MAEDN-505

# Instructional and Behavioural Technology

## MA EDUCATION
4th Semester

## Rajiv Gandhi University
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# INSTRUCTIONAL AND BEHAVIORAL TECHNOLOGY

## MA [Education]
### Fourth
### Semester

## MAEDN - 505

# RAJIV GANDHI UNIVERSITY

**Authors**

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# About the University

Rajiv Gandhi University (formerly Arunachal University) is a premier institution for higher education in the state of Arunachal Pradesh and has completed twenty-five year of its existence. Late Smt. Indira Gandhi, the then Prime Minister of India, laid the foundation stone of the university on 4th February, 1984 at Rono Hills, where the present campus is located.

Ever since its inception, the university has been trying to achieve excellence and fulfill the objectives as envisaged in the University Act. The University received academic recognition under Section 2(f) from the University Grants Comission on 28th March, 1985 and started functioning from 1st April, 1985. It got financial recognition under section 12-B of the UGC on 25th March, 1994. Since then Rajiv Gandhi University, (then Arunachal University) has carved a niche for itself in the educational scenario of the country following its selection as a University with potential for excellence by a high-level expert committee of the University Grants Commission from among universities in India.

The University was converted into a Central University with effect from 9th April, 2007 as per notification of the Ministry of Human Resource Development, Government of India.

The University is located atop Rono Hills on a picturesque tableland of 302 acres overlooking the river Dikrong. It is 6.5 km from the National Highway by the Dikrong Bridge.

The teaching and research programmes of the University are designed with a view to play a positive role in the socio-economic and cultural development of the State. The University offers Undergraduate, Post-graduate, M.Phil and Ph.D programmes. The Department of Education also offers the B.Ed Programme.

There are fifteen colleges affiliated to the University. The University has been extending educational facilities to students from the neighbouring states, particularly Assam. The Strength of students in different departments of the University and in affiliated colleges has been steadily increasing.

The faculty members have been actively engaged in research activities with financial support from UGC and other funding agencies. Since inception, a number of proposals on research projects have been sanctioned by various funding agencies to the University. Various departments have organized numerous seminars, workshops and conferences. Many faculty members have participated in national and international conferences and seminars held within the country and abroad. Eminent scholars and distinguished personalities have visited the University and delivered lectures on various disciplines.

The academic year 2000-2001 was a year of consolidation for the University. The switch over from the annual to the semester system took off smoothly and the performance of the students registered a marked improvements. Various syllabi designed by Boards of Post-graduate Studies (BPGS) have been implemented. VSAT facility installed by the ERNET India, New Delhi under the UGC-Infonet program, provides Internet access.

In spite of infrastructural constraints, the University has been maintaining its Academic excellence. The University has strictly adhered to the academic calendar, conducted the examinations and declared the results on time.The students from the University have found placements not only in State and Central Government Services, but also in various institutions, industries and organizations. Many students have emerged successful in the National Eligibility Test (NET).

Since inception, the University has made significant progress in teaching, research, innovations in curriculum development and developing infrastructure.

# About IDE

The formal system of higher education in our country is facing the problems of access, limitation of seats, lack of facilities and infrastructure. Academicians from various disciplines opine that it is learning which is more important and not the channel of education. The education through distance mode is an alternative mode of imparting instruction to overcome the problems of access, infrastructure and socio-economic barriers. This will meet the demand for qualitative higher education of millions of people who cannot get admission in the regular system and wish to pursue their education. It also helps interested employed and unemployed men and women to continue with their higher education. Distance education is a distinct approach to impart education to learners who remained away in the space and/or time from the teachers and teaching institutions on account of economic, social and other considerations. Our main aim is to provide higher education opportunities to those who are unable to join regular academic and vocational education programmes in the affiliated colleges of the University and make higher education reach to the doorsteps in rural and geographically remote areas of Arunachal Pradesh in particular and North-eastern part of India in general. In 2008, the Centre for Distance Education has been renamed as "Institute of Distance Education (IDE)."

Continuing the endeavor to expand the learning opportunities for distant learners, IDE has introduced Post-Graduate Courses in 5 subjects (Education, English, Hindi, History and Political Science) from the Academy Session 2013-14.

The Institute of Distance Education is housed in the Physical Sciences Faculty Building(First floor) next to the University Library. The University campus is 6 kms from NERIST point on National Highway 52A. The University buses ply to NERIST point regularly.

Outstanding Features of Institute of Distance Education :

(i)  At per with Regular Mode.

Eligibility requirements, curricular content, mode of examination and the award of degrees are on par with the colleges affiliated to the Rajiv Gandhi University and the Department(s) of the University

(ii)  Self-Instructional Study Material (SISM)

The students are provided SISM prepared by the Institute and approved by Distance Education Council (DEC), New Delhi. This will be provided at the time of admission at the IDE or its Study Centres.SISM is provided only in English except Hindi subject.

(iii)  Contact and Counselling Programme (CCP)

The course curriculum of every programme involves counsellig in the form of personal contact programmes of duration of approximately 7-15 days. The CCP shall not be compulsory for BA. However for professional courses and MA the attendance in CCP will be mandatory.

(iv)  Field Training and Project

For professional course(s) there shall be provision of field training and project writing in the concerned subject.

(v)  Medium of Instructions and Examination

The medium of instruction and examination will be English for all the subjects except for those subjects where the learners will need to write in the respective languages.

(vi)  Subject /Counselling Coordinators

For developing study material, the IDE appoints subject coordinators from within and outside the University. In order to run the PCCP effectively Counselling Coordinators are engaged from the Departments of the University, The counseling-Coordinators do necessary coordination for involving resource persons in contact and counseling programme and assignemt evaluation.The learners can also contact them for clarifying their difficulties in then respective subjects.

# SYLLABUS

**Objectives:**
1. To enable the students to understand about programmed learning.
2. To familiarize the students with the equipment of educational technology.
3. To enable the students analyze teaching behaviour.
4. To familiarize the students modern approaches of teaching.

**Course Content:**
UNIT  I. **Instructional Technology:**
- Programme learning: Concepts, Principles and Steps
- Typesof PI: linear, branching and mathetics
- Development of PLM

UNIT  II. **Classification of educational technology equipment:**
- Edger Dale's Cone of Experience
- Mass, multi-media approach

UNIT   III. **Behavioral Technology:**
- Modification of teaching behaviour: Micro Teaching, S.S.S.T.
- Flander's Interaction Analysis (FIACS)

UNIT  IV**. Modern Approaches of Teaching:**
- Computer-assisted Instruction (CAI),
- Personalized system of instruction (PSI),
- SAI, IGSI and Modular Approach

**Practicum :**
1. Development of instrumental material as per the prescription of PSI
2. Preparation of lesson plan for micro teaching and using it in classroom situation
3. Analysis of classroom interaction as per FIACS.

# UNIT 1 INSTRUCTIONAL TECHNOLOGY

**Structure**

## 1.0     INTRODUCTION

Instructional technology in education is the 'theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning', according to the Association for Educational Communications and Technology's (AECT) Definitions and Terminology Committee. Instructional technology is often considered a part of educational technology but their usage has changed over the years. Instructional technology covers the processes and systems of learning and instruction, while educational technology includes other systems used in the process of developing human capability. Razavi (2005) is of the opinion that educational technology covers instructional technology. It includes instructional technology and field study in human teaching and learning. Hence, educational technology covers a wider spectrum than instructional technology. Instructional technology has two signification sections— teaching technology and learning technology. In the education industry, the term instructional technology is frequently used interchangeably with educational technology.

In this unit you will learn how programmes with instructions have been created for self-learning and self-monitoring.

## 1.1     UNIT OBJECTIVES

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

• Explain the concept of programmed learning

• Discuss the principles of programmed learning

• Describe programmed instructions and its types

• Analyse the development of PLM

## 1.2 PROGRAMMED LEARNING: CONCEPT

The concept of programmed learning or programmed instruction is one of the important innovations in the teaching-learning process. Programmed instruction is a carefully specified, systematically planned, empirically established, skilfully arranged and effectively controlled self-instructional technique for providing individualized instruction or learning experiences to the learner. The subject matter or learning experience is logically sequenced into small segments. The learning experience is self- corrective. It is an application of the principles of behavioural sciences and technology in the field of education. The concept of programmed learner emphasises the interaction between the learner and the programme. English authors prefer to use the term programmed learning. On the other hand, American writers prefer the use of programmed instruction.

It is held by some educators that 'Gita' is the first example of programmed learning. They also maintain that the programmed text of the Gita has several ingredients of programming: initial behaviour, small steps, active participation, terminal behaviour, immediate feedback and self-evaluation by the learner.

Several educators regard Socrates as one of the earliest programmers who developed a programme in geometry. This was recorded by Plato in the dialogue Menu. Socrates guided his followers to knowledge by conducting them conversationally along a path from fact to fact and insight to insight.

