resources for international education.	• Network is possible at the regional level only.

8.3.1 Satellite Instructional Television Experiment (SITE)

SITE was the largest communication experiment in the use of satellite in support of developmental and educational programmes in modern times. The main impetus for the SITE project came from Prof. V. A. Sarabhai. In

1969, India and USA started an experiment called SIET by means of Applications Technology Satellite (ATS-6). On May 30, 1974, the Satellite was launched from Cape Carnival in USA. The telecast via this satellite began in India from August 1, 1975. Indian Space Research Organization (ISRO) with All India Radio (AIR) took the responsibility of broadcasting ETV programmes to the selected villages in six states of Andhra Pradesh, Bihar, Karnataka, Orrisa, Madhya Pradesh and Rajasthan, selected on the basis of their educational backwardness.

The experiment continued from August 1975 to July 1976. The instructional objectives of SITE were in the fields of education, agriculture, health and family planning and national integration. About 2400 Direct Reception Television Sets (DRS) deployed for SITE were located in different cultural, linguistics and agricultural regions of the country. Different socio-economic environments were also chosen for the purpose. Television broadcasts via satellite were made available for four hours a day, one and half hour in the morning and two and half hours in the evening. Morning times were utilized for broadcasting programmes for children which were enrichment programmes for the age group 5 to 12 years; evening programmes were directed to adults.

SITE covered four different language regions but children of other regions also watched these programmes on school days. Though the programmes were meant for children, others also viewed the programmes within the school. These were not based on school syllabi but intended to provide general enrichment. Governments of each state receiving SITE programmes were responsible for electrifying the school, which housed the television receiver.

The contents of the programmes were identified by a group of educationists drawn from National Council of Education Research and Training (NCERT). It was then placed before the senior officials of Department of Education of each of the State Institutes of Educational Technology (SIET) in the respective states. ISRO produced a series of programmes in science, which aimed at developing scientific thinking. Production studio was also set up by ISRO in Bombay and its staff developed one of the educational series. Programmes were produced at three Base Production Centers: Delhi (*Hindi*), Cuttack (*Odia*) and Hyderabad (*Telgu* and *Kannada*). The format of the programmes was lecture demonstration followed by documentary, drama and discussion. Before approaching the programmes for broadcast purpose, a few prototypes were produced and pretested in different villages. The purpose of this pretesting was to test the acceptability of the programmes.

Experience during SITE period was quiet encouraging for further expansion of television service in the country. Government decided to start the SITE continuity community-viewing programme. Forty percent of the villages were provided community-viewing facility in six SITE cluster areas by setting terrestrial transmitters. This was possible because the infrastructure existed and studio facilities developed during SITE Terrestrial transmission was made available from 1977 to 1982 and educational programmes were available in the morning hours along with other programmes in the evening.

An important highlight for SITE was teacher training through multimedia. Nearly 50,000 teachers were exposed to this training in two installments. Experts planned the lessons. SITE experiment drew attention of the world.

Two international teams, one sponsored by United Nations and other by Commonwealth Broadcasting Association toured the SITE areas and gave favorable reactions.

8.3.2 Indian National Satellite (INSAT)

The SITE implemented in India in 1975-76 received great applause at national as well as international levels. This unique success with a borrowed satellite for one year encouraged India to have its own satellite. In 1977, India approved a proposal to launch a multipurpose and space communication system of her own called Indian National Satellite (INSAT).

The major objectives of INSAT were:

- To produce and transmit varied programmes designed to awaken, inform, enlighten, educate, entertain and enrich all sections of the people in different parts of the country.
- To promote alternative approaches to education for children, youth and adults.
- To stimulate interest and involvement of people in economic development.
- To stimulate interest and involvement of people in economic development.

INSAT-1A was launched in its orbit on April 10, 1982. According to Indian specifications and requirements, it was designed and fabricated by Ford Aerospace and Communications Corporation (FACC), USA. It was a joint venture of the Department of Space, Posts and Telegraphs, Meteorological Department, Ministry of Information and Broadcasting and Ministry of Education and Culture. All these government agencies used the satellite to reach the target groups, the Ministry of Education had a special commitment to use its facility for fulfilling the educational priorities.

INSAT-1A developed mechanical snags and in September 1982 it ceased to function. However, INSAT-1B was launched on August 30, 1983. INSAT project covered six of the educationally backward states as in SITE. About four thousand television sets were installed and commissioned.

These television programmes were telecast in the morning and evening. Morning transmission was devoted to school education for children in the age group of 5-8 years and 9-12 years. These programmes were not only syllabus oriented but provided broader perspectives of enriching school lessons. Local Doordarshan Kendras and Central Institute of Educational Technology (CIET), NCERT New Delhi, produced programmes. Evening television programmes were mainly developmental and national programmes and included news, films and live telecasts.

India's space programmes took another big leap on July 24, 1993 when the multi functional indigenously built satellite INSAT-2B blasted off into space by Arriane launch vehicle from KOUROV, French Guyana in South America. INSAT-2 satellite is a multipurpose satellite providing space services for telecommunication, metrological observations and data relay, nation wide TV broadcasting, radio and TV distribution disaster warning and distress alert sources. It has 50 percent higher communication capacity than the first generation INSAT-1 satellite.

8.3.3 Indira Gandhi National Open University

IGNOU established by an Act of Parliament in 1985 has an objective to take education to the doorsteps of the students and provide education to all, irrespective of age, region or formal qualification. It also offers need based vocational and professional academic programmes. The university has a nationwide network of study centres, which are equipped with CD and DVD players, Color TV sets, besides print materials. IGNOU has a full-fledged communication division - Electronic Media and Production Centre, which produces audio and video programmes and organizes educational broadcasts over television and radio for the benefit of students as well as the general public.

Broadcast of IGNOU's educational programmes began in May 1991 on the national network of Doordarshan thrice a week in the early morning. The broadcasts of audio programmes began in January 1992 from Bombay and Hyderabad and later from Delhi and Lucknow. The IGNOU programmes are syllabus based and cater to the learners enrolled in IGNOU programmes. These programmes supplement the self-instructional texts provided to the students of the university. These broadcasts mark a major step in the progress of IGNOU in fulfilling its educational objectives and in the country's development.

Gyan Darshan

Gyan Darshan (GD) is an exclusive and dedicated twenty four hour educational and developmental TV channel of India. It is a joint collaborative venture of Ministry of Human Resource Development (MHRD), Information & Broadcasting Ministry, IGNOU, UGC, CEC, NCERT, CIET, SIETs, National Institute of Open Schooling (NIOS), Department of Space and Technology, IITs, Technical Teachers Training Institute's, Department of Space, DECU, Ministries of Rural Development, Health, Labour, Environment, National Aids Control Organisation (NACO) etc. It was inaugurated on 26th January 2000. EMPC of IGNOU has been identified as the coordinating and transmission agency.

It offers interesting and informative programmes of relevance and value to specialized categories - pre school kids, primary and secondary school children, college/university students, youth seeking career opportunities, housewives, adults and many others. The technical arrangements for Gyan Darshan is that the earth station was set up with a 7.2 m antenna with arrangements for the play of pre taped programmes from the Earth Room Station itself while others can be viewed from Video Studio II. Microwave links to enable live relay of the channel from EMPC to Doordarshan Kendra, Delhi and to source programme from the CIET studios have been installed. The footprint of the satellite is the entire country and GD signals can be conveniently received without any special equipment anywhere. Gyan Darshan as it entered in its fourth year on January 26, 2004 went completely digital. It has expanded into a bouquet of channels namely GD-1, GD-2, GD-3 *Eklavya*, and GD-4 *Vyas*.

GD-1 is a twenty four hour channel devoted to education and distance education. The transmission for curriculum based and enrichment programmes are each of 12 hour duration. The programmes of IGNOU and CIET-NCERT including NIOS are telecast for four hours each. IIT programmes for three hours, CEC-UGC programmes for two and half-hours and one hour each for TTTI and adult education. It is also available in Ku-band.

GD-2 is devoted entirely to interactive distance education. It is a one way video and two ways audio satellite based interactive system operating on the C-Band transponder of INSAT-3C.

The third channel GD- 3 *Eklavya*, is the Technology channel which brings quality education to the students pursuing engineering education throughout the country. *Eklavya* features lectures of the courses taught at the IITs situated at Kharagpur, Mumbai, Kanpur, Delhi, Guwahati, Roorkee and Chennai. Eklavya transmits 24 hours daily, with eight courses running in parallel. These are repeated once for the benefit of those who may have missed viewing the first time. This pattern continues from Monday to Saturday. Sundays are reserved for special interest programmes on Technology and Science. *Eklavya* – Technology channel reaches every corner of the country through INSAT 3C Satellite on C Band (74 degrees East), Downlink frequency 4165 MHz.

Another channel in the bouquet of Gyan Darshan channels is GD-4 *Vyas* which brings quality education to the students pursuing higher education through out the country. Higher education in India has expanded significantly. Every district and small town of the country has colleges providing higher education to people. Today those enrolled for higher education account for 9 million students in nearly 13000 colleges and 234 institutions of higher education.

The aim of this channel is to bridge the knowledge and information gap in the area of higher education and provide information to all those who need it. The vision of *Vyas* therefore, is to reach out to large number of students, teachers and general public with quality educational material electronically so as to address the issues of access and equity with quality higher education.

This channel chooses those subjects, which are in high demand but lack adequate number of competent teachers. It also selects such subjects which are difficult to be explained optimally by conventional classroom tools but could be effectively covered in the visual multi-media animated form for competitive examinations, women and general public.

The primary target audiences of the Channel are the students studying in undergraduate and postgraduate classes in universities and colleges all over the country, particularly in small towns. Students pursuing correspondence courses, teachers teaching undergraduate and postgraduate courses and also the staff of training colleges, and students appearing for various competitive examinations watch this channel. The channel acts as a tool for the audience to take up fresh initiative in broadening their horizon especially in the field of career enhancement. The *Vyas* programmes are telecast round the clock on GD-4 and some are relayed on GD-1.

8.3.4 EDUSAT

EDUSAT- the dedicated satellite for education in India was launched on 20th September 2004 by ISRO. The satellite was launched from Sriharikota. It is the first Indian satellite exclusively built for the use of education sector. EduSat has a life of seven years in space during which it will help educational institutions to provide quality education.

The satellite is capable of providing high bandwidth two-way interaction by creating a private network of Satellite Interactive Terminals (SITs) and Receive Only Terminals (ROTs) installed all over the country. The interaction mode is based on the popular Hyper Text Transfer Protocol

(HTTP) used in the Internet and web applications. Thus, the satellite enables us to create a network through which we can share existing resources (often called as digital repositories), in text, graphics, audio, and video formats; and also can create real-time interactive virtual classrooms (often called synchronous e-learning) across the country. With both these possibilities, the potential is enormous for the educational development of this country. The satellite has five Ku-band transponder providing spot beam, one Ku-band transponder providing national beam, and six extended C-band transponders covering regional beam. All put together covers the entire country through national and regional beams. Some of the major institutions using the Edusat network are: Indira Gandhi National Open University, National Council for Educational Research and Training, Consortium for Educational Communication, Visvesvaraya Technological University, *Vigyan Prasar*. Using the satellite communication, it has become possible to interact in real-time mode with students though two-way video and two-way audio system.

8.4 SATELLITE BASED EDUCATION: INTERNATIONAL EXPERIENCES

Satellite Communication for education is used world over. Use of satellite and Interactive Television broadcasting are used in countries where geography and demography make it difficult to provide efficient formal education. Accordingly many innovations have been tried out. In the following section you will read about some experiments in education at international level. The experiments are not the only ones conducted by the respective countries but many more.

China

The Peoples Republic of China (PRC) launched its first satellite, known as China 1 or Mao 1 in April 1970. The launch made China the fifth nation with a space rocket. But China's space industry picked up its pace in 1980s and 1990s. In 1981, PRC launched three satellites to orbit with one rocket. The Long, March 2 rocket, which carried China's first homing satellite to orbit, was launched in 1975. During 1980s china sold commercial space launchers to foreign satellite owners. By the end of 2001 China had launched 50 satellites with 90 percent success rate. By 2008 China conducted 115 launches. These satellites are referred by different names in China. Like China's communication satellite is known as Dongfanghong (DFH), the oceanography satellite is known as Haiyan (HY-1 and HY-2) and so on. These satellites are used for communications and direct to home broadcasting, meteorological and oceanographic observations, navigation and positioning, disaster mitigation, and seed breeding. China has launched two manned spacecraft in 2005 and 2008 like USA and Russia.

China started to use satellites for TV broadcasting in 1985, and has formed a satellite transmission network with more then 33 telecommunications satellite transponders responsible for transmitting TV programmes and educational TV programmes of CCTV (China Central Television). More than 30 million people have got college or technical secondary school education and training through it. China has also set up a satellite direct broadcasting experimental platform to transmit CCTV and local satellite TV programmes by digital compression to the vast rural areas which wireless TV broadcasting cannot cover. In this way, China's TV broadcasting coverage has been greatly increased. The China broad-band multi-media education satellite transmission network has also been established on the satellite direct broadcasting experimental platform to provide comprehensive remote education and information technology services.

Canada

Canada launched its first satellite, Alouette I in 1962. With the launch of its satellite, Canada became the third nation in 1962 to have built its own satellite for orbit. During this decade the other types of satellites launched were - Alouette – ISIS satellites and the Black Brand rockets. With these satellites, it was possible to deliver television programmes in English and French to the whole country. In 1967, Canada's space programme, refocused on satellite applications. In 1972, Canada launched Anik A1. NASA launched it on Thor- Delta launch vehicle and Canada became the first nation to have a domestic satellite in geostationary orbit Anik A2 launched in 1973 as a backup, and Anik A3 was kept on the ground till 1975. With the Anik A satellites, the quality telephone service and television programme reached every region in the country. Communications Technology Satellite (CTS) was an experimental programme jointly sponsored by NASA. The Department of Communication (DOC) supplied the earth stations. Their earth stations were very flexible as they were quickly installed and were easy to operate by the users. Many educational programmes were telecast through Anik throughout Ontario. In 1979, the Government of Canada supported another series Anik B which was the second-generation satellite launched by Telesat Canada. Knowledge Network - an educational channel was set up in British Columbia. With these two satellites, Canada was seen as a world leader in the use of satellites for social services, especially for health and education. Presently the Anik C and Anik D series have been replaced by two Anik E's. In Canada satellite systems have been adapted to serve educational needs of many provinces. British Columbia, Alberta, Saskatchewan, Manitoba and Quebec each have a dedicated satellite channel and Ontario has two, one for English and second for French language. Medical specialists use television via the satellite. Night school students in British Columbia also receive lectures from Institute of Technology in Vancouver.

The Pacific Region

The Pacific Ocean is a region of various cultures and inhabitants. People in the region speak more than 1200 languages. Radio was the first media to go to the island territories. In the South Pacific region broadcasting was derived from British, French and American origins. The Pacific region has conducted many experiments in educational broadcasting particularly, educational television in American Samoa. It used NASA's satellite ATS-1 for educational experiments using low cost ground stations.

The largest experiment in educational broadcasting in the South Pacific was the educational television in American Samoa (Schramm, 1977; Rochstad and McMillan 1978). The experiment was to restructure the whole school system by means of television. Six VHF television channels station were installed with four studio production centres capable of producing 200 television lessons a week. Television was the major form of instruction for six elementary school grades and high school grades. Studio teacher presented television programmes. Teachers also prepared written materials for use in the classrooms. Teachers were producing 6000 live programmes a year (Schramm, 1977). But in 1971 these programmes were cut to some 2,200 live programmes per year. However, parents, teachers and political leaders criticized the television programmes. In 1975, live programmings for schools came to an end and television was removed from school curriculum.

Africa

Most of the African states attained independence by 1960 when the educational facilities were inadequate and large section of the population

was illiterate. Most of the independent African countries decided to give top priority to provide education for all. Broadcasting was thought to be the only possibility of reaching the unreached. The first radio broadcast station in Africa was started in Algeria in 1925 followed by Egypt in 1926 and Kenya in 1928. However, television was slow in making in roads in Africa. Number of countries did not have facilities for television broadcasting. Reasons were high cost of programme production, absence of electric power in rural Africa, etc.

In the last few years there has been a substantial growth of satellite based broadcasting in Africa. In 1995, South Africa launched the world's first digital direct-to-home subscriber satellite service known as Mindset Network to tackle country's educational and health care problems. Presently the channel is targeting grade 10, 11 and 12 learners and educators and focussing on Mathematics, Science and English. A time tabled curriculum-based programme is broadcast in the morning. Late afternoons are allowed for school and home viewing. The broadcasts run from 8.30am to 5.30pm on weekdays. The network also provides the equipment, training and support for people to be able to access the content. The equipment includes a television, satellite dish decoder and video recorder. Mindset Network is planning to have two more education channels - one for early high school and other for early childhood development.

Australia

Australian Satellite system was started in 1985 with Aussat – 1 and 2 of the first generation of satellites. The downlink has two national beams and four spot beams covering different parts of the country. Aussat-3 have a beam with uplink and downlink capacity available for the Southwest Pacific region

Television was introduced in 1956. Kindergarten Playtime, the first TV experimental educational programme was introduced in 1956. In 1960, a concerted effort was made to plan series of programmes for use nationwide. Production facilities for educational purposes were expanded in 1963 and 1964. Direct teaching programmes were introduced in Science and Mathematics to help implement new syllabi in these subjects and to overcome an acute shortage of Mathematics and Science teachers. By 1969, the Education Department of South Australia and Queensland had begun to equip their schools with video recorders. By 1972, 90 percent of all Australian schools were making regular use of schools television programmes. The school broadcast consisted of wide range of both enrichment and subject specific programmes. Supplementary printed materials for both teachers and students were available for many of the radio and television schools broadcasts.

