# 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 26$^{th}$ 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

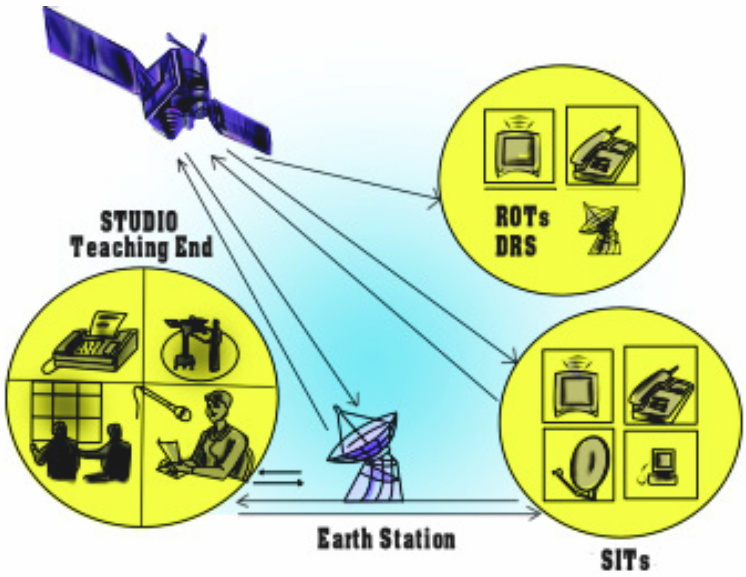


**Fig. 8.1: Teleconference Set up**

## 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