### Programmed learning as technological revolution in education

Programmed learning emerged in the beginning of the 20th century from the efforts of American psychologists. E.L. Thorndike (1874-1949) was the first psychologist whose findings bear direct relevance to programming. Other important psychologists who have made significant contribution in the field are Sidney L. Pressy, Robert M. Gagne, Robert Mager and B.F. Skinner.

Programmed learning is related with the 'law of effect' as explained by Thorndike. Sidney L. Pressey, a psychologist of Ohio State University, is credited for developing in the middle 1920's practical machines which could teach as well as test. The teaching machines as developed by Pressey present a series of questions to a student and inform him immediately whether his response is right or wrong.

In 1943, Skinner and two of his colleagues started programming by teaching a pigeon to roll'a small bowling ball by operant conditioning. By 1954, Skinner and James G Holland devised the auto-instructional methods which have served the present generation as the basis for present work in programmed instruction. In Skinnerian programmed instruction, whether mechanised or otherwise the learner is initially asked questions which he can easily answer correctly without any previous study of the particular lesson. The learner is taught by the sequence of questions. He is asked more and more as the lesson proceeds in very small steps.

In 1955, Norman A. Crowder developed what he calls 'automatic tutoring by intrinsic programming' as against 'extrinsic programming' developed by Skinner.

Robert Mager (1958) gave a new concept known as 'Learner controlled Instruction' which is a kind of Socratic dialogue in reverse, in which the learner led the instructor. The instructor remained silent until the learner himself stimulated the instructor with questions that suggested the needed illustrations, demonstrations, practice or some other help.

Stoluron, at Illinois, had been developing a process which should provide for greater individualization by measuring needs and devel-oping programmes that require a computer to assist instruction.

In 1962, T.F. Gilbert gave formalized expression of his technology of education called Mathetics. In 1962, Pennington and Slack expressed detailed methods of preparing lessons from mathetic principles.

Rothkopf in 1965 suggested a term 'mathemagenics.' Mathemagenic behaviour involves three characteristic activities: (i) the transformation of a nominal stimulus into a effective stimulus (which is to take place within the organism); (ii) some form of elaboration (which, for instance, may take the form of echoic responses); (iii) process exemplified by problem solving and inductive reasoning. These activities must take place before any learning begins. Rothkopf points out that as the learner reads a text, he experiments with and internalizes various kind of mathemagenic behaviours. The test shows that learners encounter, sort out and extinguish those behaviours which were not effective.

In 1965, Lawrence Stolurow brought the idea of computer-assisted instruction, (CAT).

## Definitions of Programmed Instruction

(1) *Arthur A. Luonsdaine* (1964): An instructional programme is a vehicle which generates an essentially reproducible sequence of instructional events and accepts responsibility for efficiently accomplishing a specified change from a given range of initial competencies or behavioural tendencies to a specified or terminal range of competencies or behavioural tendencies.

(2) *Edgar Dale:* Programmed learning is a systematic, step by step, self-instructional programme aimed to ensure the learning of stated behaviour.

(3) *Gulati and Gulati:* Programmed learning as popularly understood is a method of giving individual instruction in which the student is active and proceeds at his own pace and is provided with immediate knowledge of results. The teacher is not physically present. The programmer, while developing programmed material has to follow the laws of behaviour and validate his strategy in terms of student learning.

(4) *G.O.M. Leith* (1966): Programme is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of cueing is applied, and each response is verified by the provision of immediate knowledge of results. Such a sequence is intended to be worked at the learner's own pace-as individual self-instruction.

(5) *Jacobs and Others* (1966): Self-instructional programmes are educational materials from which the students learn. These pro-grammes can be used with many types of students and subject-matter either by themselves, hence, the name "self-instruction" or in combination with other instructional techniques.

(6) *James E. Espich and Bill William:* Programmed instruction is a planned sequence of experiences, leading to proficiency in terms of stimulus response relationship.

(7) *Kampfer:* It is a device which presents an exercise or a problem to a student, inducing him to respond, and revealing to him whether or not his response is correct.

(8) *K.O. May* (1965): Educational programming is the scheduling and control of student behaviour in the learning process.

(9) *R.C. Das* (1993: This is a method of individualised instruction, where each individual learns by himself at his own rate. Programmed learning consists of elements of new knowledge called steps which are arranged in a sequence in such a way that a student can easily learn by himself.

(10) *Smith and Moore* (962): Programmed instruction is the process of arranging the material to be learned into a series of sequential steps. Usually if moves the student from a familiar background into a complex and new set of concepts, principles and understanding.

(11) *Susan Markc* (1969): It is a method of designing a reproduc-ible sequence of instructional events to produce a measurable and consistent effect on the behaviours of each and every acceptable student.

Edward L. Thorndike (1912) described the fundamental idea of programmed self-instructional materials in these words, 'If by a miracle of mechanical ingenuity, a book can be so arranged that only to him who had done what was directed on page one, would page two become visible and so on, much that now requires personal instruction could be managed by print.' This 'miracle' later on became a reality.

In programmed learning, it is said that the most efficient, pleasant and permanent learning takes place when the student proceeds through a course by a large number of small, and easy-to-take steps Wilbur L. Schramm (1962) lists the essential elements of programmed instruction as: (a) an ordered sequence of stimulus items, (b) to each of which a student responds in some specific way, (c) his responses being reinforced by immediate knowledge of results, (d) so that he moves by small steps, (e) therefore, making few errors and practicing mostly correct responses, (f) from what he knows by a process of successively closer approximation, toward what he is supposed to learn from the programme.

**Teaching instruction and programmed instruction:** According to Edgar Dale, "'Teaching' is a broad, vague, ill-defined term and 'instruction' is a purposeful, orderly, controlled sequenc-ing of experience to reach a specified goal. 'Programmed instruction' is a sub-head under instruction and represents a more rigorous attempt to develop a mastery, over specified goals to secure 'insured' learning."

**Programmed learning and programmed instruction:** These two terms PL and PL have been used interchangeably in educational literature. The English educators prefer the use of programmed learning (PL) and the American writers on the other hand use the term programmed instruction (PI).

**Programmed instruction and educational technology:** Programmed instruction is a part and not the whole of educational technology. It is a strategy of teaching and learning and self-instructional texts or audio-tutors. It maybe treated as 'software' approach for instructional technology. Software approach refers to application of teaching learning principles to the deliberate and direct shaping of behaviour. Programmed learning is different from teaching machines and devices usually termed as hardware educational technology.

**Essence of a programme:** The essence of programme lies in writing it in such a way that every student will eventually be able to complete it without a mistake. The key to the programme is to ensure that the student tries the correct answer. The material presented to the student may be in the form of a book or simple machine or a complicated computer. In every case, the student gives his response and then checks the correctness of the response.

**Salient characteristics of programmed learning**

1. The objectives underlying the programme are defined in explicit and operational terms. This makes the terminal behaviour desired to be built up through the programme measurable and observable.

2. Assumptions about the learner are clearly stated and put in definite terms in a programmed learning type of situation. These assumptions may relate to the particular level of reading competence of the learner, his command of vocabulary and his background in the subject matter.

3. The learner is made to respond actively by asking to fill in the blank, count the number of coins in a row or complete a series of numbers. For doing it correctly the student receives reinforcement and establishes a pattern of stimulus-response interaction.

4. In a programmed learning situation, the learner progresses at his own pace.

5. A programmed test provides for immediate feedback information. This is based on the theory of reinforcement which emphasises that the learner learns from the sequence of responding and not from the making of response itself.

6. Programmed instruction takes care of the fact that there are even differences in the rate at which an individual learner learns various kinds of subject matter.

7. Programmed learning enhances the capacity of the learner to discriminate or to generalise by frequent application and, thus, offers the learner an interesting challenging project.

8. In programme learning a learner moves in every specific way as opposed to traditional procedures of teaching where the learner moves in very general way.

9. Programmed learning provides for constant evaluation through the record of learner's responses. The quality of the programme can be improved through checking the number of errors at each step and the learner's progress can be evaluated by looking into various types of responses produced by the learner.

10. Programmed learning is based strictly on the behaviouristic principles of psychology. Afair amount of stress is laid on the examination and development of understanding through the handling of various cues in the learning process.

    Programmed learning may be explained in brief as under:
    (a) The learner is presented with a stimulus which gives him information, demands on his response, or does both.
    (b) These is a continual necessity for the learner to utilise his information in making some response.
    (c) After responding, he is presented with information (feedback), which enables him to ascertain the appropriateness of response.