Among the other few experiments were the Queensland Government's satellite network 'Q-NET' which involves broadcast television to about 30 centres. This project looked into whether satellite communication is a cost-effective means of providing postgraduate vocational teaching and continuing medical education to general practitioners in Queensland. A two-year pilot phase of the project provided an in-service course to Pre School to year three teachers to help them develop children's reading and writing abilities. There are different types of earth stations: Interactive, which can receive television broadcasts and data and voice transmissions as well as transmit data and voice, television receive only (TVRO) which can only get television, data and voice but cannot transmit signals to the satellite. This was the first Telecourse development in Australia.

In Australia Centerlink Education Network is an example of one way broadcast of television programme with a return support channel via terrestrial lines. It uses the Optus B3 satellite for broadcasting of all their programmes. It offers a blended solution to education programmes most of which are accredited to match nationally recognized qualifications. Programmes are produced from the Centerlink Canberra studios and travel by satellite to Centerlink offices across the country. These are live programmes and interactive.

United Kingdom

BBC has a Broadcasting Research department, which was set up as early as 1936. It provides audience reactions to both TV and radio output. The research findings are used for strategic planning. UK has other alternative broadcast services like Channel Four, Central Independent Television and The Leaning Channel (TLC) which broadcast ITV programmes. The schools in UK can use either BBC or any other service provider. The details of all these channels are not described here but the important point is that in UK there are educational channels other than BBC, which broadcast educational programmes.

The Open University in Britain established in 1971 broadcast lectures on BBC television. The programmes are broadcast on the BBCs national radio and television networks. The programmes are for undergraduate or non degree programmes and have a reach of more than ten million viewers. These programmes cover a wide range of subjects and are filmed all over the world. These television programmes are found to be effective and useful.

The Joint Information Systems Committee (JISC)'s UKERNA 2-way Satellite Access Trial project is a two-way satellite Internet access. This pilot project was from November 2002 until the end of April 2004. It involved 17 higher or further education sites in the UK, all located in areas described as being rural and/or remote. These areas could not receive ADSL or Cable Modem broadband services, and included locations in the Highlands and Islands of Scotland, Cornwall and Wales.

The aim of this trial was to investigate how far satellite telecommunication technology can contribute towards solving connectivity and access problems in remote and currently undeserved areas. Seventeen off-campus learning centres, off-campus sites and individuals (staff) were equipped with small VSAT-based systems and services to assess the feasibility of broadband satellite as a technology for Internet access.

Two satellite service providers, representing three major satellite telecommunications technology providers, have taken part in this trial. The user group is divided into two application areas, one focusing on connecting off-campus learning centres, small user-groups and individual users (1 to 4 PCs per site), the other focuses on providing Internet connectivity for larger sites (10 PCs per site). The aim of the trial is to evaluate to what extent two-way satellite can effectively provide last-mile broadband connectivity to those Joint Academic Network (JANET) Connected Organisations in the UK. The results of the trial evaluation show an increasingly satisfied user base, certainly after initial network problems have been ironed out. This has resulted in a take up of over 50% of the commercial VSAT offer within the pilot user group. Although the usage is relatively small (traffic rarely exceeds 1 GB per month per client station), users acknowledge the fact that in their location, they do not expect an alternative access method within the foreseeable future. Moreover, this technology is providing them with an opportunity to adopt innovative eLearning and teleworking methods that were simply not possible with the previously available access provision. (***Source***: http://www.jisc.ac.uk/uploaded_documents/JISC-Sat-Rept-v1-01.pdf)

Space Link Bearing Foundation is a registered society in UK. It has created one stop space based resource on the web for teachers. It has built worlds first purpose built dedicated education satellite and conducted experiments in space relevant to the needs of the school community worldwide. The satellite supports the teaching of subjects such as science, applications of mathematics, technology, geography and space. The satellite which is of 55-60 Kgs, will provide a reliable direct one stop service for schools through its radio signals, equipment and specially tailored data streams.

Japan

Japan's space programme began in 1955 with the contribution of a handful of university professors. In 1970, Japan became the fourth country to launch its own satellite to orbit, after the USSR, the United States and France. Japan enjoyed a 100 percent success rate with its rockets though Japan's space agency — the National Space Development Agency (NASDA) had its first failure in 20 launches in 1989.

In Japan NASDA conducted experiment with the use of a satellite as a part of the i-Space Project. Here the teacher in the field is able to communicate with students in the classroom even from hard to communicate locations. The teacher gives a lecture from the area being displayed, while providing students with the feeling of actually being there. This experiment tries to realize the Field Learning which is to bring outdoor study environment into the classrooms.

Check Your Progress 8.2

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

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

Write True or False.

a) Telecast of Satellite Instructional Television Experiment (SITE) started in 1974.

b) INSA-1A was launched in 1983.

c) EduSat was launched in 2004 exclusively for education.

d) EduSat has only C-band transponders.

e) China launched its first satellite in the year 1970.

8.5 TELECONFERENCE

Teleconference in simple words, is a meeting between one individual with many people through telephone or network connection located in same city or in different cities, states and countries. It is a real time exchange of information between people. People can conduct meetings, training, demonstration, data transfer etc. Educational teleconferencing is a valuable medium for distance education. It involves the use of several media and permits interactive group communication by means of a two-way broadcast. Today, dependence on this technology is accelerating. The interest in using audio and related visual data that can be transmitted over regular telephone lines appears to be related to the growth of distance education.

8.5.1 Technical Description

Teleconferencing is an electronic means which can bring together three or four people in two or more locations to discuss or share the use of two-way

and one way video, both full motion and slow scan, electronic blackboards, facsimile, computer graphics, radio satellite and videotext. However, the most essential part of all forms of teleconferencing is a good quality audio system to help immediate interaction among the participants for information exchange.

Audio teleconferencing requires a multi-telephone line electronic switch or interconnection device called a 'bridge' to which the user can attach a wide variety of data transmission devices and telephones. The normal practice is to connect one device per line to the bridge. Audio equipments used with the bridge are the usual handsets, headsets, speaker-phones, radiotelephones, and microphone speaker units. Audio teleconferencing uses regular telephone lines provided by local public telephone companies. If the quality of standard business or household lines is good enough, virtually any line could be used. Effective contact through teleconferencing can be made in any reasonably quiet environment. Occasional users normally purchase their service from the local telephone company, teleconferencing consultants or a major user that is willing to sell available time on its system. The costs for starting a university or college-based private audio teleconferencing system are not large if the local telephone system has:

- a relatively quiet line,
- ready accessibility, and
- acceptable local and long distance rates.

A typical teleconference set up will have a studio with recording and transmission facility, where expert/teacher can sit and deliver lecture. This studio is linked to a satellite earth station through which live transmission goes to the satellite for further transmission to the reception centres, where Direct Reception System (DRS) units are placed with a parabolic antenna, television set and telephone for talk-back. This is typical scenario for one way video and two-way audio teleconference system. However, in the EduSat based teleconference such centres are called Receive Only Terminals (ROTs), which may also have computers, with web-camera connected to interact with the resource persons in the studio through video as well. In addition, the EduSat network also has two-way video conference facility with Satellite Interactive Terminals (SITs) making is fully interactive in real-time mode. A typical teleconference set up is shown in Figure 8.1

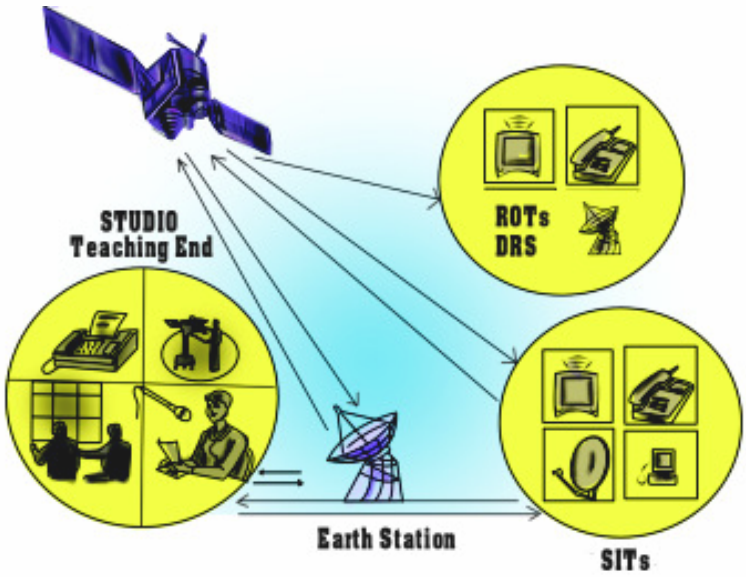

Fig. 8.1: Teleconference Set up

8.5.2 Advantages of Teleconferencing

The support for teleconference was mainly due to the consideration of the following advantages:

i) **Effective Support for Remote learners:** Teleconferencing can be very useful when most of the potential students are widely scattered among communities that are far apart and when each centre has a thin learner population, say less then ten students, in a given course or programme.

ii) **Cost effectiveness**: The cost for starting and operating teleconferencing system is relatively low in comparison with other available methods of serving remote learners.

iii) **Flexible system**: The system used can be adjusted quickly to serve large or small groups.

iv) **Familiar instructional mode**: The mode of instruction is similar to that of the seminar with the instructor being in charge of the discussion and able to stimulate multi location interaction.

v) **Easy scheduling adjustments**: A scheduling adjustment can be made almost as readily as for the on-campus classrooms.

vi) **Multi-locational access-control**: Access to the instruction in the programme can be controlled through a limited number of off-campus centres.

vii) **High-quality instruction**: The quality of instructional materials can be kept high because of the need for careful and early preparation.

viii) **Immediate feedback**: The teleconferencing system provides the facility for immediate feedback to the learners and allows them to convey their reactions to the tutors.

8.5.3 Limitations of Teleconferencing

Teleconferencing has certain inherent limitations, due to which it is not in frequent use in education. Some of these are as follows:

i) Teleconferencing requires a huge and very efficient telephonic, radio and television network throughout the country.

ii) The chances of technical breakdown are quite high.

iii) The telephone charges are very high, which all the educational institutions cannot afford.

iv) Teleconferencing is a costly technique of instruction. It requires sophisticated technology and expert human power.

v) Teleconferencing is a mode of group communication, so the willingness of each participant is an essential requirement, but this is generally lacking especially among distance learners

vi) It takes time to organize.

8.5. 4 Types of Teleconferencing

You may find the term teleconferencing misleading. Some people interpret the term to mean that television as a medium is a type of teleconferencing, but teleconferencing covers a much wider range of means which are being used in distance education or for other communication purpose. 'Tele' here means distance, i.e., talking to the students at a distance, which makes it useful for teaching at a distance. Depending on the use of hardware, there can be three types of teleconferencing:

i) **Audio teleconferencing**: Teleconferencing where the audio medium is used as a two-way communication, is known as audio-teleconferencing.

Most audio-teleconferencing communication is auditory. The use of audio conferencing is rapidly becoming a preferred instructional medium in advanced countries. Two-way audio communication is a more economic method of academic interaction. For example, the University of Calgary is involved in the creation of a system using audio telephone conferencing, strictly as a teaching tool known as 'educational teleconferencing'. There are some other universities in the developed countries using audio teleconferencing for educational purposes, but such cases are today limited in number.

There have been a number of studies on the effectiveness of audio teleconferencing from the point of view of the students' learning (Ellis and Chapman, 1982). These studies show that the telephone is as effective a medium of education as is face-to-face teaching. A study conducted in Canada found that upper level undergraduate statistics students taught through teleconference did as well as or better than most campus based students and had a zero drop-out rate! Traditional correspondence instruction on the other hand reported an average drop-out rate of 40-60 per cent. Satisfaction recorded among the students was high and remote learners thought the course did not lack rigour or suitable contact.

Audiographics

An effective variation of audio conferencing technique is the use of graphics simultaneously along with sound. The system is called as audio-graphics. A typical audio graphics set up consists of an instructor site and a number of remote sites. The instructor site consists of a speaker phone, high powered PC-based microcomputer, modem, flatbed image scanners, and high-resolution monitor. The remote sites have one or more speaker phones and a computer along with a monitor to receive images. Such a set up enables the instructor to teach in a real-time mode, showing graphics through the computer screen.

ii) **Video teleconferencing**: This type of teleconferencing is arranged by combining two-way video media. This technology is in limited use in education due to its high cost and various other problems such as the linking of multiple locations by the medium of video, availability of hardware, etc. Video teleconferencing, however, has advantages over audio teleconferencing because of its visual component. Video teleconferencing increases the quality of interaction because both the teacher and expert and the student can see each other and can share their feeling and experiences. But the problem is to justify the cost involved in arranging two-way visual communication. Video teleconferencing needs, besides budgetary provision, the most sophisticated technology at both the source and receiving ends. Uplinking facilities at the receiving end are required to make it a two-way interactive communication system.

Taking all these constraints into consideration, we can find a moderate way to make use of video teleconferencing, that is, we can use one-way video with audio return connection using the satellite uplink from the receiving end. This arrangement is also difficult to make in our context because of both financial and technological constraints.

iii) **Computer teleconferencing**: It is the most effective way of teleconferencing. With the adequate facility of suitable hardware, information can be sent and received at the convenience of both the teacher and the student with the use of computers. Computer conferencing can be text-based or full video based. Web conferencing methods use chat and instant messaging. One can see the other person by having a webcam and streaming video. Some of the common and popular programmes that use internet teleconferencing are the Yahoo Messenger, MSN Messenger, Skype, Google Talk. You will read in detail about computer conferencing in Block 4 Unit 18 in this course.

8.6 DESIGNING TELECONFERENCE SESSIONS

As a distance educator you may be given the responsibility of organizing teleconferencing in your institution. It is therefore, very important for all of us to clearly understand the techniques of organizing teleconferences.

The process of teleconferencing consists of four stages, which follow systematically one after the other.

i) **Planning**: As in any business meeting, careful advance planning is of vital importance for the success of teleconferencing. First of all, decide the content of your session. Right from the initial stages, you need to be well aware of the possible issues to be involved in the discussion, and the needs and attitudes of the students participating.

You need to know the number of students and the duration of each session.

Check all the necessary requirements, viz., and demonstration of equipment including a trial of microphones, etc. At the same time you need to have, on the location, discussions with the technical staff involved in the operation of teleconferencing -- every operational detail has to be discussed with them to avoid mid-conference failures.

ii) **Preparing materials**: After initial planning, prepare supporting materials for the students. Educational teleconferencing should be enriched by the use of printed materials, including charts and diagrams. Printed guides should reach the students well in time so that they can use these materials during the teleconferencing session and can actively participate in the discussion.

iii) **Preparing students**: Preparing the students for active participation in teleconferencing is an important function of the distance educator in charge of the conference. The students should know in advance about the content being discussed, objectives to be achieved, and about the teleconferencing system. They should be psychologically ready to learn through talk-back facilities and the preparatory activities should not take much time.

iv) **Conduct in the actual session**: After preparing the students, the actual teleconferencing starts. The sessions should be interactive so that all the students can actively participate and learn as much as they can from the conference session. While conducting the session, you have to keep some do's and don'ts in mind. They are as follows:

The expert should have a good audible voice and sound communication skills, and should undergo a simple audition test before being involved in a teleconference, i.e. the expert(s) should be selected carefully. The expert should speak directly into the microphone rather than to anyone

side. By doing so, he/she will be able to speak directly to the students. As far as possible, each student should be addressed by name, if the number of learners is small enough. Like the self-instructional materials, the discussion should be informal. There is a need to add human touch and humour as and when required, provided it does not disturb the educational value of the discussion.

It is important to set aside sufficient time for questions, answers and discussions so as to make the sessions as interactive as possible. Each student should be encouraged to actively participate in the discussion.

v) **Feedback**: After the conference is over, you should co-operate with the students to satisfy their specific needs and requirements. There after, they should be given sufficient time to react to the quality of the conference. At the same time the feedback session must help the students know about their performance. Almost equal time should be given for preparing the students for teleconferencing and collecting feedback from them.

For the students' convenience, the teleconference sessions could be recorded and be made available at the study centres for those individual students who could not, for any reason, participate in the conference. By doing so, you can make optimum use of the discussion held during the conference.

Towards the end of the sessions, you should motivate the students to send either personally or through letters, their reactions to and ideas about the overall effectiveness of the teleconference. The reactions thus collected can be used as inputs to improve the quality of the conferences to be held in the future. Systematic evaluation of this type provides further inputs of use to the teleconference organizers, distance teachers and experts in planning and conducting better teleconferences. The effectiveness of teleconferencing depends on the appropriateness of the content being discussed and the resourcefulness of the expert invited to conduct the discussion. An eminent scholar/expert can be brought into teleconferencing from anywhere in the country to give a live presentation to the participating student.

Check Your Progress 8.3

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

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

1) Write down three advantages of teleconferencing for distance education.

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2) You are given a one-hour teleconferencing programme. If the minimum conferencing programme conditions, such as the despatch of supplementary materials, topic outline, physical facilities, etc, are provided, how would you plan for a one hour teleconferencing programme? Take three activities ¾ preparing the students, conducting the actual teleconferencing session and collecting feedback ¾ into account. How much time will you allot to each component?

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8.7 LET US SUM UP

In this unit four major issues which you should learn and will be of your interest are described. Although, the content of each aspect is not exhaustive, but effort has been done to explain the main points. The key points are summarized as follows:

1) Satellite is a spacecraft which receives signals from an earth station and retransmits them back to the earth for social applications.
2) There are four types of satellite orbits.
3) Common characteristics of satellite are: power, large coverage initial investment, cost, multipurpose uses etc.
4) Various organizations in India and in developed and developing countries have conducted experiments in education and other areas by using this technology. It has emerged as a new media and tool for conferencing, training and education.
5) There are different types of teleconferencing which have there own advantages and limitations.

8.8 KEYWORDS

Audiographics: is a variation of audio conferencing technique that uses graphics simultaneously along with sound.

C-band: is a portion of the electro magnetic spectrum used for long distance radio communication. The C-band frequencies of INSAT are: 6.725–7.025 GHz (for transmission) and 4.500–4.800 (for reception).

Geo-synchronous orbit: is an orbit around the earth with an orbital period that matches the earth's sidereal rotation period, ie. Time taken by earth to complete one rotation to its own axis, and it is 23 hours, 56 minutes, 4.091 seconds. Normally the orbit is above 36,000 KM sea level. Satellite that move in the geosynchronous orbit is called geosynchronous satellite.

Ku-band: is a portion of the electro magnetic spectrum used for long distance radio communication where the frequency is between 12 to 18 GHz.

Satellite orbit: is the path on which a satellite moves. The orbit is defined by 3 factors. The first is the shape of the orbit, which can be circular or elliptical. The second is the altitude of the orbit. The altitude is constant for a circular orbit but changes constantly for an elliptical orbit. The third factor is the angle the orbit makes with the equator.

Satellite: is an object that has been placed into the orbit by human endeavour. They are also called artificial satellite. Moon is a natural satellite of Earth.

Teleconference: is exchange of information over a telephone network so as to be received by more than one person. Teleconference can be audio-based, video-based and computer-based.

Transponder: is an automatic device that transmits pre-determined messages in response to pre-defined signals. They are used in satellites to transmit specific message related through generation of electromagnetic waves.

VSAT: is abbreviation for Very Small Aperture Terminal that is a two-way interactive satellite ground station to receive and transmit data from the satellite.

8.9 REFERENCES AND FURTHER READINGS

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8.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 8.1

1) The geo-synchronous orbit is most suitable for communication satellites. A satellite in this orbit moves in such a way that it appears stationary to the people on the earth. The services of such satellite are available for all the time to the people concerned.

2) Three characteristics of satellite are:

   a) They do not require conventional power to maintain its position. They are powered by solar batteries built into the satellite.
   b) The cover large distances, as they are positioned above 36000 KM above the sea level. So, using satellite we can reach remote areas.
   c) They are multi-purpose, and can provide a variety of functions such as radio and TV transmission, telephone services, weather forecasting, etc.

Check Your Progress 8.2

a) False. In 1974 satellite was launched from Cape Carnival, USA. Actual telecast started on August 1, 1975.

b) False. INSAT-1A was launched in April 10, 1982. In 1983, INSAT 2B was launched.

c) True. EduSat is India's exclusive education satellite.

d) False. EduSat has five Ku-band transponders providing spot beam, one Ku-band transponder providing national beam, and six extended C-band transponders covering regional beam.

e) True. China became the fifth nation with satellite of its own in 1970.

Check Your Progress 8.3

1) Advantage of teleconferencing:

   - most of the widely scattered students can be approached through teleconferencing.
   - many different topics can be covered.
   - scheduling adjustments are easier.
   - constant contact with the teacher.

2) Your answer may be something like this:

   i) Preparing the students — 15 minutes
   ii) Presentation of the content — 30 minutes
   iii) Feedback — 15 minutes

UNIT 9 E-LEARNING

Structure

9.0 INTRODUCTION

The Internet as the backbone of e-learning was originally developed in 1969 by the Advanced Research Project Agency of the Department of Defense, United States. Since then the Internet has grown exponentially with the emergence of the World Wide Web (WWW) in 1991. According to one estimate, the Internet reached 50 million people in just four years. In comparison it took 38 years for Radio and 14 years for TV to reach the same number of target audience (Huber, 1997). The Internet and its WWW have simultaneously captured the imagination and interests of so many educators around the world leading to use of terms such as web-based learning, online learning, etc. The interests in the educational use of the web has been driven by higher demands for education and training, shift in the societal economy from labour intensive work to knowledge intensive work, and need for earning while learning.

In the previous units in this block, we discussed educational delivery technologies such as the audio and radio, video and television, and satellite for interactive television. In fact, the WWW makes use of all of these in one way or other, and e-learning has become an important means of educational delivery to those having access to the WWW. In this unit, you will discuss the potentials of e-learning and basics of designing online learning environments.

9.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Define* e-learning, and list the attributes of e-learning;
- *Describe* the different forms of e-learning;
- *Explain* media a technology used in e-learning;

- *Identify* steps for implementation of e-learning; and
- *Give* examples of use of e-learning in various educational and training settings.

9.2 E-LEARNING: DEFINITIONS

As in any growing field of knowledge, the terminology in e-learning field has also not been standardized yet. Many scholars use the term differently and some use the same interchangeably. These terms do have their differences, and let's look at these:

Web-Based Instruction: It is a "hypermedia based instructional programme which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (Khan, 1997).

Virtual Learning: "The educational process of learning over the Internet without having face-to-face contact is known as **Virtual Learning"** (French, et al., 1999). However for some, virtual learning may also include tele-learning.

Online Learning: It is synonymous to web-based learning where learning is fostered via hypertext transfer protocol (http) in Internet or Intranet.

E-Learning: "The term e-learning covers a wide set of applications and processes including computer-based learning, web-based learning, virtual classrooms, and digital collaboration" (WR Hambraecht+Co., 2000: p.8). However, the term e-learning is becoming more and more accepted as substitute for web-based learning or online learning, falling in line with e-commerce and e-business.

From all these definitions, we can very well see that they have almost same meaning with different name. So, we may define e-learning as the use of networked information and communication technology in teaching and learning. The network being Internet or intranet is the most important aspect of the educational communication process, and its access and usability decide the kinds of interactions and teaching that may happen in e-learning.

9.2.1 Advantages and Disadvantages of E-learning

Before we proceed further, it is worthwhile to look into the advantages and disadvantages of this new technology for teaching and learning. This will enable us to understand what can be done with this technology and what can't.

The web-based learning environment provides tremendous advantages over traditional distance learning or classroom-based teaching. Some of these advantages are:

i) Quick production, alteration and up-dating of course materials;

ii) Interaction with tutors, course writers, and students to enrich learning;

iii) Location and time independent delivery of course materials;

iv) Ability to serve a large number of students at a potentially reduced cost;

v) Interactive and dynamic learning experience through online assessment tools, simulations and animated learning objects;

vi) Platform independent delivery, accessible through any computer with a simple browser interface;

vii) Increased learner control through hypertext based presentation of information; and

viii) Seamless integration of multimedia, enabling instruction designers to prepare quality materials and learners to get a rich learning environment (McCormack and Jones, 1998; Goldberg et al, 1996; Weller, 2000 and Starr, 1997).

In spite of its enormous advantages, the web-based learning is not devoid of problems. It is essential to understand these problems to design useful learning environment for the learners. Some of the problems associated with e-learning are:

i) Access to computers and Internet at present is abysmally low. At the end of 2009, only 26.6% of world population had access to the Internet. In Asia the access is just 20.1%, and in Africa it is 8.7% of the total population. The access statistics in just 7% for India (Source: www.internetworldstat.com). Because of the poor access, it is still being considered as a technology that can divide the society.

ii) Internet bandwidth at present in most places is just 28.8 kbps, though access to broadband is increasing. Poor bandwidth makes the access slower and frustrating for the user.

iii) Cost of access to computers and Internet is high too for the developing countries. Though price in this sector is fast going down, the cost of web-based courses is not accessible to most at present. However, the cost of the courses will also go down as the number of student would go up.

iv) Students as well as teachers need to be trained to make use of this new technology. Preparedness to use technology for learning is very low with teachers, as a result technology dominates the pedagogic purposes.

v) Lack of any acceptable standard of quality in web-based learning allows uncontrolled growth of teaching shops on the web.

vi) Application of copyright laws on the web is indeterminate at this time as the users can download any text or image file that he or she can view.

vii) Authentication and security over the network are still problematic to facilitate online assessment for certification (Starr, 1997; McCormack and Jones, 1998).

According to Piskurich (2006), while e-learning can make distance learning more interactive and collaborative, it has some disadvantages such as the demand over more faulty time, reduced attention of learners in the cyberspace during synchronous sessions, non participation in chat and discussion forums, and need for higher self-direction from the learners.

9.2.2 Characteristics of a Typical E-learning Solution

While you will learn about the various components of e-learning and technologies used in this unit, it is important to give a brief outline of the typical characteristics of e-learning solutions available in the market. The web-based technologies available in the market provides an integrated solution for various task of teaching and learning that can be performed on the web.

Table 9.1: Characteristics of A Complete e-Learning Solution

1)	Assessment and Curriculum Design and Development	• Organizational and individual needs assessment • Setting competency standards of performance • Goal setting and incentives • Roadmap to educational access
2)	Branded educational content	• Proven, high-quality intellectual capital • Timely, relevant, and consistent information • Keeping fast-changing content current, dynamic, and refreshed • Off-the-shelf and customized
3)	Broad and easy access to	• Anyone, anytime, anywhere, and any subject • Multiple technology based delivery methods • Synchronous and asynchronous • Enabling just-in-time training
4)	Engaging user experience	• Rich multimedia experience • Realistic simulations and role playing • Video-based teaching and storytelling • Advice and explanations from experts/mentors • Animated case studies and examples • Interactive games, activities, and music
5)	Regular reinforcement	• Personalized and/or real-time online mentors • Web-casts, interviews, live events • Practical exercises and application • Facilitated workshops and discussion groups • Desktop advice, special events, and updated learning opportunities • Weekly newsletter and relevant articles
6)	Collaborative online communities	• Access to fellow learners, instructors, business leaders, and experts • Access system knowledgebase • Private company and global communities
7)	Centralized tracking and	• Easy and automatic knowledge management • Tools to evaluate progress of individuals or groups • Assessment metrics to pinpoint employee needs and goals • Measuring return on investment
8)	Scalable technology	• Leveraging existing open industry standards • Scalable to any size enterprise • Flexible technology to include groups of workstations or the entire organization • Easy integration with client's internal systems • Delivering media rich broadband experience
9)	Organizational consulting, implementation, and integration	• Integration with existing curriculum and training delivery system • HR and IT Administration training • Employee incentive and accreditation programs • Performance reviews • Cultural support for self study • Customized management training support • Behavioral change measurement and reporting

Source: WR Hambrecht+Co (2000)

These systems provide:

- a standard way to organize course materials;
- have prior evidence of the environment's effectiveness in instructional uses;
- use tools to support basic instructional activities, such as course design, organization of group spaces and personal space, grading and easy integration of multiple media files; and
- models to support learning strategies that involve collaborative learning, knowledge building and multiple representations of ideas and knowledge structures (Harasim, 1999).

Table 9.1 gives an outline of the characteristics of a typical e-learning solution available in the market. From this, we can conclude that e-learning systems provide: easy access to information and technology (without need for a technical programmer); access to specially designed content in standard formats to suit various technologies; better user experience of rich media; collaborative learning opportunity; assessment of curriculum and learner prerformance; tracking of the progress of the learners to provide timely feedback; centralized data storage and processing; and ability to scale-up the educational provisions.

Check Your Progress 9.1

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

b) Compare your answers with those given at the end of the Unit.

1) Define e-learning in your own words.

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2) List four advantages and disadvantages each of e-learning.

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9.3 INSTRUCTIONAL DESIGN FOR E-LEARNING

E-learning can be delivered in three modes: (i) using the web as a supplement to face-to-face instruction, (ii) using the web in a mixed mode with face-to-face instruction or distance learning scenario, and (iii) using web-based instruction as completely online with no face-to-face student-student or student-teacher interaction. It is the last category that is more challenging to educators and instructional designers. It allows training and learning opportunities to reach the learners just in time. The environment is beneficial for both learners and teachers, as it can facilitate shift from instructivist to constructivist learning paradigm that represent "student-directed learning" rather than "teacher-directed learning" (French et al, 1999).

The constructivist-learning paradigm believes:

1) Objectives are written with student collaboration based on the learner's needs;
2) All the learners are unique and bring their own social understanding to learning context;
3) Problems are solved when they have personal relevance to learners;
4) Knowledge is individually and socially constructed; and
5) Learning can only be measured through direct observation and dialogue (French, et al, 1999).

Constructivist learning encourages learners to express their conception of an idea, to reflect on the opinions of others or on feedback provided about their ideas, and to revise their initial conception to account for new opinions and feedback (Oliver, 2000). All these three activities work in cyclic fashion – expression, reflection and revision. Some of the constructivist tasks related to the three activities and tools supported in the web environment are depicted in Table –9.2.

Table 9.2: Constructivist Tasks vs. Web Tools

Constructivist Tasks	Web Tools
Establishment of personal and group objectives/goals	e-mail, discussion group
Discuss and debate ideas and receive feedback	e-mail, discussion groups, voice-chat
Seek and collect information	Web pages, search engines, digital drop boxes, bookmarking
Organising information in a coherent framework	Softwares to analyse data, prepare tables, charts and concept maps
Integrate different external information to internal conception	Note-taking, annotations, etc.
Generate/construct new information	HTML editors, web page creation tools, word processors etc.
Manipulate external information and variables.	Simulations and animation on the web
Understanding real world phenomenon	Streaming media technology for audio and video.

Source: Based on Oliver (2000)

While the constructivist approach is considered as the most suitable for e-learning, Mishra (2002) proposed an eclectic model of e-learning covering behaviousim, cognitivism and constructivism. He analysed these learning theories in the context of e-learning to identify the instructional approaches to be used (See Table 9.3). Based on the features identified, Mishra (2002) proposed the instructional design model (See Figure 9.1) for e-learning environment that should consider the learners, the subject and learning outcomes desired in the learners to create the courses and programmes in the online world.

Table 9.3: Approaches to Instruction

Learning Theories	Overall assumption	Basic instructional approaches	Online approaches
Behaviorism	• Basically, behaviour is a function of its consequences. Learning is achieved through frequent response and immediate reinforcement of appropriate behaviour • Essentially, behaviour and performance are either seen as synchronous or performance is seen as the useful outcome of learning behaviour	• Instruction is designed to promote individual pacing and progress • Instruction is designed using a task analysis, which breaks down the behaviour into a sequence of observable actions • Assessment practices measure objectives in which behavior is operationally defined and measured according to some performance indicators	• Lessons with explicit objectives in behavioural terms in the web pages • Use of self-assessment questions as interactive activities in the learning materials • Step-by-step description of learning materials in small chunks
Cognitivism	• New information is built on existing structures • Relevant processing activities are stimulated and specific strategies are taught to assume that the learner efficiently acquires the information or solves the problem	• Instruction is designed to promote processing activity akin to that of an expert • Assessment practices rely on observable behaviour but infer specific mental operations based on the design of the test	• Use of note-taking and annotation • Instructions for learning to learn • Peer-assessment of learning • Information seeking through search engines
Constructivism	• Learning is understood as interpretative and emergent, and under the control of the learner. Cognition is situated and must be understood in terms of the setting, purposes, tools, and tasks in which the knowledge is to be learned. • Knowledge is to a large extent a negotiated meaning as cribbed to reality and should be achieved via collaborative group work	• The goal structure need to be negotiated through teacher-learner interaction • Learners are at the centre of the design activity. Some form of constructivism stress cooperative learning • Assessment practices are designed around real-life problems and promote self-evaluation and reflection and to maximize learner responsibility	• Use of discussion forums and chat (both synchronous and asynchronous techniques) • Email transfer amongst learners • Group projects • Streaming media use • Provision for social activities on the net

Source: Based on Villalba and Romiszoski (2001)

9.3.1 Instructional Strategies

As discussed earlier, while constructivist approach is more suitable in the e-learning situations, other approaches can and should also be used. In fact, a suitable instructional strategy on the web is integration of the best components of all the different learning paradigms, which will include information presentation, guidance, collaboration, drill and practice, reflection, feedback, articulation and creation, discovery, decision-making, and assessment. The following are some of the instructional strategies that can be used in e-learning.

i) **Information presentation**: The web pages display textual as well as graphical information for the learners. Also audio-video based learning materials can be supplied to the learners on the web page.

ii) **Decision-making**: Computer and web technologies allow learners to take their own decision to follow links provided on the pages. The learning environment can be customized for individual needs based on learner's decision to take course/module/units. The learners can also decide on the kind of interface (graphical and/or text-based).

iii) **Guidance and Collaboration**: E-mail and online asynchronous discussion group facilitate collaboration on the web. Using e-mail, the learners can contact a tutor or another student to clarify doubts. Similarly learners can collaborate through discussion groups to discuss and debate on various aspects of the curriculum.

iv) **Drill and Practice**: As in computer assisted learning, the web also provides drill and practice opportunities. Using formative assessment techniques in the course content presented in small web pages can lead to optimized learning.