**Need for programmed instruction:** Technology or automation is the only solution to the challenge posed by 'knowledge explosion' and 'population explosion'. The present era, therefore, is passing through a period of a silent revolution in the field of education. Programmed instruction is an innovative step in this direction towards automation and individualisation of instruction.

| 8. Programme is prepared in such a way that the student automatically participates actively by making responses continually.' | 8. The student usually remains a passive listener and the teacher himself does the summarising and reviewing. |
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| 9. A programme is developed empirically through a series of tryouts and refined gradually. Effective sequences of frames are retained and ineffective ones discarded. | 9. It is usually found to be very difficult to modify traditional instruction on the basis of student reaction. |

### 1.2.1 Principles

Researchers have evolved five principles of programmed learning. According to behaviourist psychology, the effects of learning can be measured through a number of responses a learner makes under controlled conditions. Feedback is essential to correct responses to reinforce such response, and it was thought that such a process would require individual learning. The principles are mentioned below:

**Principle of small steps:** It is shown by experiments that even the dullest students can learn as effectively as the brightest students if the subject matter is presented to them in suitable small steps. When we divide the task to be learnt into very small steps, and ask the students to learn only one step at a time, then probably all the students will be able to learn one small step at a time and sequentially learn all the steps. It is a difficult task to climb a mountain but once steps are built even a child can climb the mountain very easily. This is known as the 'principle of small steps'.

**Principle of activity responding:** Tht second psychological principle is that the students learn better and faster when they are actively participating in the teaching-learning process. In our classroom teaching the teachers do ask a few questions and the students respond. But it is not possible for the teachers to ask all the students to respond at each small step. A teaching machine text or a programmed text contains a large number of questions—one question at each small step and the students respond actively. The principle of active responding is used for the programmes. The teaching machines and programmes have proved to be superior because they provide opportunity to every learner to respond at every small step.

**Principle of reinforcement:** Every response even approximately correct must be reinforced immediately. Delayed reinforcement fails to work. This is possible only when a teacher has to teach only one student at a time. The most ideal situation is when the teacher can cater to the needs of his students individually. But in classroom teaching this is hardly possible. No teacher, however efficient and sincere, can reinforce each correct response of each of his students as soon as it is made in a classroom situation where he has to teach about 4/50 students. The teaching machines and the programmes do the job more efficiently.

**Principle of self-pacing:** The programmed instruction is based on the basic assumption that learning take place effectively if the learner is allowed to learn at his own pace. Therefore, a good programme of the material always takes care of the principle of self-pacing. A learner moves from one frame to another according to his own speed of learning.

**Principle of student-evaluation or student testing:** Continuous evaluation of the student and the learning process leads to better teaching-learning. In the programmed instruction, the learner has to leave the record of his responses because he is required to write a response for each frame on response sheet. This detailed record helps in revising the programme.

Edward F.O. classifies principles of programmed instruction in two broad categories mandatory and optional.

**(i) Mandatory principles:** These include:

    (a) Principle of objective specification

    (b) Principle of empirical testing

       It includes: (a) Individual try-out (b) Small group try-out (c) Field try-out

    (c) Self-pacing

**(ii) Optional principles**

    4. Overt responding

    5. Immediate feedback

    6. Small step size

### Rule for the art of programming

I. Klaus has summed up twelve rules of the art of programming and building instructional frames:

1. *Active responding: A* learner learns from making a response and not from hearing or seeing it.

2. *Proper cueing:* The provision of proper cueing is the main difference between a test question and an auto-instructional frame.

3. *Appropriate context:* This is the kind of stimuli that will be capable of evoking the desired response at some time in future.            \

4. *Small steps:* It is very desirable that there should be as many small steps as possible.

5. *Sequence of topics:* The topics of the subject-matter should be carefully sequenced so as to provide adequate motivation.

6. *Frequent repetition:* Cues associated should be changed and frequent repetition provided in frames.

7. *Knowledge of subject-matter and technical accuracy: A* sound knowledge of these is very necessary for preparing a suitable and effective programme.

8. *Lecturing to be avoided:* The learner should be helped to learn and this is possible in case we provide facts to the learner.

9. *Evoking a relative response:* Right kind of illustration should be used for evoking a response.

10. *Providing cues in adequate number:* Excess of cues will prevent the learner from making his own generalisations and discovering principles.

11. *Not assuming too much knowledge:* The programmer should not assume too much knowledge on the part of the learner.  .

12. *Presenting of facts in frames:* Only one fact should be presented in one frame.

### Effects of programmed learning on the teaching process

1. Tutorial experiences are provided for individual learners on a large scale whereby the learner may proceed at his own.

2. Programmed instruction can exercise control on homework and individual study.

3. Programmed instruction can enable the learner to catch up the loss of absence from school.

4. Programmed instruction provides a technological solution to the problem of individual differences. Programmed instructional materials enable the teacher to gear up his presentation to what he senses is the average, too slow for the bright student and too fast for the slow one.

5. The availability of instructional material of a programme and its powerful tools make the teacher much more a professional man than he now is.

6. By interpreting the feedback obtained through oral questions and discussions in the class, the teacher can intelligently vary the flow of information or further instruction.

7. A basic feature of teaching machines is 'immediate knowledge of results' followed by immediate correction of errors and rewards for correct answers. It has been established by research that more frequent the rewards, the better the learner assimilates the mate-rial.

8. It eliminates cheating because the learner has to gain nothing by it.

9. The students like the use of machines than studying a textbook.

10. It eliminates the influence of teacher variable in research.

11. Immediate scoring promotes the learning process.

12. The technique is valuable in giving tests which can automat-ically be scored. Professor John

Blyth and John Jacobson describe the following uses of programming:

1. No class time is wasted on drill.

2. Examination of student's work on the programnR can enable us to prepare for a class period with prior knowledge of the points that is needed for further clarification.

3. No time is wasted to locate and correct misconceptions the students may have through unchecked practices.

4. Classroom efficiency may increase by about 30 per cent. More material can be covered in less time.

5. Individual differences may be reduced to a considerable extent.

6. Difficulties of the students can be easily diagnosed.

7. Individual and class differences can be easily located.

8. There can be a great increase in interest and improvement in morals.

**Merits of programmed learning**

Programmed learning is considered to be a more efficient method of teaching-learning. Its superiority is well-established over the traditional methods of teaching-learning. It is increasingly being used in the advanced countries of the world. It is realised that the programmed instruction has potentialities to revolutionise the theory and practice of teaching. Following are the main merits of programmed learning.

1. A well-programmed instruction is a great thrust in the direction of individualised instruction, as it is tailed to the needs of the individual learner in the class.

2. It permits individual learner to progress at his own speed. An intelligent learner needs no longer to be bored or allowed to lose interest on account of his slow progress of other learners of the class. He can make progress as he is able.

3. Since a programme requires continuous response from the learner, it overcomes the inertia and passivity on the part of the learner.

4. The teacher can give explanation in the classroom if the error is common or he may arrange individual conferences on specific points.

5. A well-programmed instruction is a great thrust in the direction of individualised instruction as it is tailored to cater to the needs of the individual students of the class.

6. Learning material in a programmed instruction is presented in such a way that learning becomes an interesting game and the learner is motivated to meet the challenges set by his own capabilities.

7. Programmes are developed by experts. They are empirically tested and modified till they are standardised. Anumber of learners can use a single good programme and thus save textbooks.

8. In programmed instruction the learner is immediately reinforced to correct his response and this reinforcement sustains the motivation of the learner.

9. The self-instructional technique presents material in which its complexity is simplified through the analysis of the subject- matter into small and more easily assimilated segments of information.

10. The introduction of programmed instruction is of great significance for developing countries which are set on the path of educating millions of learners and are short of teachers.

11. Good teachers are freed from the boredom of routine classroom teaching and are in a position to devote more time to more creative activities.

12. The programmed instruction has been used more successfully in teaching the discernment of the logic of various disciplines and inspiring students to creative thinking and judgment.

13. Certain motor skills and intellectual abilities normally taught by frequent drills and rote memorisation can be very efficiently taught by self-instructional devices.

14. Self-instructional materials have been found to be very useful in the West in revolutionising the social setting of the classroom. Problems of discipline have been solved and a new hope for eliminating emotional and social problems has been generated.

15. Programmed instruction enables the teacher to diagnose the problems of the individual learner.

16. The introduction of programmed instruction is very helpful in certain situations where human instructors are not easily available in the required number, for instance small schools in the isolated or hill areas.

## Limitations of programmed materials

Programmed materials have been severely criticised as a threat to replacing the teacher.

It is also argued that there is too much emphasis in learning facts and very little emphasis on the mastery of principles and concepts.

Some critics of programmed instruction maintain that the user of a programme does not know where he is headed to.

They also point out that the learners are not aware of the organisation and programmed instruction is unrelated to other aspects of instruction.

It is also argued that the programmed instruction material is very costly and only rich

nations can afford it.

It is also stated that the development and use of programmed instructional material require expert knowledgeand training. An average teacher finds it very difficult to make use of this device.