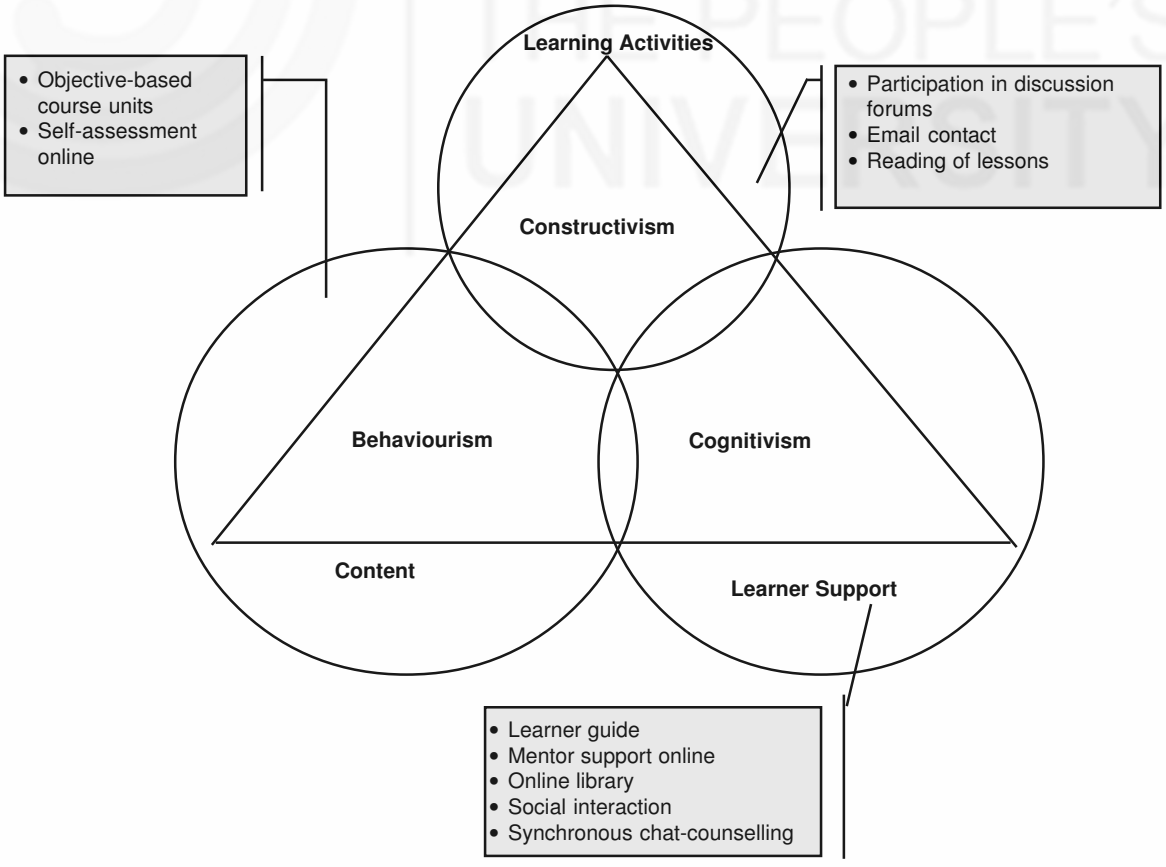

Figure 9.1: Design framework for online learning environments (*Source*: Mishra, 2002)

v) **Feedback**: As we understand, feedback is a very essential component of the over all learning process. Learners can receive automated feedback to their assignments, and interaction with formative assessment tools in the web pages. Tutors can also provide e-mail based feedback to learners with human touch.

vi) **Reflection**: Using the asynchronous discussion tools, learners can express and reflect on ideas and conception held by other learners, as well as on real life events.

vii) **Articulation and Creation**: When the learner is reflecting on someone else's idea, he/she is also trying to articulate his/her own thought so as to put it in writing. In the process the learner apply greater depth of thinking and create new knowledge embedded in a social and meaningful context.

viii) **Discovery**: The web provides an opportunity for the learner to discover new knowledge and learning materials on the web. Inclusion of search facility on the learning site can facilitate this or the learner can use other search tools. The emphasis here is on promoting independent learning and evaluating the quality of information that one gathers through web searches. Wilkinson et al (1997) have provided useful tips for evaluating quality of Internet resources.

ix) **Assessment**: Though this is yet a foggy area, the web provides new ways and means of assessment. With the emphasis on self-directed learning and learner autonomy, the assessment issues become secondary as the learner tries to evaluate him/herself. However, the web provides opportunity for speed, and power test in objective type questions. Electronic assessment of essay type questions is also now possible to bring objectivity into the evaluation process (Swartz, 2001).

Check Your Progress 9.2

Notes: a) *Write your answers in the space given below.*
b) *Compare your answers with those given at the end of the Unit.*

1) List the three ways in which e-learning can be used.

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2) Write which web tool(s) you will use for the following tasks:

a) Collect information on the web:
b) Save weblinks online:
c) Construct new information:
d) Organize information:
e) Discuss and debate ideas:

9.4 MEDIA AND TECHNOLOGIES IN E-LEARNING

The Internet, the backbone of online learning, is an interlinked network of networks that allows computers worldwide to connect to it, and to communicate or exchange data with each other. The Internet is based on Transmission Control Protocol - Internet Protocol (TCP/IP); information is

routed in "packets" according to TCP/IP specifications. The WWW works on the Internet through its own HyperText Transfer Protocol (HTTP), an interactive platform that uses the following media:

- Text, plain or formatted
- Hybrid text/graphics documents, such as Adobe Acrobat
- Colour images, still and animated or videos
- Sound
- 3-D models
- Interaction or simulation using JavaScript, VB Script, ActiveX (Ryan *et al*, 2000).

The WWW also supports real time, text-based chat and audio/video communication. The basic unit of the WWW is a web page, consisting of one or more of the media types above. A set of connected pages constitutes a website. Clicking on links in each page accesses other pages on a site.

Websites are *hosted* in a computer called a *server*. Individual *client* computers interface with the server computer through a web browser (such as Microsoft Internet Explorer or Mozilla Firefox); when a specific address is typed into the address bar of the browser, the server supplies the requested web page.

9.4.1 Online Media Creation Tools

Text: Preparing text-based learning material is relatively easy and can be done with only computer keyboarding skills. Text-based materials are also easily accessed and understood by learners. A typical web page is prepared using HyperText Markup Language (HTML) instructions; HTML files can be created using common word processing software, such as Microsoft Word. The WWW also supports other text formats, such as Rich Text Format (.RTF) or Adobe Acrobat's Portable Document Format (.PDF), which can be embedded within HTML-coded pages.

Graphics and images: Graphics and images are useful to clarify or illustrate concepts in an online learning programme. Graphics and images can be created, or digitised using a scanner and imported into a computer using specific image manipulation software, such as Adobe PhotoShop or Adobe Illustrator. Images are then imported into an HTML web page.

Common image formats include the Graphic Interchange Format (.GIF) and Joint Experts Photography Group (.JPEG), which use compression technology to make image file sizes smaller for quicker web display or download. Though graphics and images are useful learning tools, their preparation requires some skill and experience in using graphic design software. Graphics or images generally have a bigger file size than plain text, and take longer to download or to display on screen.

Audio and video: Audio and video are useful to show practical and real life activities. Hazardous and costly experiments can be captured using video for presentation on the WWW, for repeated use. With new digital audio and video *progressive download* and *streaming* capabilities, audio and video can be transmitted directly over the Internet although transmission quality still depends on the learner's network connection and available bandwidth.

Popular audio and video file formats and software include Apple Quick Time, Windows Media Technologies and RealNetwork's Real Systems.

Another emerging format is the Motion Pictures Experts Group (.MPEG), although the disadvantage of MPEG is that the whole file must be downloaded before it starts to play. If high bandwidth is available, all these technologies can deliver high quality video and sound. Today, the popular audio format is MP3, and video format is Flash Video (FLV).

Animation and 3D-models: Animations and 3-D models can be very powerful in teaching and learning spatial applications, but need high bandwidth to display well. The WWW animation standard is animated GIF files, although Java, Shockwave and Macromedia Flash are also used. The standard for 3-D modelling is Virtual Reality Modelling Language (VRML). A web browser needs a VRML plug-in to display 3-D models properly. Designing quality animation and 3-D models also requires a high degree of skills and experience in the appropriate software.

9.4.2 Communication Tools

Internet communication is either asynchronous (email, mailing lists, bulletin boards) or synchronous (text-based chat, audio chat, videoconferencing). Web-based communication for teaching and learning has been popularised by the constructivist-learning paradigm (Oliver, 2000; Hung & Nichani, 2001), which is based on collaborative learning principles.

Electronic mail: Users send and receive email text messages asynchronously through a programme (like Microsoft Outlook or Qualcomm's Eudora Pro) installed on the user's computer, which sends and receives information through an email server provided by the user's Internet Service Provider (ISP) or office network. However, web-based email (like Hotmail or Yahoo Mail) allows users to access their account from any computer with an Internet connection. A user can send emails to multiple recipients simultaneously, and can attach files (word-processed documents, spreadsheets, images) to each message. This facilitates collaborative group learning at a distance, but puts the onus on the learner to initiate or maintain contact.

Mailing lists: Mailing lists are many-to-many communication channels on the Internet, managed using specialised software such as Listserv, Majordomo, and Listproc. People email instructions to join or leave a list to the computer running the service. Lists can be moderated or unmoderated, and can be used to collaboratively discuss and debate education or training issues within learning communities. However, too large a group can hinder rather than help the learning process.

Discussion boards: Internet discussion board systems such as WebBoard, Yahoogroups or GoogleGroups are similar to mailing lists, with the additional feature of everyone's messages being available on the WWW as a series of discussions. Messages are displayed online as they are received or as appended replies to the original message, allowing simultaneous coverage of many topics.

Chat: Internet Relay Chat (IRC) is the standard for synchronous, multi-person, text-based chat. Most IRC applications (such as MSN Messenger, ICQ, Skype, Yahoo Messenger, etc.) are independent of the WWW, but can also be launched from a web page. The software keeps track from a central server of when you, and a list of people you specify, are online. You can text-chat or voice chat one-to-one, or in a conference. Some systems have an electronic whiteboard on which a teacher may "write" information viewable by all online chat participants, simulating a classroom situation. However,

synchronous text or voice chat can create organisational problems - especially in globally offered web courses, where there are time zone issues.

Other Communication Tools: Besides the above traditional tools, everyday new forms of communication tools based on the web are available. Some of these are Blog, Wiki, micro-blogging, etc. These are also often called Web 2.0 tools, and they provide the user an increased ability to interact and contribute to the system as an active participant rather than a passive receiver of information. These are discussed in Unit 17.

Check Your Progress 9.3

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

b) *Compare your answer with the one given at the end of the Unit.*

Choose the right answer in the following multiple choice question:

i) Text for use in online learning can be prepared using:
   a) HTML Editor
   b) Word Processing software
   c) Acrobat Document Write
   d) All the above

ii) Which of the following is not a graphic format:
   a) .DOC
   b) .GIF
   c) .JPEG
   d) .PNG

iii) MP3 is a format of:
   a) Video
   b) Animation
   c) Audio
   d) Animation

iv) *Listserv* is a form of:
   a) Chat system
   b) Mailing list management software
   c) Discussion board
   d) Email software

9.5 BUILDING E-LEARNING ENVIRONMENTS

Designing E-learning requires grounding in pedagogy, an understanding of the subject to be taught and of how the WWW works. Collis and Moonen (2001) identify *institution, implementation, pedagogy* and *technology* as the key components; Jolliffe, Ritter and Stevens (2001) describe an 18-step process for developing online learning. However, they emphasise "there is no magic in the actual number of steps." Let's discuss a possible and systematic approach.

Needs analysis

Market research on the demand and need for an online course should be the starting point. The resulting report should contextualise the project, outlining its benefits or disadvantages and potential obstacles.

- **Demand for online courses:** Does real demand exist? Will online delivery be cost-effective? Is it the best option currently available?
- **Course credit and equivalence:** How will course credits be transferred for certification? What about the equivalence of the course with face-to-face programmes? Is it necessary to get certification from an accreditation body?

Learner profile

This will help you understand who your potential learners are, and how you can best fulfill their learning needs.

- **Hardware/software:** Do learners need to purchase special hardware or software to access the course? Most computers now ship with a web browser. If learners have to download a special plug-in from the Internet to view a particular course component, it is better to provide them with a CD-ROM of that component to save costly Internet access time.
- **Internet access/bandwidth:** How accessible is the Internet for the learners, and what bandwidth or connectivity (e.g. dial-up modem, DSL, cable) is available? Low bandwidth availability has significant design and pedagogic implications. You can't prepare learning materials based on graphics, animation, sound or video because of the time and costs involved for learners to adequately view or download the materials.
- **Costs:** Who will bear the cost of needed computers and Internet access? Although normally this falls to the student, the costs may be prohibitive. Is it possible for your organisation to arrange for subsidised learning, in partnership with industry or government? Can you facilitate educational loans? Is it possible for you to create learning resource centres, with computers and Internet facilities, for group learning and access?

Organisational profile

Your organisation must be prepared to undertake an online learning project.

- **Expertise and infrastructure:** Do you have the in-house expertise to design, develop and deliver an online programme? Do you have the infrastructure to support online courses, or will upgrading be needed? Can you affordably outsource expertise (content and technology) and infrastructure from elsewhere?
- **Faculty development:** How prepared is your faculty to handle additional online courses? Will faculty be compensated for any extra effort, and in what way? What training facilities are available for teachers to upgrade their teaching skills for the online learning environment?

Blueprint

In addition to the needs analysis, learner and organisational profiles, the blueprint for the course should contain:

- **Pedagogical features:** Online teaching and learning must meet the requirements of the subject and the needs of the target learner group. Online learning can be a supplement to face-to-face instruction, equally mixed with face-to-face instruction, or the main delivery method, instead of face-to-face instruction. The last category is the most challenging for educators and instructional designers. When designing online learning, it is best to consider the best practices of all learning

theories (behaviourism, cognitivism, constructivism). The WWW provides opportunities to use all these.

- **Media mix:** An appropriate media mix for the course, taking into account the suitability of a given media to a particular subject (such as using 3-D models for an architectural drawing), will increase the effectiveness of student learning and contribute to the successful achievement of course objectives. Media delivery options must be decided during course content planning, so that the appropriate media creation tools can be used for content development.
- **Interaction:** Interaction is a major contributing factor to successful learning experiences. Table 9.4 lists different possible learning technology combinations, based on three basic interaction modes (Moore, 1989) and on four methods of computer-mediated communication (Paulsen, 1997).

Table 9.4: Learning events based on interaction

	Learner-Content interaction	Learner-Teacher Interaction	Learner-Learner Interaction
One-alone Method	*Web pages with graphics, animation, audio, video, quizzes, interactive check your progress, etc.*		
One-to-one Method		*Email, Chat, Online Diary, Tutor marked assignments*	*Email, Chat (both social as well as academic)*
One-to-many Method		*Email, Mailing list, Group Chat, Discussion board*	*Email, Mailing list, Group Chat, Discussion board*
Many-to-many Method		*Group Chat, Discussion board*	*Group Chat, Discussion board, Group projects, peer based evaluation, etc.*

- **Assessment:** Assessment and evaluation of learner performance is crucial. Although online examination brings a number of authenticity, security and certification issues, evaluation models should take the WWW's constructivist (student-centred) approach into account. The WWW can facilitate many evaluation systems - from computer-based (web-based) objective testing to tutor-evaluated, long answer tests or assignments - but is capable of supporting much more than the traditional, three-hour paper and pencil test. Online course developers now use alternative assessment tools such as evidence-based tests (where learners submit projects online), learning diary submission, participation in discussion forums, peer-based evaluation, etc.
- **Learner responsibilities:** The nature of online learning requires learners to be very self-motivated. The role of the instructor is to challenge learner curiosity and help learners achieve personal learning goals. Online learning should therefore be designed according to adult learning principles, in which learners have as much responsibility as their teachers, if not more. Learners need to be informed of their role and responsibility prior to starting the course. A period of orientation may be needed, as most online learners are initially novices of the medium.

- **Development strategy:** At this point in the design and development of online learning, most institutions and instructors have to decide if the course will be developed using a suite of individually available web tools, or an integrated course delivery software package.

Commercially available, integrated application software packages include facilities for every aspect of designing an online learning programme.

Learner tools are available to learners when they log on to the system:

a) **Course tools:** for content presentation, displaying industry-standard, interactive web pages to learners. The pages have links for navigation, and contain all course texts, graphics and multimedia learning materials.
b) **Collaboration tools:** for synchronous and asynchronous activities like email for one-to-one communication, discussion boards for conferencing, chat for real time clarification of doubts, whiteboards for lecture presentation and group work, or a virtual "drop box" for sharing programmes and applications.
c) **Support tools:** include personal learner profiles, a facility to upload files to the system (e.g. for submitting assignments), personal library, search facilities, study skills guidance, bookmark facilities (to remember where you stopped in the last session) and calendars.

Developer tools for the website administrator and the instructor. These seem initially more complex, but are easy to use after a short training or demonstration period:

a) **Administrator tools:** allow course software to be installed on a server, provides resource monitoring and website management facilities. It assigns user identification, passwords and usage rights to learners. Some systems also handle online registration and fee payment.
b) **Designer tools:** online teaching tools for the instructor. Includes facilities to prepare course plans, upload files (course content) and announcements, design assessment tools (such as quizzes) and a calendar of activities. The instructor can also design the appearance of individual web pages through choice of background colour, text font and type of images or graphics.
c) **Learning management tools** are features to track student progress and log-ins to the website. Instructors can monitor the progress of individual learners and provide personalised feedback. Complete statistics on website use can be generated for reviewing or evaluating policies and practices. Interactive user guides and "Help" facilities for troubleshooting and systems operation are also common in almost all software packages, for both learner and developer tools.

Institutional preparation

Any project-related hardware or software should be installed and tested. All involved faculty and staff should be trained in the systems and equipment, and should be familiarised with the pedagogical techniques. Institutional preparation is important for e-learning. Without institutional preparation, if online programmes are launched, it will be a step towards failure!

Learning materials development

Implementing course development and design standards maintain consistency, especially if many people or partner organisations are involved. Since course development is time consuming, it is worth securing permission

to use or adapt existing material where appropriate to launch the course more quickly.

Byun (2000) provides ten-commandments for the course development process. These are:

1) Start the design and development process early;
2) Research the minimum hardware/software available to students;
3) Identify and arrange for necessary administrative and technical support, both for students and instructors;
4) Develop a plan for evaluating student learning and assessing course quality;
5) Look for models and colleagues;
6) Publicize course offerings in both traditional and online venues;
7) Arrange for necessary copyright permissions;
8) Focus on the management of instructor-student communication;
9) Facilitate faculty in their efforts to become self-supporting; and
10) Arrange for usability testing with potential and past students of the course.

For any web-based course development process, planning and decision taking with regards to the software to be used and instructional strategies to be followed are very important. According to one estimate the development of online courses take 2.5 – 3 times more than traditional courses.

Training of support staff and tutors to use the web-based course effectively should be a priority area in the course development process. It should not be kept outside the course development, as most teachers need specialized training to handle learners in the new environment.

Evaluation

Once course materials are uploaded to the online learning environment, there should be a field trial of the learning materials and usability testing of the website, possibly through an initial pilot project. No online course should be launched without thorough evaluation. While planning for evaluation, it is important to consider the following:

- **Learning effectiveness:** how does the online course compare with face-to-face or other distance delivery methods?
- **Cost-effectiveness:** take into account the high initial set-up cost, and any ongoing costs such as upgrading of equipment or software.
- **Learning environment:** how do learners negotiate the online environment?
- **Accreditation:** the issues/problems in accreditation of online learning.
- **Evaluation:** how do you improve the evaluation process?

Promotion

The course must be promoted both online and offline to its target learners, with plenty of lead-time for course registration. Ongoing promotion will encourage the level of enrolment needed to make the programme financially viable.

Maintenance and updating

Online programmes require constant updating and maintenance to be effective. Learners need prompt feedback to address concerns and technical

problems. Course instructors or specialised personnel should be trained to constantly monitor and maintain the website.

Check Your Progress 9.4

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

b) *Compare your answers with those given at the end of this unit.*

1) Which tools are normally found in commercial application software for online learning?

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2) List the main points that you will cover in a blueprint for online learning programme.

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9.6 TOWARDS VIRTUAL EDUCATION

As the e-learning practices in educational institutions and in the business and industry grew, virtual institutions started emerging to provide education and training opportunities. While analyzing the developments of Virtual Education, Farrell (1999) identified the forces driving and opposing the development of virtual education in the world. These are:

Driving Forces

- The increasing capacity, flexibility, and suitability of information and communication technologies to educational applications
- The growth of knowledge and obsolescence of much of what was previously learned places an ever-increasing pressure for lifelong learning, and with diverse personal circumstances, they require flexible access-to-learning opportunities and venues such as the home, the work place, the community learning centre, etc.
- Many institutions, particularly in Europe and North America, perceive that the application of information and communication technologies will enable them to increase their market share in an environment that is increasingly competitive.
- There is also a tendency amongst institutions to be seen as doing the "right thing" by starting virtual initiatives to be in the news.
- Policy makers and administrators believe that the development of virtual delivery models will reduce costs, increase productivity, and enable expansion without cost increases.

Opposing Forces

- No access or prohibitive access to information and communication technology.

- Copyright restrictions on the use of instructional products and materials do not promote sharing through collaborative inter-institutional arrangements or through broad international delivery models
- The cost of initial hardware, operating software, and instructional material development typically require capitalisation funds that far exceed the resources of most institutions. In some cases the problem is dealt with through internal reallocation of funds (e.g., from library acquisitions to technology support). There is also a widespread practice of passing these costs on to the student through tuition fee increases or special levies.
- Faculty unwillingness to adopt new information and communication technology due to lack of training and adequate technology resources.
- Transfer and accumulation of credit from amongst many institutions do not yet have a formal structure in many countries.

Though the situation is similar in many countries for the developments of virtual education, there has been a perceptual change in the way information and communication technology, and particularly e-learning is being used today. As the technology has developed, the Internet bandwidth and access to technology have also increased over the year making it possible for the emergence of full-fledged virtual educational institutions rather than e-learning being just part of an institution. Table 9.5 gives a list of virtual universities with their date of establishment.

The Commonwealth of Learning has initiated The Virtual University for the Small State of the Commonwealth (VUSSC) in 2000. It intends to cover 32 small states of the Commonwealth by providing appropriate support to ICT applications for both on-campus instructions and distance learning. In view of the high demand for quality content, it plans to encourage the use of Open Educational Resources, and has developed a Transnational Qualifications Framework. This is an interesting model to watch for its future developments.

Table 9.5: List of Virtual Universities

Name of the Institution	Established in
Jones International University (jonesinternational.edu)	1993
Kentucky Virtual University (www.kyvu.org)	1997
African Virtual University (www.avu.org)	1997
Western Governors' University (www.wgu.edu)	1998
Michigan Virtual University (www.mivu.org)	1998
Swiss Virtual Campus (www.virtualcampus.ch)	1999
California Virtual Campus (www.cvc.edu)	1999
Canadian Virtual University (www.cvu-uvc.ca)	2000
Dutch Digital University (www.du.nl)	2001
Finnish Virtual University (www.virtuaaliyliopisto.fi)	2001
Tamil Virtual University (www.tamilvu.org)	2001
Global Virtual University (www.gvu.unu.edu)	2002
Swedish Net University (www.natuniversitetet.se)	2002
Syrian Virtual University (www.svuonline.org)	2002
Virtual University of Pakistan (www.vu.edu.pk)	2002
Danish Virtual University (eng.uvm.dk/news/dvuni.htm)	2003
Virtual University of Tunis (www.uvt.rnu.tn)	2003
Mediterranean Virtual University (www.med-vu.org)	2004
Asia eUniveristy, Malayasia (www.aeu.edu.my)	2006

9.6.1 Virtual Education in India

The developments related to e-learning should be seen in the context of the socio-economic and ICT infrastructure of the country. In spite of its low PC penetration and Internet access, India has progressed well in the IT sector primarily due to the IT training by the private sector. The country's first online educational enterprise also came with private initiative when the National Institute of Information Technology (NIIT Limited) started Netvarsity in 1996. Since that time, a large number of online "teaching shops" have been in operation primarily to support school level education and for preparing students for competitive examinations like the medical and engineering entrance tests. While many e-learning initiatives and programs are underway, the National Association of Software and Services Companies (NASSCOM)'s Market Intelligence Service reports that the e-learning market in India remains in an infant stage. In fact, in 2002, e-learning was just a US$4-5 million market with an expected 4 year cumulative annual growth rate of 20-25% (NASSCOM, 2003). The real impetus for e-learning came from the National Task Force on Information Technology and Software Development constituted by the Prime Minister of India in 1998. The Task Force report presents India's master plan and long term policy for capacity building of institutions, human resource development in IT related areas, and the use of ICTs in education. The Indira Gandhi National Open University (IGNOU) responded to the recommendations of the Task Force with its Virtual Campus Initiatives (VCI) in 1999. Since then, a number of such initiatives have been placed in operation within the country (see Table 9.6).

Table-9.6: Virtual Educational Institutions in India

Sl.No.	Name and URL	Areas Covered	Owned and managed by
1	**Netvarsity** *http://www.netvarsity.com*	IT related areas and soft skills	NIIT Online Learning Limited
2	**Indira Gandhi National Open University** *http://www.ignou.ac.in*	IT related areas and in Social Sciences, Health Sciences, Law, etc.	Part of the National Open University established by the Govt. of India
3	**Yashwantrao Chavan Maharastra Open University** *http://www.ycmou.com*	Use e-learning as part of its distance learning strategy in technology courses	Part of YCMOU established by the Maharastra State Government
4	**Tamil Virtual University** *http://www.tamilvu.org*	Tamil language, literature, and culture	Governed by the society established by the Government of Tamil Nadu
5	**Punjab Technical University** *http://www.ptuonline.com*	Engineering and Technology related courses	Established by the Government of Punjab, the online venture is a collaborative effort with a trust
6	**Birla Institute of Technology and Sciences** *http://vu.bits-pilani.ac.in*	Engineering courses	Part of the BITS (Deemed University status accorded by the University grants Commission)
7	**Institute of Management Technology** *http://www.imtonline.org*	Courses in Management leading to eMBA	Managed by NPO, and the courses approved by AICTE
8	**Symbiosis Centre for Distance Learning** *http://www.scdl.net*	Courses in Management leading to PG Diploma	Managed by Symbiosis Society (NPO), part of Symbiosis International University, and approved by AICTE
9	**Indian Institute of Technology, Mumbai** *http://www.cdeep.iitb.ac.in/*	IT related courses at diploma and non-credit level	Institute of national importance, and the programs are offered by the Kanwal Rekhi School of Information Technology
10	**Indian Institute of Technology** *http://nptel.iitm.ac.in/*	Engineering courses	Ministry of Human Resource Development, Government of India supported courses

(***Source***: Mishra, 2009)

The National Programme on Technology Enhanced Learning (NPTEL) started in 2007 is an initiative of the Ministry of Human Resource Development, Government of India and a joint venture of the Indian Institute of Technology and Indian Institute of Science. The main objective of the program is to improve the quality of engineering education in the country by developing curriculum based video and Web-courses. In the first phase of the project, 129 Web courses and 110 video courses have been developed. Each of these courses consists of contents equivalent to 40 lecture hours in text, graphics, animation, and video. The video programs developed are available through YouTube (http://in.youtube.com/iit). Consequently, they are available as e-learning resource not just for the people of India, but for the world.

Under the Eleventh Five Year Plan, the Ministry of Human Resource Development, Government of India has initiated the National Mission on Education through Information and Communication Technology (NMEICT). Some of the major mission objectives related to e-learning are:

- Any-time availability of desired knowledge at appropriate levels of comprehension to all for self paced learning
- Extensive leveraging of the advancements in the field of ICT for taking the knowledge resources to the door steps of the learner
- Use e-learning as an effort multiplier for providing access, quality and equality in the sphere of providing education to every learner in the country
- Provide for Connectivity & access devices, content generation, personalization & mentoring, testing & certification and encouragement of talent
- Bringing efforts of different interested agencies working in the field of e-learning under one umbrella and establishing logical linkages between various activities
- Spreading Digital Literacy for teacher empowerment and encouraging teachers to be available on the net to guide the learners
- Conversion of existing educational tapes into indexed formats compliant with the internationally accepted standards such as SCORM (Sharable Content Object Reference Model)
- Creating a clearinghouse cum rating agency for various web based learning contents for guiding Indian learners
- Development of pedagogical techniques based on edu-entertainment.
- Customisation of Open Source Tools etc.
- Providing e-Learning support to every higher education institution for technology assisted learning
- Setting up virtual labs and lab centers and finishing schools for quality enhancement.
- Standardisation & Quality Assurance of e-Content

The Mission's objectives are far and wide, and many ICT projects are already in the process of development, including the development of a project similar to the NPTEL for the Social Science and Humanities sectors. These developments show that India will be a front runner in the use of ICT in education, and e-learning content and process developments.

Check Your Progress 9.5

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

b) *Compare your answers with those given at the end of this unit.*

1) List five major objectives of NMEICT related to e-learning.

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2) List the driving forces for virtual education.

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9.7 LET US SUM UP

E-Learning is developing fast, and refers to the use of networked information and communication technologies for the delivery of teaching and learning. In this unit, we discussed the interchangeable terminologies used in describing e-learning. Because do the numerous advantages, e-learning is being widely used by educationists world over. While we discussed the advantages, we also cautioned about the limitations of e-learning due to poor access to technology, bandwidth, cost, faculty time and security related issues. We discussed instructional design for e-learning and emphasized that while constructivist approach may be more suitable in the online world, it is useful to consider eclectic model by using the best practices of behaviourism, congnitivism, and constructivism. We also listed the instructional strategies that can and should be used in e-learning.

Next, we discussed the media creation tools and communication tools used in e-learning. We described a mine step model of building e-learning environments in detail that emphasized preparation of a blueprint covering pedagogical features, media mix, interaction possibilities, and assessment related issues. Towards the end of the unit, we discussed the trends in virtual education in the world with special reference to India.

9.8 KEYWORDS

E-Learning: "The term e-learning covers a wide set of applications and processes including computer-based learning, web-based learning, virtual classrooms, and digital collaboration" (WR Hambraecht+Co., 2000: p.8).

Online Learning: It is synonymous to web-based learning where learning is fostered via hypertext transfer protocol (http) in Internet or Intranet.

Virtual Learning: "The educational process of learning over the Internet without having face-to-face contact is known as **Virtual Learning"** (French, et al., 1999). However for some, virtual learning may also include tele-learning.

Web-Based Instruction: It is a "hypermedia based instructional programme which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported" (Khan, 1997).

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9.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 9.1

1) In whatever way you define e-learning, it should include the following:
   - Network-based teaching and learning;
   - Hypermedia nature of the Internet;
   - Supporting synchronous and asynchronous learning.

2) Advantages of e-learning are:
   - Increased interaction (student-student, student-teacher), and interactivity with learning material;
   - Multimedia approach due to the nature of the web;
   - Reaching large number of students anywhere, anytime with access to Internet; and
   - Quick production, delivery and pupation of learning materials.

   The disadvantages are:
   - Poor access to Internet limits its potentials;
   - Poor bandwidth limits multimedia capabilities;
   - Lack of quality control; and
   - ICT skills must for the learners.

Check Your Progress 9.2

1) Three ways in which e-learning are: (i) completely online, (ii) as supplement to face-to-face teaching, and (iii) as mixed/blended mode along with face-to-face or distance learning.
2) (a) search engines, (b) bookmarking, (c) HTML Editor, (d) Concept map, (e) Email, Discussion Forum

Check Your Progress 9.3

i) The correct answer is (d), as you can prepare text-based pages for online learning using HTML editor, Word processing software and Adobe's PDF.
ii) .DOC is a format for word processing, and therefore, the answer is (a)
iii) Correct answer is (c).
iv) Correct answer is (b)

Check Your Progress 9.4

1) The commercially available e-learning application software normally includes: course tools to prepare pages for information transfer; collaboration tools to help both synchronous and asynchronous communication in groups; support tools to facilitate bookmaking, search, file management, etc.; administration tools to manage the server, online registration, etc.; designer tools to plan

courses and progrmmes; and learner management tool to enroll, and track student progress.

2) A blueprint for online programme should include: the pedagogical features of the course, media mix to be sued, interaction facilities to be provided to the learners, modalities for assessment of student activities, and learner responsibilities.

Check Your Progress 9.5

1) Five major objectives of NMEICT are:
   - Spread digital literacy for teacher empowerment and encouraging teacher to use the net to guide learners
   - Providing e-learning support to every higher education institution in India
   - Encourage content creation for online learning
   - Convert exiting materials to SCROM complaint online learning objects
   - Develop quality assurance mechanism for e-content

2) The driving forces of virtual education are:
   - Increased use of ICT in all spheres of human activity
   - Faster rate of obsolescence of knowledge
   - Need to capture the higher education market for sustainability
   - Believe that virtual education can reduce cost structures

UNIT 10 M-LEARNING

Structure

10.0 INTRODUCTION

Consider the following statistics, current to January 2009:

- Total circulation of all daily newspapers worldwide = about 480 million
- Total number of cars on the road = about 800 million
- Total cable and satellite television subscriptions = 850 million

Numbers increase for newer technologies:

- Desktops, laptops and netbooks currently in use = 1 billion
- Fixed land line telephone connections = about 1.2 billion
- E-mail users = about 1.3 billion
- Internet users = about 1.4 billion
- Credit card users = about 1.7 billion

Now consider this statistic: 4 billion people subscribed to mobile phone subscriptions in the same time period (Ahonen, 2009).

Certainly the world has gone mobile! The mobile penetration is about 61 per cent of the total population of the world. "In the developing world, mobile phones have revolutionized telecommunication and have reached an estimated average 49.5 per cent penetration rate at the end of 2008 — from close to zero only ten years ago" (ITU, 2009). In Africa mobile penetration has risen from just one in 50 people at the beginning of this century to more than one-quarter of the continent's population today. Africa's mobile penetration of 28 per cent compares to 38 per cent in Asia, 72 per cent in the Americas, 79 per cent in Oceania and 111 per cent in Europe (ITU, 2009). It is almost certain that these figures would be outdated by the time this unit is printed! This indicates the potential of the mobile technology to provide greater access to people in remote and geographically disadvantaged locations. "In regions with difficult geography or poor economic conditions, mobile networks can be designed and implemented in far quicker and cost-efficient ways than fixed networks" (Dholakia and Dholakia, 2004).