## Theory of programmed learning

It is true that Sidney Pressj' had actually designed several self-testing devices in the 1920's but it was Professor Skinner who in his famous article "Science of Learning and Art of Teaching" published in 1945, pleaded for the application of knowledge derived from behavioural psychology to classroom procedures and sug-gested automated teaching devices as a means of doing so. He emphasised that to acquire or learn behaviour a student must engage in behaviour. It is not enough to attract students attention but, more important, the attention of students should actually be directed to what the teacher wants them to learn. Reinforcement, i.e., the knowledge of the correctness of the learning behaviour, must be immediate and frequent; the knowledge that student is right is sufficient reinforcement to encourage him to learn more. Skinner also pointed out that 'holding students together for instructional purposes in a class is probably the greatest source of inefficiency in education'. In his view, if a certain behaviour is expected of a student to alter the learning experience, he must be encouraged to perform in that manner during the learning session itself. A student learns better and is motivated to learn more if the step taken by him is confirmed to be correct, that is to say if the learnt behaviour has been reinforced. It is easier to learn one step at a time. If the behaviour to be learnt is analysed into parts which are properly spaced and arranged in logical sequence, it would be easier to learn the whole desired behaviour by learning one step at a time. There should be few errors in the learning process so that the student practices correct responses and these responses are reinforced immediately by the knowledge of results so that he makes closer approximation to the responses which are the desired outcomes.

## Can programmed learning replace the teacher?

Programme learning cannot replace the teacher. Any innovation in the school programmes and practices must remain in the hands of the teachers. The radio and T.V. did not displace the teacher. Similar is the case with programmed instruction. It is upto the enlightened teachers to take up the challenging task of preparing programmes. We have got a wide market. The programmes can be sold all over the country. A student who is convinced that he can learn better, achieve more with the help of this programme, will definitely prefer instead of buy this programme to buying a textbook. By taking up this challenging task we will not only help the cause of education, help our fellow teachers by setting them free from the routine task of information, giving help to the students to achieve more, but we will be helping ourselves also.

It may also be remembered that these gadgets can be used mainly in the cognitive field and possibly in the psychomotor field to develop certain abilities and skills of the student as an individual. Ateacher is something more than all these gadgets put together. He has to bring about socialization of the individual; he has to promote socially desirable attitudes and interests and mould the personality of the students. The effective domain is almost reserved for his care. At present the teacher is not able to devote his energy and time to this important task as most of his time and energy is consumed by his routine job as an information giver. We always talk of education for three 'H's'—the head, the hand and the heart. But it has almost remained a mere slogan. Programmed learning, teaching machines and other gadgets will set teacher free from routine work. These are labour-saving devices for the teacher so that he may function more effectively in a field of his own choice.

Technique involved in programmed instruction can be used in teaching different subjects. Teaching of mathematics, science, social studies and elements of Indian languages can be done effectively

with the help of this new technique. The teacher has to formulate objectives of teaching a particular subject, undertake content analysis of the subject matter in the light of objectives, frame a chain of questions which will lead the pupils in the direction of the objective and present the questions to his pupils who are expected to try their hand at answering the questions independently. The teacher will have to play the role of a friend, guide and philosopher in the class when the pupils are engaged in solving the riddle and at the same time acquiring knowledge or skill. The question of class discipline may not arise as the pupils will be found busy doing the task assigned to them by the teacher. The teacher will have to do remedial or corrective teaching as the weakness of his pupils will be located in the very act of learning. The pupil will also undergo a process of self-evaluation as he completes his work.

Role of the teacher in the changed context of programmed learning maybe stated as under:

1. As an adviser in helping students in the selection of programme learning material

2. As a discussion leader for focussing the attention of the learners on important points

3. As a guide to clarify doubts and elaborate on various points asked by the learner

4. As an evaluator of the learning outcomes

5. As a consultant to the various agencies engaged in production of programmed material

**Programmed learning approach in normal classroom teaching**

The programmed learning approach can be adopted in normal class- room teaching in the following ways:

1. A teacher can make use of the principles of programmed learning such as active responding, minimal errors and confirmation while teaching various subjects in the conventional manner.

2. A teacher can define behavioural objectives in advance of teaching.

3. A teacher can validate the instructional systems of a class in terms of the performance of learners immediately after teaching is over.

4. A teacher can regulate questions and answers. The answer of a learner can be immediately reinforced by informing or telling whether it is correct or incorrect.

5. A teacher can plan the entire instructional programme of a class-room and can treat the terminal behaviour, the pre- requisite skills and content analysis in advance.

Komoski (1960) has observed,' Two thousand years ago the world's first public administrator, a gentleman by the name Quintilian, wrote what might be called a handbook for teachers.' In it he has one bit of advice which will serve as an excellent starting point for a discussion of programmed learning and its potential uses. His advice is: 'Do not neglect the individual student. He should be questioned and praised.'

## 1.2.2 Steps

It should be noted that education is a process with two dimensions: instructions and learning. The former is the job of the teacher, the latter of the student. It is for the teacher to plan out the steps of teaching keeping in view the capacity of the student. So, small step-by-step instructions with feedback from the students should be taken. The subject matter of the programme and the instructions should be presented by breaking them into small steps in a logical sequence. Information delivered in small proportions, meaning small units, would ensure smooth and easy translation and understanding of the subject matter. The small steps stress the gradual nature of the increase in complexity and the smoothness of the transition from one item to the next. Information grows in depth. Changes occur in quality and quantity. Programmed instruction is a process of

constructing sequences of instructional material in a way that the rate and depth of learning are maximised, understanding is fostered and the motivation of the student is enhanced. A programmed instructional sequence takes into consideration the initial behaviour of the learner with which it starts and the terminal subject matter competence which the learner is to achieve. The instructor, too, gets immediate feedback.

## 1.3    TYPES OF PROGRAMMED INSTRUCTION

Programmed instruction (PI) is still in its infancy in India. Programmed instruction as an optional or elective paper has been included at the B.Ed./M.Ed. level in a few universities in India. It also form a part of the paper of Educational Technology/Educational Innovation. However, as regards its classroom use, it may be observed that it is almost nil. As far back as in 1966, the Kothari Commission suggested to develop programmed material in different subjects to test the suitability of the technique in Indian conditions. An association of programmed instruction has been formed to coordinate the research being done at different centres in the country. The association also disseminates the information on new studies through its journal issued from time to time. The National Council of Educational Research and Technology has also done some work in the field. In spite of all these efforts, it may be stated that the application of programmed instruction has not yet made an appreciable impact on our classroom teaching. Our methods of teaching still remain traditional, by and large-Following are the important factors which stand in the way of introducing programmed instruction in Indian schools:

1. Resistance to change.
2. Lack of good programmes and programmers.
3. Lack of facilities

### 1.3.1 Types of Programming

As a result of experimental studies and research, following types of programmed instruction have emerged.

1. Linear or extrinsic programming
2. Branching or intrinsic programming
3. Mathetics programming
4. Rules system of programming
5. Computer assisted instruction
6. Learner controlled instruction

The first three styles—-linear, branching and mathetics are the basic formats. The rules system represents the deductive and inductive approach to teaching. The other two types, computer-assisted instruction (CAT) and learner controlled instruction (LCI) are not the basic format of programming. They are, infact, the ways and means of providing instruction. Here we have taken up only the basic type of programming.

### (i) Linear programming

B.F. Skinner is the originator of linear programming. It is also called a single-track programme. According to Skinner, a creature, a bird or a human being can be led to a desired behaviour by means of a carefully constructed programme consisting of small steps leading logically through the subject- matter from topic to topic, provided each step is reinforced by some kind of favourable

experi-ence or reward. The increments in information which the learner is expected to absorb are small. The favourable experience, or response increases the probability of the same response, to. occur again in the future. The process of rewarding the correct response to a stimulus increases the general tendency to give a response

As shown in the figure, the sequence of frames and path of learning in the programmed learning is systematic and linear. That is why, this type of programming is referred to as linear programming. Hence, all the learners have to proceed through the same frames and in the same order.

In a linear programme, learner's responses are controlled externally by the programmer sitting at a distant place. Hence linear programming is also termed as extrinsic programming. In branching programming, learner's response is controlled by internally learner himself. It is, therefore, also called intrinsic programming.

## Principles of linear programming

1. Principle of small steps.
2. Principle of active responding.
3. Principle of minimum erros.
4. Principle of knowledge of results.

## Chief characteristics of linear programming

1. A linear programme is a single track or a straight line programme.
2. In this programme, learning material is presented into a series of small steps (frames).
3. Every learner follows the same path in a linear programme.
4. In lineai- programming, the content is broken into small units ranging from just one word to as many as 40 or 50 in length.
5. In a linear programme, the learner is given a small programme, the learner is given a small amount of information.
6. The sequence of steps remains unchanged.
7. The learner is expected to compose his own answer to each question.
8. The learner is expected to respond actively to each step or frame.
9. The responses of the learner get immediate reinforcement.
10. Linear Programming provides for self pacing i.e. one can learn according to one's own speed.
11. Linear programming moves slowly but steadily in leading a learner from initial to terminal behaviour.
12. Each of the unit constitutes a frame.
13. In a linear programme, the programmer controls the response of the learner.
14. In a linear programme, the learners learns by avoiding the error.