"Mobile phone use in DE will not only benefit learners in Asia, but can be exported to other developing and developed areas around the globe. Mobile phone diffusion in Asia particularly is spreading at a dramatic rate with the advent of cheaper handsets and better services" (Motlik, 2008), and, therefore, mobile technologies should be the preferred mode of teaching and learning support. Keegan (2002, 2005) declared that the future of distance education is wireless as there had never been a technology that has penetrated the world with the depth and rapidity of mobile telephony. He claims that the challenge for distance educators is to accept this fact and to now develop pedagogical environments for mobile devices. It is in this context, the present unit shall discuss m-learning at a very basic level to give you an overview of its potential to provide teaching and learning support.

10.1 LEARNING OUTCOMES

After working through this unit, you are expected to be able to:

- *Define* m-learning;
- *Describe* different types of technology used in m-learning;
- *Discuss* issues related to design and delivery of m-learning;
- *Enumerate* advantages and disadvantages of m-learning; and
- *Give* examples of use of m-learning in various educational and training settings.

10.2 MOBILE LEARNING: CONCEPTS

Educators' tryst with technology has a long history. Thus, the field of education has seen many innovations and innovative use of common technologies for teaching and learning, including the use of television, radio, computer and the Internet. Despite Thomas A. Edison's 1922 prediction "that the motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks", despite the volume of research documenting "no significant difference" in student outcomes between alternate modes of education delivery (see www.nosignificantdifference.org) and despite the debate over the question "Do media influence learning?", technology use has dominated educational discourse in the 20th century. In the beginning of the 21st century, the use of mobile telephony in education gave birth to a new wave called "mobile learning" ("m-learning"). The popularity of mobile learning can be appreciated from the large number of publications and conferences on the subject since 2001. According to Kim et al. (2004), "Mobile wireless technology provides efficient and effective communication and network connectivity for teachers and students in K–12 education because it does not require any wires." As mobile technology is pervasive, users no longer need to worry about access to the computer lab for technology activities, software assignments or Internet access, and its operational simplicity makes it the next killer application.

10.2.1 M-Learning: Definitions

"The term 'mLearning' has lately emerged to be associated with the use of mobile technology in education. It seems, however, that it is used in commercial purposes rather than as an educational concept. We wonder if the term is a commercial trick to market technology and educational services or if it an emerging concept that educationalists take seriously" (Sariola et al., 2001).

Interestingly learning cannot be mobile, but learners are mobile and they use mobile technologies (Keegan, 2002). If serving the mobile learners is the focus of m-learning, then distance education institutions have always been doing this — serving learners anytime, anywhere. For some, m-learning is e-learning delivered through mobile devices, and Keegan (2002) takes this point when he represented m-learning through a diagram showing links to other materials, the World Wide Web, interactions among students, interactions between the student and the teacher, provision of learning materials and student support services. Thus, for Keegan, mobile learning is provision of teaching and learning on a mobile device. "Mobile learning (m-learning) is defined as the provision of education and training on mobile devices: Personal Digital Assistants (PDAs), smartphones and mobile phones" (Keegan, 2006). Ally (2004) defined m-learning as the delivery of electronic learning materials on mobile computing devices to allow access from anywhere and at anytime. According to Quinn (2000) m-learning can be defined as learning that takes place with the help of portable electronic tools. Stone (2004) defines m-learning as a special type of e-learning, bound by a number of special properties and the capability of devices, bandwidth and other characteristics of the network technologies being used. Geddes (2004) defines it as the acquisition of any knowledge and skill through the use of mobile technology, anywhere, anytime, which results in an alteration in behaviour. However, Laouris and Eteokleous (2005) claim that a precise educational definition of m-learning is yet to be achieved.

A portable device that supports learning may be freely moved, but learner is mostly stationary, even though they are using a mobile device. Although the device is mobile and portable, the learning as an event cannot be described as mobile (Ahonen et al., 2004). According to Laouris and Eteokleous (2005) the definition of m-learning must view the learner as the one being mobile and not his or her devices. O'Malley et al. (2005) define mobile learning more broadly as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies." Mobile wireless technology involves two areas — mobility and computing. "Mobility" in this context is defined as continuous accessibility to users, and "wireless" means communication using radio waves, infrared waves and microwaves instead of cables or wires in order to transport a signal to connect communication devices (Malladi and Agrawal, 2002). Kim et al. (2004) define "mobile wireless technology" as technology that provides continuous accessibility to users anytime, anywhere without using wire or cable to connect to networks (like the Internet), to transmit data or to communicate with others. Colazzo et al. (2003) state that mobile learning can be considered as any learning and teaching activity that is possible through mobile tools or in settings where mobile equipment is available. Traxler and Kukulska-Hulme (2005) define m-learning as a personal, unobtrusive, spontaneous, "anytime, anywhere" way to learn and to access educational tools and material that enlarges access to education for all.

Thus, mobile learning includes access to electronic materials and resources mediated by mobile devices for the exclusive purpose of teaching and learning support. Taken this view, m-learning is a sub-set of e-learning available through mobile technology to facilitate learning on the go. Koole (2009) has proposed a framework for understanding mobile learning. According to this framework, mobile learning falls within the intersection of learner, device and social aspects as represented in Figure 10.1. The labels in the illustration can be explained as follows:

- *Device Aspect* — refers to size, weight, input or output capabilities, file storage and retrieval, processor speed of the equipment.
- *Learner Aspect* — refers to their prior knowledge, memory, context and transfer, discovery learning, emotions and motivations.
- *Social Aspect* — refers to conversations, co-operation and social interactions among users.
- *Social Technology (DS) intersection* — refers to device networking, system connectivity and collaboration tools.
- *Interaction Learning (LS) intersection* — refers to interaction, situated cognition and learning communities.
- *Device Usability (DL) intersection* — refers to portability, information availability, psychological comfort and satisfaction.
- *Mobile Learning (DLS)* — refers to information access and selection, mediation and knowledge navigation in mobile learning.

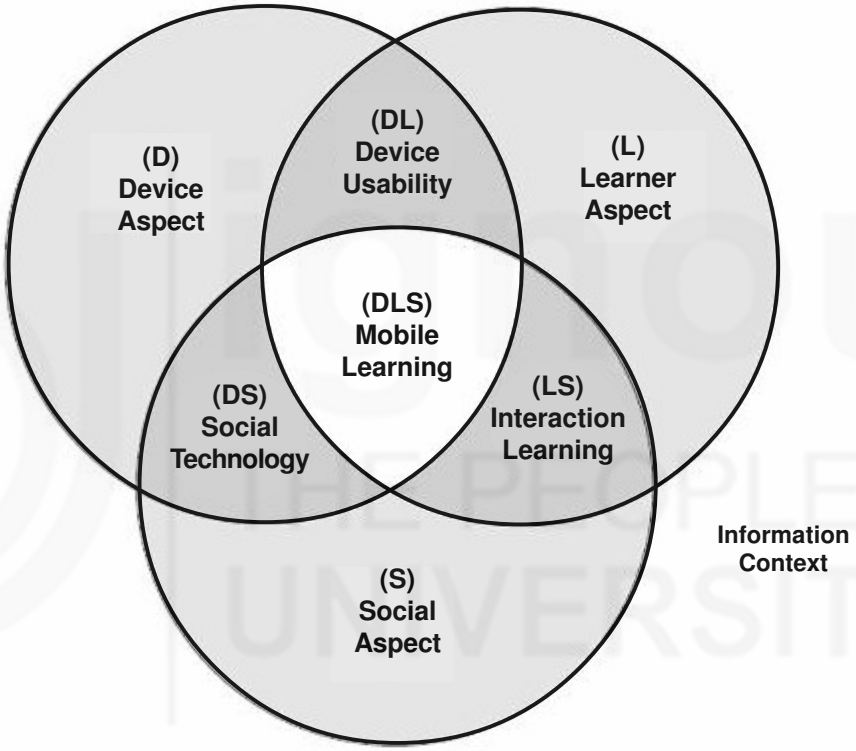

Figure 10.1: Mobile Learning: A Framework (*Source*: Koole, 2009)

10.2.2 Strengths and Limitations

Some key advantages of mobile learning include the following (Attewell, 2005):

- allows truly anywhere, anytime, personalised learning;
- can be used to enliven, or add variety to, conventional lessons or courses;
- can be used to remove some of the formality which non-traditional learners may find unattractive or frightening and can make learning fun;
- can help deliver and support literacy, numeracy and language learning;
- can help learners and teachers to recognise and build on existing basic literacy skills which allow young people to communicate in notational form via text messages;

- facilitates both individual and collaborative learning experiences;
- enables discrete learning in the sensitive area of literacy;
- can help to combat resistance to the use of ICT by providing a bridge between mobile phone literacy and PC literacy;
- has been observed to help young disconnected learners to remain more focused for longer periods; and
- can help to raise self-confidence and self-esteem by recognising uncelebrated skills, enabling non-threatening, personalised learning experiences and enabling peer-to-peer learning and support.

Analyses of 12 international case studies by Kukulska-Hulme and Traxler (2005) reveal the reasons of m-learning use in several different contexts.

Access

- improving access to assessment, learning materials and learning resources;
- increasing flexibility of learning for students; and
- compliance with special educational needs and disability legislation.

Changes in teaching and learning

- exploring the potential for collaborative learning, for increasing students' appreciation of their own learning process and for consolidation of learning;
- guiding students to see a subject differently than they would have done without the use of mobile devices;
- identifying learners' needs for just-in-time knowledge;
- exploring whether the time and task management facilities of mobile devices can help students to manage their studies;
- reducing cultural and communication barriers between staff and students by using channels that students like; and
- wanting to know how wireless or mobile technology alters attitudes, patterns of study and communication activity among students.

Alignment with institutional or business aims

- making wireless, mobile, interactive learning available to all students without incurring the expense of costly hardware;
- delivering communications, information and training to large numbers of people regardless of their location;
- blending mobile technologies into e-learning infrastructures to improve interactivity and connectivity for the learner; and
- harnessing the existing proliferation of mobile phone services and their many users.

Limitations

Most of the limitations of mobile learning are due to the small screen size of the mobile devices and their limited battery life. A study by Doolittle and Mariano (2008) found that learning while mobile was negatively affected in comparison to learning while stationary. They "found that students who learned about historical inquiry using a portable digital media player (e.g., iPod), while navigating a walking course that required attention to the path taken, performed significantly more poorly on measures of recall and transfer than students who learned while simply sitting at a desk" (p. 524). This is a serious drawback, and exclusive use of mobile device for any teaching and learning is therefore not recommended.

Maniar et al. (2008) reported that regardless of the screen size of a mobile device, students tended to have a positive overall opinion of m-learning, and watching a video significantly increased their knowledge of the subject area. However, compared to students who used devices with 2.28-inch to 3.78-inch screens, students who used a device with a 1.65-inch screen had a significantly lower subjective opinion of the screen quality and learned a significantly lower amount. This finding indicates that if an m-learning environment that relies heavily on video-based material is displayed on a device with a 1.65-inch screen, such as an average mobile telephone, then the effectiveness of the learning experience may be inhibited. Zawacki-Richter et al. (2007) reported that 62 per cent of respondents agreed that screens are currently too small to present complex learning material, and limited battery life of mobile devices was regarded as a problem for extensive use by 59 per cent of respondents. Despite these limitations, 50 per cent of the respondents believed that screen size is not as important as mobile devices should rather be used for communication and interaction purposes rather than for content distribution. Because of the small screen size in mobile devices, the interface should be built in such a way to convey the message using the smallest amount of text, and proper navigation must be built into the system to allow learners to move between screens and sections of the lesson (Ally, 2004).

Despite these small limitations, mobile devices should be seen as an opportunity to deliver just-in-time learning and support to learners in remote areas. As Sharples (2003) suggests, rather than seeing mobiles as disruptive devices, educators should seek to exploit the potential of the technologies children bring with them and find ways to put them into good use for the benefit of learning practice.

10.2.3 Some Examples

Learnosity — Using mobile phones for language learning

Second year Junior Certificate students (average age of 14) participating in the pilot project were supplied with a mobile telephone for the duration of the initiative. The school chosen to participate in the trial demonstrated how the project could succeed under extreme circumstances, without the cushioning of a school well-equipped with technology.

There are several components to the Learnosity system that, taken together, make it unique. These are as follows:

- The use of mobile phones with the interactive voice response (IVR) system.
- Questions are selected at random from a question bank.
- Students can re-record and repeat the process as required.
- Answers are recorded as WAV (compressed audio) files and saved to a server from which they can either be marked online through a Web site or saved and marked as a podcast.
- Students can hear not only their own, but exemplary answers as well.
- Feedback is given in the form of a printout or e-mail which can be saved to an e-portfolio if available.
- New vocabulary can be delivered by SMS text each day for use in class or written work.
- Text-chat with peers through Google Talk. In the pilot this was done with PCs but it could be via PDAs. Teachers can mediate in real time and assess later with the scripts also recorded and saved for self assessment.
- Access to an online dictionary supports further language development.

Outcomes

- 67 per cent students reported that they had made significant progress with oral Irish language in the six weeks of the pilot. There are plans for further trials in six schools, task-based and role-play conference calls and potentially, biometric voice recognition. However, wireless access in schools can be a barrier in remote areas.

(***Source***: http://www.learnosity.com/go/clients/ncca-ireland/phase1-results)

Mobile Learning and Teaching with PDAs

(Dewsbury College, Thomas Danby College and Bishop Burton College)

Personal Digital Assistants (PDAs) have been used at Bishop Burton College across the curriculum in workshop training and fieldwork, while Dewsbury College has trialled the use of PDAs in outreach centres with an NVQ Level 3 course in early years childcare and education. At Thomas Danby College, the focus has been on supporting basic skills and English for speakers of other languages (ESOL).

PDAs have been shown to be valuable in stimulating learners in environments that do not usually offer access to technology. They can support dynamic group activities without internet connectivity by the use of beaming, but like all new technologies, it is essential that they are not put to unsuitable uses such as conveying large quantities of information in text format. Some learners may not be able to use small screen devices successfully. Accessibility issues should always be considered and alternative routes provided.

(***Source***: http://www.elearning.ac.uk/innoprac/practitioner/resources/dewsbury.pdf)

JAVA midlets for Teaching Actuarial Sciences

Java based small applications that can be stored in a mobile phone were used in several courses in the Actuarial Sciences degree of the University of Málaga. This project was carried out by a multidisciplinary group of teachers who were engaged in developing learning resources in electronic format. They followed a flexible blended strategy that includes the traditional classroom, e-learning and m-learning elements. Thus, the students can customize their learning processes using the contents and the way of access they are more comfortable with or consider more effective.

The results of the study revealed that mobile phones may also be used as small computers and thus, their use in higher education as a new tutoring and communication medium can be very useful. The high degree of adaptivity and personalization of these devices can be educationally beneficial to students, especially in courses with insufficiently motivated ones. However, the limited capacity of the current mobile phones, small memory and little screens, makes it necessary to design small applications. The Java J2ME platform proved a better way of delivering content than the WAP one for educational purposes in this project. The students prefered the off-line execution of micro-modules (that are compiled into Java midlets) than the access on line to WAP pages, arguing that the first method avoids the payment of connection costs.

(***Source***: http://www.formatex.org/micte2006/pdf/2095-2099.pdf)

More examples on mobile learning can be found though a simple search on Google. One site that gives case studies is http://www.m-learning.org/case-studies/

Check Your Progress 10.1

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

b) *Compare your answers with those given at the end of this unit.*

1) Define m-learning in your own words.

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2) Identify four strengths of m-learning.

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3) What are the three important aspects of mobile learning?

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10.3 DESIGNING M-LEARNING

Although Grasso and Roselli (2005) recommended a set of guidelines for development of content for mobile learning, they also suggested rationalising because mobile devices have limited capacity and there is a risk of overloading the content giving rise to loading and storing problems. Park (2005) presented an adaptive approach to mobile learning management system that provides content adaptive to a learner's learning style. Accordingly, a learner is provided with the type of learning content adaptive to his or her learning style on the process of the individual learning. Bae et al. (2005) demonstrated that the use of an Attention-Relevance-Confidence-Satisfaction (ARCS) model in designing content is useful to learners at the school level. Tsai et al. (2005) presented a six-stage model for design and development of mobile learning, as follows:

Stage 1 — Analysis of the learners' needs and mobile situation

Stage 2 — Integration of mobile technology–based instruction with a learning environment that uses digitised information

Stage 3 — Design of mobile instructional strategies

Stage 4 — Design and development of mobile learning content

Stage 5 — Implementation of instructional activities

Stage 6 — Evaluation of mobile learning effect

Ismail and Idrus (2009) reported the use of a SMS physics lesson at the Universiti Sains Malaysia. They suggested the following educational design considerations in the use of mobile phones:

- present course materials in a systematic and chronological way;
- present a "daily" chunk of information, including learning tips, laws, rules, simple formula, definitions, rhetoric, quiz, points to ponder, glossary, everyday examples, etc.;
- make materials available in diverse formats either to use text, image, audio or video according to the systems they are using, whether GPRS or 3G;
- ensure content is experientially real to students in the sense that they can engage in personally meaningful activity and learning;
- ensure students have capability to return the message for further action;
- incorporate SMS with electronic portal for archival purposes;
- incorporate interaction (via forum) in the electronic portal;
- create student groups via the hand phone;
- develop an easy interface; and
- utilise capabilities of hand phone such as saved messages etc.