## Merits of linear programming

1. Immediate knowledge of results acts as a great motivator and releases anxiety and tension.
2. The smallness of the frames brings the sub-goals within the reach of the learner and thereby

facilitates secondary reinforcement.

3. Repetition strengthens the responses and ensures learning.

4. Easy nature of the programme provides 'success experience' to the learner.

## Limitations of linear programming

1. hi linear programming, the learning process becomes quite dull on account of the following reasons (a) subject matter is broken into very small pieces (b) responding is quite mechanical and restrictive and (c) the learning process is quite slow.

2. The use of linear programmer is limited to some subjects and topics.

3. Linear programming cramps the imagination of the learner and initiative for creative, integrative and judgement learning.

4. Linear programming encourages guessing.

5. Linear programming does not develop the discriminating power of the students.

## (ii) Branching or intrinsic programming

Branching or intrinsic programming was developed by Norman A. Crowder (1954) an American technician. According to Crowder, branching or intrinsic programme is one which adopts to the needs of the learners without the medium of any extrinsic device such as a computer. It is not controlled extrinsically by the programmer.

Norman A. Crowder was a technician who was working in the United States Air Force. He was faced with the problem of efficiency of Vocational training. His programme is based on intution. His approach at the most is practical. This type of programme employs multiple choice response patterns. The learner is,,required to select one right answer out of several responses presented to him.

## Characteristics of a branching programme

LA frame may contain two or three related ideas or related sequences.

2. Each frame is of relatively bigger size as compared with the linear type.

3. With a view to answering the question, the learner has to arrive at an answer by setting the relationship between one idea and the other and by filling up the gaps not fully covered in the frame. Only then he can select the correct alternative from the multiple choice.

4. The learner moves forward if his responses are correct but is diverted or branched to one or more remedial frames if he does not give the correct response.

5. Frames explain the matter afresh when response is not correct. The frames ask the learner questions to elicit the right answer and reveal his previous mistakes. The learner, then, returns to the original frame.

6. The cycle goes on till the learner passes through the whole instructional material at his own pace.

7. Branching programme contains multiple choice of items where the learner selects response whereas in linear programmes or Skinnerian style the response are constructed rather than selected.

8. In a branching programme, all learners do not follow the frame route. Rather, the route depends on the response made by the learner. Thus, learners branch according to their

responses.

**Assumptions of Branching**

1. Learning takes place better, if the subject-matter is presented in its totality. •
2. Learning takes place better, if the subject-matter is presented in the form of meaningful components or units.
3. Wrong answers do not necessarily hinder the learning of a correct answer.
4. Multiple choice items help more in the learning process.
5. It is based on the possibility of detecting and correcting errors.
6. Basic learning takes place during the learners exposure to the new material.
7. Learning takes place better if the learner is allowed sufficient freedom to take decisions for adopting the instruction to his needs.

**Merits and advantages of a branching programme**

1. Big size of a frame as well as the branching minimises unnecessary repetitions and responding, thus reducing the amount of learning time and fatigue.
2. The pitfalls and consequences of erroneous logic are usually explained in the remedial frames so that the learner not only gets the correct response but also understands why some other response is hot correct.
3. Instead of simple response it provides alternatives in the form of multiple choice.
4. Through its broad frames, branching programme provides for more freedom to respond and scope of choosing one's own path of 'earning according to one's need. Thus it helps in maintaining the nterest and initiative of the learner.
5. Branching programme is helpful in the development of the power of discrimination of the learner.
6. Branching programme helps in the development of creativity and problem-solving ability.
7. Branching is most useful in the areas beyond facts, definitions and basic skills.
8. The frames being of larger size contain a good deal of information and this may enable the programmer to enrich his style and expand his ideas.
9. The programmed material in branching programme may be employed in the form of programmed text or teaching machines. The material when presented in a book form takes the form of a ' scrambled book.'

**Limitations of branching programming**

1. The multiple choice questions provided in this programming may lead to guesswork on the part of the learner and he may not understand the subject matter of the frame.
2. The setting of appropriate multiple choice questions suiting to the entire material of the frames proves a difficult task.
3. No branching method can provide infinite branching to take care of all possible needs of every individual student.
4. The cost of branching programme is very high when compared with traditional teaching approaches.

5. The branching programme is not suitable for small children as %ey are unable to express the symbolism.

6. The programme needs revision after every two years.

7. It is difficult to cover the entire subject-matter.

8. The diagnostic questions framed by the programmer may or may not suit the needs of the individual learner.

9. The programme cannot shape the behaviour of the learner.

*Backward branching.* Backward branching is based on the principle of repeating the missed frames'. As shown in the diagram the learner of frame No. 1 of the main stream goes to frame No. 2 of the main stream only if he makes a correct choice. But if he makes a wrong choice, he is led to a remedial frame wherein he is given some more help in understanding the concept and in solving the solution by a better logic. He will be then directed to the original frame No. 1 so that he can read it again and answer it correctly in the light of the remedial materials he has received. So the learner who has committed error goes though the same frame twice (once before the remedial material and once after the reme-dial material).

*Forward branching.* **In** the forward branching, whether the learner makes a wrong choice or correct choice, he will always be going t'o new pages, thus physically progressing from page to page. The learner making a correct choice will go directly to the. next frame of the main stream. But the learner who had made a wrong choice goes to a remedial frame wherein his mistake is fully explained, probably followed by another parallel question, from which he goes to the next frame of the main stream. So, even though he is wrong, physically he does not return to the original frame but progresses to a remedial frame which is more logical and simpler and then joins the main stream.

*Forwardness or backwardness of a programme.* We as programmers depend first on our previous knowledge and experience and if necessary let it be checked by a set of learners. This forwardness or backwardness of a programme is quite arbitrary but the only thing is that as long as we are successful in explaining the errors and consequently successful in inhibiting them, we are quite free to choose any of them.

*Use of linear-cum-branchingprogramme.* The style of programming depends on the topic programmed, population for which it is programmed and other multi-factors. Whether we are going to present it in a branching or a linear style, requiring overt to covert responses, as long as it aims at taking the student through an elaborate and systematic path of self-learning and testing processes, thus facilitating the student to achieve the terminal goals, it serves its functions. It is very difficult to adhere rigidly to one type of presentation. A combination of the two may prove more useful. Thus an item on the main stream of the programme may follow branching pattern, but some of the remedial sequences may be linear to guide the learner in short steps through material which he found difficult.

A linear teaching machine cannot easily be adapted to take branching sequence. This type of machine is made cheat-proof by its technical construction. Its frame size is usually too small to accommodate a large frame accompanied by multiple choice answer.

A branching machine on the other hand is more flexible.

The choice of linear or branching is left open to the free choice of the programmer according to his aims, resources and the character-istics of students with whom he is working. In general, a linear programme will be of great use in the following situations.

1. When the programmer thinks that the learners cannot digest a large chunk of material, but

may need small steps.

2. When the programmer thinks that the concepts or skills involved in the programme are of such importance that their complete mastery must be ensured by the trainees;

3. When the population of trainees has more or less the same entering behaviour, i.e., there is more homogeneity among the trainees.

4. When it is proved empirically (by way of individual and group try-out) that the very nature of the content demands linear format, e.g., in a subject which is entirely hierarchical.

## (iii) Mathetics

Thomas P. Gilbert (1962) is the originator of the concept of mathetics. According to him 'mathetics is the systematic application of reinforcement theory to the analysis and construction of complex behaviour repertories usually known as subject-matter mastery, knowledge and skills. Mathetics, if applied diligently, produces materials that exceed the efficiency of lessons produced by any known method.'

The word mathetics is derived from the Greek work 'mathein' which means to learn.

There are two distinctive types of programming techniques: one stressing the subject-matter and its treatment and the other stressing the behaviour. Mathetics falls under the second category.

Mathetics is eclective in nature but it is unique in application. It analyses the deficiencies and tries to make them up. The success of task analysis depends to a great extent on the adequacy and reliability of data. The term task analysis suggests the breaking down of the task into its constituent parts and involves detailed listing of component behavioural elements of a job or task. A task analysis is really an inventory to which knowledge, skills and attitudes are identified and isolated with a view to ultimately synthesising them into a hierarchical organisation relevant to the writing of learning prescription.

The aims of task analysis may be stated as under:

1. Description of the task which the learner has to learn.
2. Isolation of the required behaviour.
3. Identification of the conditions under which the behaviour occurs.
4. Determination and generalisation of a criterion of acceptable performance.

Task analysis is of three types (i) Analysis of topic, (ii) Analysis of the job, and (iii) Analysis of the skills.

## Main features of Diathetics programming

1. Like any other well-thought out instructional plan, a mathet-ics programme begins with a detailed analysis of what is to be taught.

2. In mathetics, an exercise is the technical unit o/learning instead of a frame as in linear or branching programming.

3. No restriction is put on the size of an exercise.

4. The size of the exercise is determined by how big a step a Learner can reasonably take at a moment.

5. Each exercise assumes the reinforcement value of accomplish-ment. In a mathetics style, a different strategy of reinforcement i.e., other than the 'knowledge' of results, which is the main source of reinforcement in the linear programming is employed.

6. This programme makes use of the techniques of retrogressive or backward chaining.

7. Learning prescription involves three principles: (i) Principle of discrimination, (ii) Principle of chaining, and (iii) Principle of gen-eralisation.

The underlying rationale of mathetics programme is that closer the learner is to reinforcement when he is taught, the more effective the reinforcement becomes. The reinforcement, in this case, is the completion of the task.

*Discrimination.* Discrimination implies making a different label or name for a non-example which shares some properties with previous examples. The three examples are reproduced from Gilbert.

(i) A colour band can have 10 colours.

Read thoroughly this list twice. Learn the number for which each colour stands.

A five-dollar bill is *green.*

One *brown* Penny.

A *red* heart has two parts.

A *white* cat has nine lives.

Three *orange* oranges.

Seven *purple* seas.

A poor legged *yellow* dog.

*Blue* tail-fly has six legs.

An eighty-years-old man has *grey* hair.

(ii) List the number for which each colour stands.

*Red* (heart), *White* (cat), *Purple* (seas), *Brown* (penny), *Green* (bill), *Grey* (hair), *Blue* (tail-fly), *Orange* (oranges), *Yellow* (dog).

(iii) List the number for which colour stands Black—Brown— Grey—Green— White—Purple—Red—Orange—Blue.

There is a correct response for each stimulus situation but there is no particular order in which these responses have to occur.

*Chain.* In a chain there is a fixed sequence of responses to be emitted, e.g., steps in division, order of words in a sentence, opening or closing a bottle or tying or untying a shoe lace. Frames that follow indicate the chaining process.

In chains responses must occur in a fairly regular order. Each response produces some change in the stimulus situation mat sets the occasion for the next responses to occur.

*Retrogressive chaining:* **It** is based oh the basis tha;t closer the student to the reinforcement when he is being taught, the more effective is the reinforcement. In this case the reinforcement is the completion of the task. Each time the student performs, he completes the task.

The six-frame sequence that follows Retrogressive Chaining to teach a mathetical procedure is designed to teach one something by making one apply the knowledge one already has plus new infor-mation that this programme will supply.

**Areas of behaviour most suited for shaping through mathetics programming**

1. Behaviour requiring chain
2. Skills and complex behaviour repertoirs
3. Behaviour which shows dependence of one on the other

**Merits**

1. It is a job and task-oriented programme.
2. Results can be linked to concrete goals which we intend to achieve through a mathetics programme.
3. Its stress on learner-success at 90/90 criterion level of mastery motivates the learner.
4. It utilises the principle of backward chaining.

5. It is relevant, significant, meaningful and valid in the eyes of the learner and the programmer.
6. It can be applied to a wide range of subject-matter but it specifically suits the teaching of skills where the main objective is transfer of training of skills from one situation to another.

**Drawbacks of mathetics programming**

1. It is very technical in nature and as such demands a lot of skill, training and labour on the part of the programmer.
2. It is not suitable for learning the material of all subjects. Only concrete material and subject material involving psycho- motor skills Can be gainfully programmed by means of Mathetics.
3. This programme makes inadequate provision for individual differences. All learners have to learn the same way.
4. It provides very little freedom to the learners as usually construct responses are required.
5. The learner encounters difficulty in constructing the last response or mastery response in the beginning.
6. Mathetics cannot be used for factual content.
7. Mathetics cannot be used for higher cognitive and affective learning objectives.
8. Mathetics does not provide any remedial help for the weaknesses and difficulties of learners.
9. Mathetics is not based on any sound learning theory.

**An Example of Mathetics Programme**

Do whatever the programme asks. If you come to the blank, (...) put the correct word, number, symbol or whatever in the blank.

When a response is required, you will find the correct response on the lower part of the page. Check your answer, then go on to the next.

**Programme Page 1**

1. To find the square of a two digit number ending in 3.
   (a) Multiply the number by its first digit and add to it the product of the two digits.
   (b) Write 9 to the right of the result. No. response in required.

Programme Page 2

2. To find the square of 16.
   (a) Multiply the first digit (1) by the next consecutive number (2).   2
   (b) Write 56 to the right of (2).                                   2    56
   (c) Square of 16 is 256. *No response
       required:*

## Programme Page 3

3. To find the square of 17.
   (a) Multiply the first digit (1) by the next higher
       consecutive number (2).
       In the Mathetics Style, an exercise in the technical
       unit of learning instead of a frame in the linear programming.
   (b) Write 89 to the right of the result.
   (c) The square of 17 is 289.

## Programme Page 4

4. To find the square of 26.
   (a) Multiply the first digit (2) by the next higher consecutive
       number.
   (b) Write 76 to the right of the result.
   (c) The square of 26 is 676.

## Programme Page 5

5. To find the square of 21
   (a) Multiply ...by...
   *(b)* Write ...to the ...of
   (c) The square of 21 is ..
       (i) Multiply 2 by 2 (ii) Write 41 to the htof4 (iii)
       The square of 21      is 441.

## Programme Page 6

6. What is the square of:
   (a) 25?                (a)     625.
   *(b)* 35?              *(b)*    1225,

## Programme Page 7

Here each frame includes the entire process, part of it supplied by the programmer and part of it supplied by the student. Each frame of the programme increases the student's share and decreases the amount supplied by the programmer.

   *Mastery Frame or Demonstration*—In the above model, the first frame in mathetics is mastery frame which is called demonstration. The mastery step completes the task or procedure to be learned.

*Teaching Frames*—Mastery frame is followed by teaching frames where prompts are used to assist the learner to give the desired response.

*Testing Frames*—The testing frames in mathetics are called release where no prompts are provided. In the above model, the, last frame is the release frame.

## 1.4   DEVELOPMENT OF PROGRAMMED LEARNING MATERIAL (PLM)

The development of a programme is a very challenging, highly dynamic and time-consuming exercise. The programmer must have a scientific temper to study all aspects of behaviour, its various forms and levels. In writing a programme, a programmer has to be very pragmatic and skilful.

Important stages mprogramming. These are as givenbelow:

   I. Preparation

  II. Constructing or writing the plan

 III.  Try-out and revision

 IV.  Evaluation **(1) Preparation**

Peter Pipe suggests the following points before getting down to details:

1. Be prepared to find that preparation accounts for at least 25 per cent of your total time.
2. Do not bother about attaining perfection in one step before you begin the next.
3. There is no substitute for hard work. Preparation requires hard work.
4. Do not rely on memory to keep track of new ideas.

*Steps at the preparation stage:* These are listed below:

(1)  Selection of a topic (unit).

(2)  Writing assumptions about learners.

(3)  Defining objectives in behavioural terms.

(4)  Writing the entry behaviour of the learners.

(5)  Developing specific outline of content.

(6)  Preparing a criterion test\

  1. *Selection of a topic to be programmed.* Following points should be taken into consideration:

    (1)  Is no programme already available on the topic?

    (2)  Does it allow to develop a simple, logical and systematic programme?

    (3)  Does it meet the requirements of the curriculum?

    (4)  Will it help in lessening the burden of the teacher?

    (5)  Will the expenses and labour involved in the programme be justifiable in terms of the gains.

    (6)  The topic for a programme should be selected from the programmer's own field of study. In the selection of the unit, the following yardsticks must be applied:

*Fig.* 5.6 Flow Chart indicating the Structure of the Programme

(a) Is this something the learner must know?

*(b)* Is it difficult for him to find a good explanation from other sources?

(7) The subject-matter should be simple.

(8) The beginner programmer should select short units which he can use, evaluate and revise in a fairly brief period.

(9) The programmer should select a unit from a field which is usually considered a stumbling blockto the learner. Of course, the criterion of ease and length should not be ignored.

(10) Special needs of the students should also be taken into consideration.

**2.** *Writing assumptions about the learners:* The programme is meant for the learners. Therefore, a programmer should be fully aware of the characteristics of the learners. Following points should be taken note of:

(1) The programmer must list basic assumptions about learners in very objective and concrete terms.

(2) He should describe the age and gender, skills, interests and ambitions of the learners.

(3) The ability of the learners maybe judged from scores obtained on intelligence, aptitude and achievement test, etc.

(4) The programmer should know the socio-economic status of the learner.

(5) The programmer should know the educational level of the parents of the learner.

(6) The programmer should be quite frank in writing assump-tions about learners.

(7) The programmer should not be concerned about its length or its literary style.

3. *Writing objectives in behavioural terms:* The programmer should state clearly the type and extent of the behavioural changes to be expected from the learners after going through the programme developed by him.