Mishra (2009) suggested that while designing the m-learning system for teaching and learning, it is important to identify the learners need. Such needs can be categorized into static and dynamic information, and interactive and non-interactive type (See Table 10.1).

Table 10.1: Categories of learners' needs for m-learning

	Static information	Dynamic information
Non-interactive (broadcast type)	• Last date of submission of assignments • Last date of filling examination forms • Cancellation of a counselling session	• Tips, news, etc. • Podcast lectures • Video
Interactive (student query type)	• Eligibility in a programme of study • Grade in assignment and term end examination	• Teleconference • Chatting, discussion • Games

Design and development of m-learning applications are important, and in this context the research and development in this area is not comparable to the developments in the field of e-learning. Today, many open source Learning Management Systems (LMS) such as Moodle, ATutor, etc. among others deliver online learning. The same is not true for m-learning. Thus, most projects and institutions start from the basics and develop their own systems. Rather than focusing on the teaching and learning, the projects focus on technology developments. However, it is possible to deliver Moodle

courses on mobile through the use of Mobile Moodle (MOMO), a JAVA-based application that allows Moodle clients to access a MOMO add-on to the Moodle learning management system (see www.mobilemoodle.org). Android (see www.android.com) is a free, open source mobile platform that includes an operating system and other software for development of Internet-like applications on mobile phones. The Tribal Group (see www.m-learning.org) in the UK has developed a set of software tools for development of lessons for mobile, SMS quizzes, a discussion board and a student tracking system. The design and development of mobile learning applications require a systematic approach and should be considered from a theoretical perspective as well a technological one.

Check Your Progress 10.2

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

b) *Compare your answer with the one given at the end of this unit.*

While designing m-learning applications what are the types of information you will consider to include in the services?

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10.4 TECHNOLOGY OF M-LEARNING

It is generally accepted that devices such as mobile phones, PDAs and MP3 players fit into the category of mobile devices (Mellow, 2005; Andronico et al., 2003). However, laptop and notebook computers are sometimes not considered as mobile devices. "While they are capable of working without plugging into a power source and can utilize wireless networks, they are not devices that people can carry everywhere and quickly access at any time due to their size, configuration, and the time required to boot up and shut down" (Caudill, 2007).

Attewell (2005) categorises technologies used in m-learning into five categories:

1) delivery options;
2) platform options;
3) media options;
4) development languages; and
5) transport options.

To this list we may add another category —device options. A clarifying concept map of technologies used in m-learning is given in Figure 10.2.

Klopfer et al. (2002) identified five properties of mobile devices that produce unique educational affordances:

1) *Portability* — The small size and weight of mobile devices means they can be taken to different sites or moved around within a site.
2) *Social interactivity* — Data exchange and collaboration with other learners can happen in both synchronous and asynchronous mode.
3) *Context sensitivity* — Mobile devices can both gather and respond to real or simulated data unique to the current location, environment and time.
4) *Connectivity* — A shared network can be created by connecting mobile devices to data collection devices, other devices or to a common network.
5) *Individuality* — Scaffolding for difficult activities can be customised for individual learners.

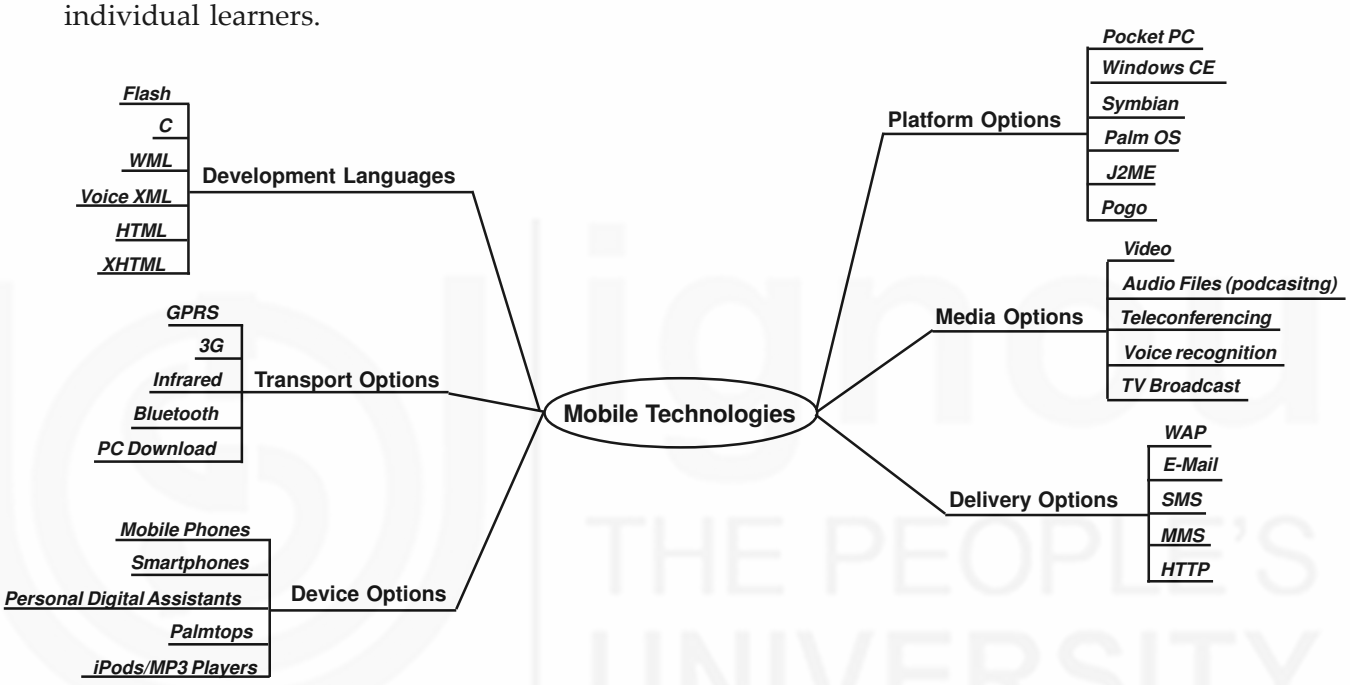


Figure 10.2: Mobile Learning Technologies (Adapted from Attewell, 2005)

Keegan (2006) describes a range of mobile technologies used for administrative support as well as for teaching and learning through the use of SMS (for support, for quizzes and for assignment advice); personal or peer tutoring through mobile devices; instructional delivery through podcasting over mobile devices; and content delivery through appropriate design of the learning materials to suit different mobile devices. Now let's consider some commonly used technologies:

Hand-held Computers

Hand-held is a generic term used for PDAs, palmtops and laptop computers. The Palm Education Pioneer (PEP) programme was one of the earliest comprehensive mobile learning initiative covering 102 classroom teachers in K–12 schools in the United States. The final evaluation of the programme revealed an overwhelmingly positive response about the use of hand-held computers in classrooms. Approximately 90 per cent of PEP teachers stated that hand-helds are an effective instructional tool and hand-helds have the potential to have a positive impact on students' learning. Teachers found that use of hand-held computers in the classroom increased student motivation and improved collaboration and communication. However, key drawbacks included inappropriate use of technology, management issues related to

synchronisation and equipment damage. A personal use strategy rather than shared strategy was more likely to increase students' time spent on schoolwork outside of school time (Vahey and Crawford, 2002).

Vogel et al. (2007) reported that students who already engaged in use of mobile devices found that use of a PDA enhanced their learning experiences. Moreover, those students who received support through mobile devices also reported increased performance enhancement. It has also been reported that PDAs are effective in improving knowledge creation during experiential learning (Lai et al., 2007) among fifth-grade students.

Mahamad et al. (2008) present a case of implementation of m-learning for primary schools in Malaysia by using open source technology. The case study focused on learning mathematics using hand-held devices among primary school students aged 11 and 12 years. Main users for this system included students, teachers and the administrator. This application suggests a new mobile learning environment with a mobile graph for tracking the students' progress and performance.

Short Message Service

Short message service has the widest application in teaching and learning, as it is available in most basic mobile devices available in the market, and it can be used for both teaching and learning support. Viljoen et al. (2005) from the University of Pretoria experimented with the use of different types of SMSs to support learners and found that learners liked the academic instructions most, followed by mini lectures, interactive quiz, interactive student questions and instructional lecturer response, indicating learners wanted direct and short help messages. Cavus and Ibrahim (2009) reported an increase of more than 65 per cent in post-test score of learning new English words through SMS teaching. Jones and Edwards (2009) used text SMS to support student learning, and their study revealed many students perceived the SMS communication to have had a positive impact on their management of study time. Jones and Edwards argued that mobile text-based communication has the potential to support the development of time management skills, an important component of self-regulatory learning.

Traxler and Dearden (2005) in the context of sub-Saharan Africa presented a detailed report on potential applications of SMS in school empowerment, as the capital cost is negligible and the sunning cost is nominal. They emphasised SMS can be used for delivering distance learning programmes as follows:

- to provide study material, giving week-by-week support, maintaining momentum, contact, morale and continuity;
- to provide content support such as hints, tips, outlines, lists, summaries and revision;
- to provide reminders for assessment, contact, broadcast, discussion, video and meetings;
- to discuss in the form of feedback, seminars and queries;
- to provide encouragement and motivation; and
- to provide urgent alert messages about errata, cancellations and changes.

Podcasting

Lee and Chan (2007) argue that podcasting can be used to deliver a form of m-learning that offers a higher degree of lifestyle integration than many

current "state of the art" m-learning applications. Haaparanta et al. (2007) present the use of podcasting by teachers in schools using mobile phones.

Video use

Uses of video in m-learning have also been demonstrated by Doolittle and Mariano (2008) and Maniar et al. (2008). The use of mobile technology as a gaming device (for recreation and entertainment) makes it highly potential tool for educational usage despite the fact that these devices have very small screen size and therefore may require special developmental efforts. Small nuggets of video and animation can be used for teaching specific skills just in time.

10.5 TOWARDS A THEORY OF M-LEARNING

According to Naismith et al. (2004) use of mobile technology in education can be categorised into six main themes:

1) *Behaviourist* — activities that promote learning as a change in observable actions (drill and feedback model).

2) *Constructivist* — activities in which learners actively construct new ideas or concepts based on both their previous and current knowledge (participatory and interactive model).

3) *Situated* — activities that promote learning within an authentic context and culture (authentic and contextual model).

4) *Collaborative* — activities that promote learning through social interaction (conversational and shared model).

5) *Informal and lifelong* — activities that support learning outside a dedicated learning environment and formal curriculum (personalised, outside formal application model).

6) *Learning and teaching support* — activities that assist in the co-ordination of learners and resources for learning activities (learning support model for academic, administrative and technical purposes).

From a developing country perspective, features such as limited or no dependence on permanent electricity supply, easy maintenance, easy-to-use audio and text interfaces, affordability and accessibility are the most important considerations for using mobile phones as potential learning tools. Based on the use pattern, Traxler (2007) has categorised mobile learning as:

- *Technology-driven mobile learning* — Some specific technological innovation is deployed in an academic setting to demonstrate technical feasibility and pedagogic possibility.
- *Miniature but portable e-learning* — Mobile, wireless and hand-held technologies are used to re-enact approaches and solutions already used in "conventional" e-learning, to provide access to some virtual learning environment (VLE) using mobile technologies as flexible replacements for desktop technologies.
- *Connected classroom learning* — The same technologies are used in classroom settings to support collaborative learning, perhaps connected to other classroom technologies such as interactive whiteboards.
- *Informal, personalised, situated mobile learning* — The same technologies are enhanced with additional functionality (for example, location-

awareness or video-capture) and deployed to deliver educational experiences that would otherwise be difficult or impossible.

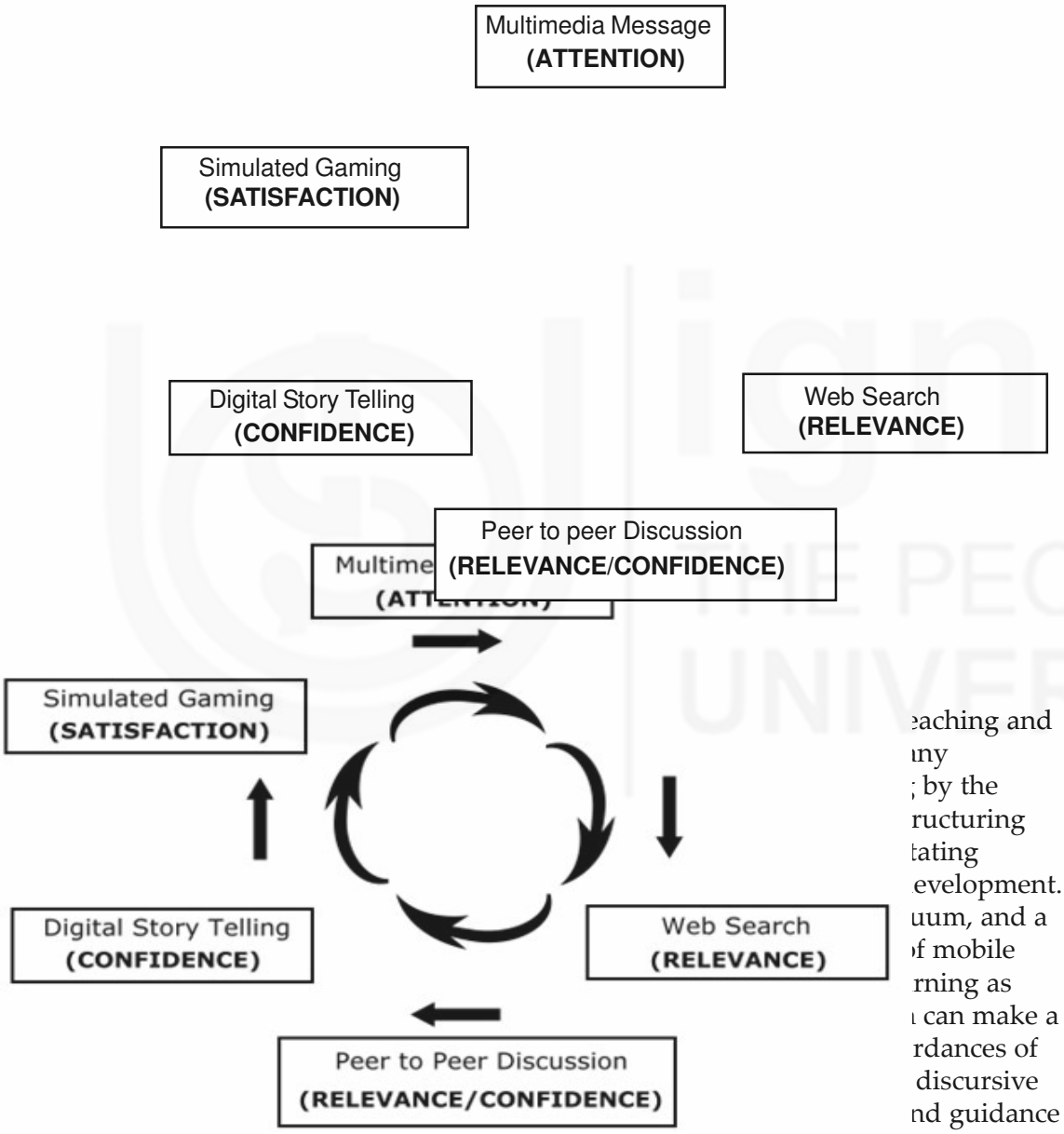
- *Mobile training or performance support* — The technologies are used to improve the productivity and efficiency of mobile workers by delivering information and support just-in-time and in context for their immediate priorities.
- *Remote, rural or development mobile learning* — The technologies are used to address environmental and infrastructural challenges to deliver and support education where "conventional" e-learning technologies would fail, often troubling accepted developmental or evolutionary paradigms.

Without theoretical underpinnings, technological innovation would not be sustainable. So, in this section, we make an attempt look into the theoretical implications of m-learning, and the theoretical models that are used in the design, development and delivery of m-learning. Three standard schools of thought — behaviourism, cognitivism and constructivism — play significant roles in the use of mobile technology for teaching and learning. Collaborative learning, situated learning and social constructions of learning are dominant approaches apart from the behaviouristic approach of using quiz and provision for immediate feedback. Arrigo et al. (2004) presented an innovative mobile platform for computer-supported collaborative learning based on third-generation mobile telephones. Students in the system can collect and share live data immediately, anywhere and at any time, enabling them to play an active role in the knowledge-building process. Nyiri (2002) notes that knowledge is information in context, and since mobile devices enable the delivery of context-specific information, they are well placed to enable learning and the construction of knowledge.