*Writing the entry behaviour of the learners.* We start with some-thing that the learners already know i.e. initial information and knowledge possessed by them. The starting point with respect to one's behaviour is called his entry behaviour and the end-point as the terminal behaviour. Hence the programmer has to describe the behaviour of the learners in terms of the base i.e. pre-requisite. knowledge, skills, attitudes and interests etc.

4. *Developing specific outlines of the content:* The course contents to be covered through the programme are decided on the basis of assumptions about the learners, their entry behaviour, objectives to be realised in the form of terminal behaviour and the courses of study prescribed by the authorities—school, department of education, board etc.

The contents should be organised logically as well as psychologically and an ideal balance struck. Every possible effort should be made to go through the relevant literature: textbooks, workbooks, manuals etc. Subject matter experts may also be consulted.

5. *Preparing a criterion test:* The criterion test is designed to ascertain the effectiveness of a programme by measuring the learner's performance on clearly defined educational tasks. Through the criterion test, the terminal behaviour of the learner reached after the completion of the unit of a programme is assessed for ascertaining the extent to which the desired objectives have been realised. A sort of standard to test the programme is set up. In the light of this standard

or criterion test, evaluation is made whenever needed.

## (2) Construction or developmental phase (writing of the programme)

The writing of the programme is carried under the following heads:

(1) Writing the draft frames in a sequence i.e. from simple to complex.

(2) Editing the draft frames by a team of experts usually consisting of (i) Subject matter expert, (ii) A skilled writer, and (iii) The programmer.

## (3) Try-out and revision

This step is carried on as under:

(i) Giving the programme to a few individual learners, finding out their reactions and making necessary changes in the light of reactions.

(ii) Trying out the programme on a group of learners at a few places and making changes on" the basis of reactions.

(iii) Trying out the programme in the field.

## (4) Evaluation

Evaluation enables the programmer to judge the success or the failure of the programme. It is done on internal as well as external criteria. Internal evaluation is done in terms of three aspects (i) Error rate, (ii) Programme density, and (iii) Sequence progres-sion. External measures include (a) Criterion test, (b) Gain ratio, and (c) Learner's attitude.

The programmer or the evaluator applies 90-90 criterion. In other words, the statements or the frames where 10% or less than that number of learners give incorrect responses are considered to be valid. The statements or the frames, in which, more than 10% learners give wrong responses, are deleted.

## Specific skills needed in the construction of a programme

*Skills needed for the planning stage.* These are:

(a) Skill in writing behavioural objectives

(b) Skill in defining entry behaviour

(c) Skill in content analysis

*(d)* Skill in preparing a criterion test.

*Skills needed at the writing stage.* These include:

(i) Skill in differentiating the functional and structural ingredients of frames

(ii) Skill in using primes and prompts

(iii) Skill in ordering arid arranging frames in a proper sequence

## Skills needed at revising, editing and testing

(a) Linguistic skill

(b) Editing skill

(c) Skill in individual testing which requires establishing a rapport

(d) Skill in obtaining evidence about the worthwhileness of the programme

**Use of primes, prompts and cues in programming**

For helping the learner make the correct response and eliminate error, he is assisted" in the form of 'primes' and 'prompts' in the introductory frames. Priming is introduced in a frame through a process of copying the response given in the stimulus material: For example.

All elements are made up of small particles of matter called 'atoms'. The smallest particle

of copper is called—

Response: atom

A prompt, on the other hand, does not indicate to the learner the correct response in the stimulus itself. A hint or cue is provided to help the learner to choose the correct response. According to Skinner, prompts can be classified into two categories: (i) Formal prompt, (ii) Thematic prompt.

Thematic prompt depends on the general properties of the prompting stimulus. It gives a hint. For example:

The ray that is incident on a reflecting surface is called 'incident' ray. The ray which is reflected by the mirror is called., ray Response reflected

It may be kept in view that the primes and prompts should be provided only in the initial steps and thereafter gradually with-drawn.

**Illustrative programmes in school subjects programme No 1 Civics, Class X**

*Introduction.* This is a programme meant for you for the study of salient features of the Constitution of India.

In this programme you will find paragraphs which are called frames. Study each frame carefully and write down what is required. Answers are given at the end. After stating your answers, check them. If your answer is wrong or you do not understand anything, you can again go back to the frame. It is not a test but instead it is a self-study programme.

**Frame 1**

The Constituent Assembly of India was set up under the provis-ions of the Cabinet Mission Plan to frame the Constitution of India which was formally adopted on 26th Nov. 1949 and came into force on 26th January 1950. It took nearly three years to complete the work.

   (i) What was the work assigned to Constituent Assembly?

  (ii) Under whose provision was it formed?

 (iii) When did our Constitution come into force?

 (iv) When was it adopted?

  (v) How much time did Constituent Assembly take to complete its work?

**Frame 2**

The Preamble of the Constitution has a great significance but is not a part of the Constitution. The Constitution was framed by the people of India through their representatives. It stresses che fact that the reign- of the land lies with the people of Indm. .

(a) Is the Preamble a part of the Constitution?

(b) By whom was the Constitution framed?

(c) In whose hands does the reign of law of India lie?

**Frame** 3

The Preamble of our Constitution is as under:

We the people of India having solemnly resolved to constitute India into a Sovereign Socialist Secular Democratic Republic and to secure to all its citizens:

Justice, social, economic and political;

Liberty of thought, expression, belief, faith and worship;

Equality of status and of opportunity; and to promote them all;

Fraternity assuring the dignity of the individual and the unity and integrity of the Nation.

In our Constituent Assembly this twenty-sixth day of November, 1949, do hereby adopt, enact and give to ourselves this Constitution.

*Note*—Three new terms—Socialist, Secular and Integrity were added to the original text of the Pi eamble when it was amended in 1976 with the 42nd Amendment.

The Preamble stresses the democratic basis of the Constitution by stating that the People of India gave to themselves this Consti-tution. It also states objectives like justice, liberty, equality and fraternity.

(i) Who has given the Constitution of India?

(ii) What kind of justice has been ensured by the Preamble? (iii) What type of

Republic is to be constituted? (iv) What kind of equality has been given to its

citizen? (v) How many types of liberty can a citizen enjoy?

**Frame 4**

Another important feature of the Preamble is that the people themselves adopted and enacted the Constitution. Thus, the representatives of the people frame the laws of the country and they have the power to change or amend the Constitution.

(a) Who frames the laws of the country?

(b) Who has the power to amend the Constitution?

**Frame 5**

The Constitution of India has many unique features which distinguish it from Constitutions of other countries. The framers of the Constitution freely borrowed ideas but took care to adapt these to the needs of the country.

The Constitution makes India a Sovereign, Socialist Secular, Democratic Republic. The word Sovereign means that India is completely free from external control. No outside power has the right to interfere either in her internal administration or direct her in the conduct of her foreign policy.

This was emphasised to ensure that India was no longer' dependent' on the British Empire as she had been before Indian Independence Act 1947 or 'dominion' as she had been from 15th August, 1947 to 26th January 1950.

(a) What kind of status did India enjoy during 15th August 1947 to 26th January 1950?

(b) Was India sovereign between 15th August 1947 to 26th January 1950?

(c) What is the meaning of the word 'sovereign"?

(d) Does the Constitution of India has unique features?

(e) Did the framers of the Constitution borrow ideas?

Answers

1. (i) To frame the Constitution of India.

   (ii) Provisions of the Cabinet Mission Plan, (iii) 26th January 1950. (iv) 26th November 1949. (v) Nearly 3 years.

2. (a) No.

   (b)   People of India through their representatives.

   (c)   People of India.

3. (i) People of India.

   (ii) Social, economic and political.

   (iii)   Sovereign Socialism Secular Democratic.

   (iv) Equality of status.

   (v) Five.

4. (a) Representatives of the people. (6) Representatives of the people.

5. *(a)* Dominion.

   (b) No.

   (c) India is completely free from external control. (d)Yes.

   (e) Yes.

**Programme No. 2 Biology Taxonomic Categories Class XI**

*Introduction.* (On the pattern of "rogi'ammf No. 1.)

**Frame 1**

All round ourselves, we see several kinds of animals and plants. They all exhibit various degrees of differences and resemblances. One feels the necessity of arranging these innumerable living things in some sequence. The method of arranging and grouping of animals and plants in various divisions is called as classification.

   (i) All animals exhibit various degrees of.........and...........

   (ii) The organisms can be better studied if they are .......... in some .......sequence.

   (ii)  .........is the method by which various organisms are grouped.

**Answers**

   (i) Differences, resemblances,

   (ii) Arranged,

   (iii) Classification.

**Frame 2**

The organisms are classified according to certain characteristics. First they are placed into the bigger groups like all the organisms of world have been put into 2 groups, namely plants and animals. These groups are further divided and sub-divided into various smaller groups.

All these different groups are called categories. These categories have been given different names at different stages, e.g., Kingdom, Phylum, Class, Order, etc.

  (i) The assemblage of organisms in the groups according to certain characteristics is said to form a .