Sharples et al. (2005) present a framework for theorising about mobile learning to inform the design of new environments and technologies to support mobile learning. Using the activity theory approach, they analyse learning as a cultural-historical activity system, mediated by tools that both constrain and support the learners in their goals of transforming their knowledge and skills. They identify two separate perspectives as layers: (1) semiotics and (2) technology. The semiotic layer describes learning as a semiotic system in which the learner's object-oriented actions are mediated by cultural tools and signs. The technological layer represents learning as an engagement with technology, in which tools such as computers and mobile phones function as interactive agents in the process of coming to know in a networked and connected world. Shih (2005) presents a modified ARCS model for designing m-learning that can be considered an instructional design approach. The learning cycle in the Shih's model as shown in Figure 10.3 includes:

- sending a multimedia message to mobile phones to trigger and motivate learners;
- searching the Web for related information by using hyperlinks (URLs) embedded in the message received;
- discussing with learning peers by text, voice, picture or video messaging;
- producing a digital story that tells what they learn through an audio or video diary (a moblogging journal); and
- applying what they learn in a simulated environment such as online educational gaming.

One of the major reasons m-learning does not work at the present level of development is a lack of teaching and learning models using mobile devices. Not enough has been done to experiment with m-learning using the various learning theories and instructional design models available. Keough (2005) presents "mobigogy" as distinct from "pedagogy" and "andragogy" for application in mobile technologies. Accordingly, mobigogy is a teaching and learning paradigm for the mobile technologies that is continuous, learner directed and believes in education as democracy. Mobigogy enables network thinking, dynamic learning in supported communities, sharing experiences and learning from others in an object-oriented, just-in-time knowledge model.



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Personal Learning: Mobile devices are becoming personal possession of individual learners. It is something that today's youth do not want to leave for a movement. They are engaged with the mobile device in an intricate manner for different activities that the tool provide. For mobile learning to be possible, we must exploit this behaviour of the leaner to deliver content through mobile device to reach anytime and anywhere by giving bite-sized information just in time approach.

Didactic Content: The dominant model of education is information transfer, and mobile technology can deliver information fast in different sizes ranging from Short Message Service (SMS) to delivery of podcast and eBooks in PDF and multimedia files. Mobile technology enabled by Voice XML can also provide speech-to-text and text-to-speech facility to provide content. These contents may be notes and presentation, eBooks, multimedia, websites and LMS delivered through PDA, and smart phones.

Discursive Interaction: Most educators believe that interaction is essential for learning to happen and sustain for a long time. In e-learning, we use discussion forum, email, etc. for interaction between student and teacher, and student and student. We also use the concept of 'e-moderation'. Similarly, we can think of using interaction through mobile in both synchronous and asynchronous manner. So, while we can use SMS and MMS for asynchronous interaction, using the web interface in a suitable mobile, we can also make Computer Mediated Communication (CMC) possible through mobile devices. Today, mobile devices are available with pre-installed social network facilities that can be integrated around teaching and learning activities.

Generic Academic Support: Mobile devices can be used to develop study skills, personal information management, and time management skills. Phone based applications can be used for these purpose to develop lifelong learners. Mobile with in-build dictionary, maps are some other applications that can also provide academic support to the learners.

Subject Specific Support: Mobile devices can be GPS enabled, and can also have local map features. These can be appropriately used to teach specific subjects such as Geography. Learners may be asked to map the local area, and share and discuss he demographic patterns of a locality through the use of mobile phones. Similarly, language learning can be contextualised with the use of mobile phones.

Guidance and Counselling: A telephone is a highly useful medium for providing timely guidance and counselling to those who need. We can sue mobile technologies to extend the support services available to the learners into 24X7. While this support can also be academic, it is more useful for non-academic and para-academic support and guidance anytime. Learners can receive information about a range of services through phone call or interactive SMS. Mobile technology can also be used to give career guidance, counselling to cope up with stress, and other psychological issues of adolescence, etc.

Check Your Progress 10.3

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

b) *Compare your answers with those given at the end of this unit.*

1) Write the five properties of mobile devices that provides unique educational affordances.

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2) List the six areas where mobile devices can be applied in education.

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10.6 COST AND IMPACT OF M-LEARNING

Cost is probably the most difficult aspect of mobile learning, for post-secondary institutions and particularly at the school level in the developing countries. Traxler (2003) identified elements of a theoretical basis for estimating and predicting the effectiveness, efficiency and economics of mobile learning as:

- content development costs;
- teaching costs;
- software development costs;
- hardware costs; and
- usage costs, e.g., phone charges.

However, no in-depth analysis of these costs has yet been done. Experiences in the field of e-learning and distance learning show that the cost of m-learning is high at the present because of technological development, though m-learning has the potential to be much less costly due to economies of scale. Rekkedal and Dye (2009) accepted that cost-efficiency considerations prohibited them to develop parallel versions of courses for mobile learning. They recommend that "courses must be developed, presented, and distributed in a manner that allows both mobile and non-mobile distance learners to participate in the same course, using the same course materials that can be accessed from standard and mobile technologies."

Impacts

Many benefits accrue when hand-held computers are used (Juniu, 2003). The most important benefit to the learners and teachers is the opportunity to take the learning experience outside of the confines of the classroom. Perry (2003) states that wireless technologies, notably PDAs, are proving to benefit "family learning" as learners are able to use them for various literacy tasks, including note-taking and reading e-books, and then take the PDAs home to continue working on them with their parents. Barker et al. (2005) described three significant impacts of mobile technologies as "portability," "collaboration" and increased "motivation" of the learners. So, m-learning has the potential to change teaching and learning practices. Use of mobile devices in education and training would increase communication and collaboration and provide authentic learning experiences to the students through field trips and group work. However, real impact of m-learning has not yet been seen as most applications are in project stage and are yet to be integrated into the mainstream of educational institutions. Learners are the biggest stakeholders in m-learning projects, and it should be a top priority to ascertain their needs to have positive impact later. Kim and Ong (2005)

identified six factors affecting user satisfaction in m-learning, as follows:

1) relevant content;
2) service commitment of the m-learning provider;
3) usability of the system;
4) content accuracy and assurance;
5) system assurance and performance; and
6) community membership.

Thus, any m-learning provider should have a service policy and commitment, provide access to relevant learning materials developed on the basis of needs analysis and encourage the development of a community of learners.

10.7 LET US SUM UP

The growth of mobile phones and its access to people have propelled the imagination of educators the world over to use mobile technology for teaching and learning support. We defined m-learning through a detailed discussion in this unit. Simply put, it is the use of mobile devices for teaching and learning. While the 'learner' and the 'technology' are mobile, what is important in m-learning is learning that is personal, unobtrusive and anytime, anywhere. We discussed the strengths and weaknesses of m-learning. Access has been identified as a major strength, whereas many do consider the small screen-size as an impediment. You also learned design issues in m-learning, including the importance of identifying the nature of information/content required by the learners. We also discussed about various technologies used in m-learning. These are handheld computers, smart phones, Portable Digital assistants, Short Message Services, Podcasting, Video, etc. Towards the end of the unit, we discussed possible developments of a theory of mobile learning and identified five areas of use on m-learning that may lead towards development of a theory of its own. These are: personal learning, didactic content, discursive interaction, generic academic support, subject specific support, and guidance and counselling.

10.8 KEYWORDS

M-Learning: is access to electronic materials and resources mediated by mobile devices exclusively for the purpose of teaching and learning support.

Personal Digital Assistants (PDAs): is a handheld device that combines the feature of a mobile phone, computer, fax, and can provide access to the Internet.

Podcasting: A series of media file (usually audio) released episodically for download and use in mobile devices.

Shot Message Service: A form of text messaging using mobile phones/devices. It may also include multimedia files as attachment (often referred as MMS)

7 THINGS YOU SHOULD KNOW ABOUT...
MOBILEAPPS for LEARNING

Scenario

Tabitha has been studying the influence of changing climate patterns on animal migrations. As part of her senior project, she has been monitoring hummingbirds, which have been seen in increasing numbers locally in past years. Tabitha is observing two sites in her neighborhood where they have been seen and one where they have not.

She sets up motion-sensitive cameras at each of the three sites—one at the local botanic garden, a second near a honeysuckle bank in an undeveloped wooded area, and a third near heavy perennial plantings on the back side of the community center. The cameras are set to record video of anything that moves, so she aims them high enough to ensure human traffic will not set them off. Whenever video is recorded, a message with a URL to access the video is sent to her smartphone. She consequently spends her free moments during the day—waiting for class to start or standing in line at lunch—viewing video on the screen of her mobile, trying to decide if there has been hummingbird activity. She also visits the camera locations daily, recording information on temperature and humidity. She uses her smartphone to upload these observations to a database and to compare the day's weather data with that of previous years.

Her first sighting comes five days into the study. She is scanning the video on her way to class when she sees a streak across the screen that she is sure is a hummingbird. Excited, she checks the data from the previous four years and notes her sighting is two days earlier than the average.

For her, the most exciting moment of her project comes after hummingbirds have been present for more than a week at two of her sites. A male hummingbird soars right in front of her as she checks temperature readings at the wooded location, her third site. Excited, she pulls out her mobile to check the hummingbird habitat maps. She thinks the bird is a full half-mile northeast of where his species had been spotted previously. Tabitha will need to do further research, but she believes she might have evidence confirming that the migration patterns continue to shift.

1 What is it?

Mobile learning, or m-learning, can be any educational interaction delivered through mobile technology and accessed at a student's convenience from any location. The software that underlies m-learning includes not only mobile applications designed specifically for learning purposes, but also those designed for other uses—such as geolocation, data access, readers, and maps—but that can be adapted for educational purposes. M-learning hardware may include mobile phones, handheld PCs, tablets, the iPad, and netbooks, as well as devices such as the iPod touch that are able to run mobile applications. Because m-learning utilizes a variety of devices, many of which are ubiquitous in the lives of students, it can foster student engagement and offer opportunities to make learning integral to daily life.

2 How does it work?

The applications used in mobile learning generally focus on brief interactions of perhaps five minutes or less, using simple navigation and graphics to accommodate multiple screen sizes. Such applications enable the quick review of information rather than prolonged or deep learning—as such, they are better suited for activities such as a status check, a request for just-in-time information, or as a student response tool in the classroom.

M-learning projects, by contrast, can involve complex tasks that employ multiple applications to track down complex data sets or complete assignments that involve solving multidimensional problems. Some exercises contain collaborative elements or game play, employing a variety of tools like social networking, calendars, customized calculators, simulations, or augmented reality. M-learning endeavors frequently fall into categories like data collection or application of location-based information, such as checking a map to see whether project team members are nearby.

These m-learning activities can be used on a growing list of devices, though the prevalence on campus of smartphones with a data plan—which allow users to run applications on the phone's operating system, browse the web, and send and receive e-mail— makes them attractive options for course projects that are supported with mobile technology. That said, the smartphone category represents a range of devices and software, and new classes of mobile tools are emerging, such as HP's Slate and Apple's iPad, that will likely introduce new options and opportunities.

3 Who's doing it?

As an early m-learning adopter, Abilene Christian University has chosen to focus on Apple devices, distributing either an iPhone or iPod touch to each incoming freshman. Instructors can leverage applications from the Apple iTunes store for learning purposes including field activities, while a dedicated portal offers campus news and calendars to keep students engaged in the learning community. Also focusing on the Apple platform, Seton Hill University announced plans to offer an iPad to every full-time student in fall 2010, a technology chosen both for

its mobility and the promise of easy future access to e-textbooks. A joint outreach program undertaken by Carnegie Mellon University and the University of California, Berkeley, called Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE) seeks to support a group of English teachers in rural India with m-learning applications designed for grade-school students. The children access these activities via their mobile phones to work on English skills in the classroom as well as in the fields on days when they help with farm work.

4 Why is it significant?

As learning management systems adapt to the mobile platform, m-learning may become a common tool for exploration by tech-savvy faculty. The use of mobile devices seems a natural fit for distributed learning and field activities in that handheld technology can not only accompany the learner almost anywhere but also provide a platform that is rapidly evolving and always connected to data sources. Learning management systems may drive campuses to recognize the potential of this always-on, anyplace technology that lowers the physical boundaries to learning and extends the classroom. Ease of use offered by mobile devices supports lifelong learning, and because the devices themselves are integrated into everyday life, they facilitate authentic learning. Ultimately, it might be the ubiquity of these student-owned devices that ensures their use as teaching and learning tools. The rising popularity of smartphones should promote the development of cloud-based applications that work on multiple devices. While some m-learning applications may be provided by colleges and universities, mobile technology in the main provides an inexpensive layer of functionality to the institution, capitalizing on an infrastructure that is increasingly supported by cloud services and by the technology that students bring to campus.

5 What are the downsides?

Hardware for mobile learning represents a wide range of platforms, screen sizes, and functionality, and no clear standards exist for development that address all of the tools available. As a result, colleges and universities can find infrastructure issues tricky to resolve. The cost of smartphones and data plans is out of reach for some students, and adoption and ownership is uneven. While the screen size on many mobile devices enforces simplicity of design, the small screens and keys are difficult for some to use effectively, and the additional strain on battery life imposed by mobile apps can be frustrating. Because m-learning is an emerging market, there remains a dearth of applications designed specifically for learning, and repurposing existing lesson materials for the mobile platform might add to faculty workload. The eclectic mix of devices and mobile formats, which are generally subject to student and faculty choice, could delay m-learning development, and standards may be slow to emerge in an environment where manufacturers are often trying to decide whether to merge their mobile devices with slates, tablets, or e-readers. Finally, while the devices can go anywhere with students, they might not engage students for long periods of time, as mobile learning activities are subject to frequent interruptions.

6 Where is it going?

New kinds of devices are emerging, blurring the distinctions between phones, PDAs, e-readers, and other types of hardware. Future mobile technologies will be able to present textbooks, create data visualizations, aid library research, and foster contextual learning.

Regardless of the directions taken by mobile manufacturers, newer incarnations of these devices are sure to provide easier access and better support for multimedia creation and collaborative applications. Field learning from art appreciation to zoology may soon find support from mobile devices pulled from a student pocket and used on the spot to check data, snap a photo, record location data, make a blog entry, or enter a question on the class discussion board. This rapid access to data, available wherever and whenever questions arise, could change our learning landscape, altering the way we solve problems.

7 What are the implications for teaching and learning?

The cell phone is currently the most common platform for m-learning, lending itself to collaborative and project-based efforts that leverage its potential to support the communication requirements of a team. Where wireless networks are available, or where smartphones with data plans have access to cell networks, mobile lessons and exercises can leverage the ability to gather information from a variety of interdisciplinary sources in a wide array of formats while exploiting the value of location-based learning. In developing countries where mobile devices are available at a fraction of the cost of other computing hardware, m-learning has extended the infrastructure of distance education to outlying areas that have previously been poorly served. Regardless of the hardware employed, as demand requires that more applications be re-authored for mobile formats, institutions may find it necessary to overhaul data-sharing and content-delivery techniques to support the mobile platform.

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10.10 FEEDBACK TO CHECK YOUR PROGRESS QUESTIONS

Check Your Progress 10.1

1) Your definition of mobile learning should cover the use of mobile devices, teaching and learning support, and access to electronic resources.

2) Four strengths of mobile learning are:
   - Personalized learning, anytime, anywhere
   - Increases collaborative learning and social support
   - Increases access as mobile is becoming pervasive
   - Develop confidence by giving just-in-time skill training

3) The three important aspects of mobile learning are: device, learner and the social aspect. The device aspects refer to considerations such as size, weight, input capabilities, storage capacities etc. The learner aspect refers to students' prior knowledge, context and motivation to use technology; and social aspects relate to conversations, collaborations and social interactions. Mobile learning should consider all these while being applied in education and training situations.

Check Your Progress 10.2

For mobile learning applications, we should consider information as interactive and non-interactive, as well as static and dynamic. Non-interactive and static type of information include: last date of submission of assignments, etc., while non-interactive and dynamic information may be delivery of content such as podcast, tips and news items. Interactive and static information may involve grades in a course, while interactive and dynamic information may involve use of mobile in a teleconference session, games, chatting, etc.

Check Your Progress 10.3

1) The five properties of mobile devices are:
   - portability
   - social interactivity
   - context sensitivity
   - connectivity
   - Individuality
2) Mobile technologies can be applied in education for the following six purposes;
   - Provision of personalize learning to individual learners
   - Didactic information transfer
   - Promote discussion
   - Provide generic academic support
   - Provide subject specific support
   - Guidance and counselling through telephone

Indira Gandhi National Open University

STAFF TRAINING AND RESEARCH INSTITUTE OF DISTANCE EDUCATION

Dear Learner,

While studying the units of this block, you may have found certain portions of the text difficult to comprehend. We wish to know your difficulties and suggestions, in order to improve the course. Therefore, we request you to fill out and send us this from as soon as you complete reading this block. Kindly use a separate sheet, if you find the space provided insufficient.

Please mail to:
Course Coordinator (MDE-418)
STRIDE, IGNOU, Maidan Garhi
New Delhi – 110068, India

Questionnaire

Enrolment No. | | | | | | | | | | |

1) How many hours did you need for studying the units?

Unit no.	1	2	3	4	5
No. of hours					

2) In the following table we have listed 4 kinds of difficulties that we thought you might have come across. Kindly tick (√) the type of difficulty and give the relevant page number in appropriate columns.

Page Number and Line Number	Type of Difficulties			
	Presentation is not clear	Language is difficult	Diagram is not clear	Words/Terms are not explained

3) It is possible that you could not attempt some CYPs. In the following table some possible difficulties are listed. Kindly tick (√) the type of difficulty and the relevant unit and question numbers in appropriate columns.

Unit No.	CYP No.	Question Not-clearly posed	Type of difficulty		
			Cannot answer on the basis of information	Answer given (at the end of unit) not clear	Answer given is not sufficient

4) Any other comment:-