  (ii) _____ and _____ are the names of the categories.

**Answers**

  (i) Category,

  (ii) Kingdom, Phylum, Class, Order (Any of these).

**Frame 3**

In classification, these categories are placed in a definite sequence. Some categories are higher than others, e.g., Kingdom is a higher category than Phylum. Each higher category contains all the lower categories.

  1. Is there any definite sequence to arrange the category?

  2. Which category will be studied first while classifying any organism? (higher, lower)

  3. Study the sequence of categories given below:

  Kingdom, Phylum, Class.
   (a)  If Kingdom is the highest category, Which will be the lowest?
   (b)  Category Phylum will contain category ... also.
   (c)  Will category Kingdom contain all the classes?

**Answers**

  1. Yes;

  2. Higher;

  3. (a) Class, *(b)* Class, (c) Yes.

**Frame 4**

The putting up of the taxonomic categories in a logical sequence is called a hierarchy. Study carefully the list of categories given below in a descending order i.e., first one is the highest category.

  Kingdom, Phylum, Class, Order. Family Genus, Species. This sequence forms a hierarchy.

  (i) If various categories are arranged in a sequence, it forms a...............

  (ii) Write whether the sequence of the categories given forms a hierarchy.

  Order, Kingdom, Phylum, Genus, Class, (iii) Make a hierarchy of the

categories given above, (iv) From the hierarchy made by you, answer the

following:

   (a) ......... is the highest category.

*(b)* ......... is the lowest category.

**Answers**

(i) Hierarchy, (ii) No, (iii) Kingdom, Phylum, Class, Order, Genus, (iv) (a) Kingdom; *(b)* Genus.

**Programme No. 3 Class X History Topic: Hinduism**

*Introduction*

**Frame 1**

Hinduism is considered to be the oldest religions of the world. It made significant progress during the Golden Age of the Guptas, (i) Which is considered to be the oldest religion of the world? (ii) During which age Hinduism made a great progress?

**Answers**

(i) Hinduism; (ii)  Golden Age of the Guptas.

**Frame 2**

Main tenets of Hinduism are: (i) Belief in an Omnipotent God. (ii) This belief does not debar them from worshipping several gods signifying the different forms of the same divine, (iii) Worship of several gods gave birth to numerous religious sects of which two are more important having their respective God as Head.

| *Religious Sects* | *God Head* |
| --- | --- |
| Vaishnavism | Lord Vishnu |
| Shaivaism | Lord Shiva |

(i) What is the belief of Hinduism? (ii) Name two important religious

sects in Hinduism, (iii) Name the God Heads of these sects.

**Answers**

(i) Belief in an Omnipotent God; (ii) Vaishnavism and Shaivaism; (iii) Vishnu and Shiva.

**Frame 3**

The principal Hindu Scriptures are the Vedas, the Upanishads, the Darshanas, the Gita, th*e Ramayana and Mahabharata. Name any five principal Hindu scriptures.

**Answers**

(i) The Vedas;

(ii) The Upanishads; (iii) The Darshans;

(iv) The Gita;

(v) The Ramayana.

**Frame 4**

The Hindus believe in salvation or 'moksha' as the supreme objective of one's life. This objective can be realised by exercising full control over one's own senses. There are believed to be three courses to achieve salvation—the 'Karma Marga', or the way of good deeds; the 'Gyana Marga' or the way of true knowledge and 'Bhakti Marga' or the way of Divine devotion.

   (i) What is the objective of a man's life in Hinduism?

 (ii) How many courses have been prescribed in Hinduism for salvation? (iii) What is the

meaning of the word 'Karma Marga'? (iv) What is the other word used for salvation?

**Answers**

  (i) Salvation;

(ii) Way of good deeds; (iii) Three; (iv)

Moksha.

**FRAME 5.**

The soul is immortal. It is involved in an unending cycle of births and deaths and rebirths and deaths. The Hindus believe in the theory of 'Karma' which means that actions in one's present life bear their fruit in the next life.

  (i) Does the soul die?

 (ii) Is the soul Immortal?

(iii) Soul is involved in an,........ cycle of.. .........and

 (iv) Do the Hindus believe in rebirth? (v) What is the

 theory of 'Karma'?

Answers

  (i) No;

 (ii) Yes;

 (iii) Unending, births, deaths; (iv) Yes;

 (v) Actions in one's present life bear their fruit in the next life.

## 1.5   SUMMARY

In this unit, you have learnt that:

- Programmed learning or programmed instruction is one of the important innovations in the teachmg-learning process.
- Programmed learning is related with the 'Law of Effect' as explained by Thorndike.
- Robert Mager (1958) gave a new concept known as 'learner-controlled instruction', which is a kind of Socratic dialogue in reverse, in which the learner led the instructor.
- Rothkopf in 1965 suggested a term rnathemagenics.
- According to Gulati and Gulati, programmed learning as popularly understood is a method of giving individual instruction in which the student is active and proceeds at his own pace and is

provided with immediate knowledge of results.

- In programmed learning, it is said that the most efficient, pleasant and permanent learning takes place when the student proceeds through a course by a large number of small, easy-to-take steps.
- According to Edgar Dale, 'Teaching is a broad, vague, ill-defined term and instruction is a purposeful, orderly, controlled sequencing of experience to reach a specified goal. Programmed instruction is a sub-head under instruction and represents a more rigorous attempt to develop a mastery, over specified goals to secure insured learning.
- Programmed instruction is a part and not the whole of educational technology. It is a strategy of teaching and learning and self-instructional texts or audio-tutors.
- Programmed instruction is a process of constructing sequences of instructional material in a way that the rate and depth of learning are maximised, understanding is fostered and the motivar tion of the student is enhanced.
- Technology or automation is the only solution to the challenge posed by 'knowledge explosion' and 'population explosion'.
- Programmed instruction can enable the learner to catch up the loss of absence from school.

- Programmed learning is considered to be a more efficient method of teaching-learning.
- Programmed materials have been severely criticised as a threat to replacing the teacher. It is also argued that there is too much emphasis in learning facts and very little emphasis on the mastery of principles and concepts.
- Programme learning cannot replace the teacher. Any innovation in the school programmes and practices must remain in the hands of the teachers.
- Technique involved in programmed instruction can be used in teaching different subjects.
- As a result of experimental studies and research, following types of programmed instruction have emerged:
- Linear or Extrinsic Programming.
- Branching or Intrinsic Programming.
- Mathetics Programming.
- Rules System of Programming.
- Computer Assisted Instruction.
- Learner Controlled Instruction.
- B.F. Skinner is the originator of linear programming. It is also called a single track programme.
- In a linear programme, learner's responses are controlled externally by the programmer sitting at a distant place.
- The use of linear programmer is limited to some subjects and topics.
- Branching or intrinsic programming was developed by Norman A. Crowder (1954).
- Branching programme contains multiple choice of items where the learner selects response whereas in linear programmes or Skinnerian style the response are constructed rather than selected.
- Branching programme is helpful in the development of the power of discrimination of the learner.

- Backward branching is based on the principle of repeating the missed frames.
- In the forward branching, whether the learner makes a wrong choice or correct choice, he will always be going to new pages, thus physically progressing from page to page.

if/A linear teaching machine cannot easily be adapted to take branching sequence. This type of machine is made cheatrproof by its technical construction.

The word 'mathetics' is derived from the Greek work 'mathein' which means foTearn.

m a chain there is a fixed sequence of responses to be . emitted, e.g., steps in division, order of words in a sentence, opening or closing a bottle or tying or untying a shoe lace. Frames that follow indicate the chaining process.

- Product lifecycle management (PLM) is the procedure of regulating the lifecycle of a product from its conception, through design and manufacture, to service and disposal.
- The development of a programme is a very challenging, highly dynamic and time-consuming exercise. The programmer must have a scientific temper to study all aspects of behaviour, its various forms and levels.
- The programme is meant for the learners. Therefore, a programmer should be fully aware of the characteristics of the learners.
- The programmer should state clearly the type and extent of the behavioural changes to be expected from the learners after going through the programme developed by him.
- The contents should be organised logically as well as psychologically and an ideal balance struck.
- Evaluation enables the programmer to judge the success or the failure of the programme. It is done on internal as well as external criteria.

## 1.6 KEY TERMS

- **Chain:** hi a chain there is a fixed sequence of responses to be emitted, e.g., steps in division, order of words in a sentence, opening or closing a bottle or tying or untying a shoe lace.
- **Self-instructional text:** Reading matters with elaborate instructions for learners.
- **Linear programming:** Learning programmed placed in a linear and systematic manner.
- **Branching programme:** Branching or intrinsic programme is one which adopts to the needs of the learners without the medium of any extrinsic device such as a computer. It is not controlled extrinsically by the programmer.

## 1.7 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Programmed learning or instruction is a carefully specified, systematically planned, empirically established, skilfully arranged and effectively controlled self-instructional technique for providing individualized instruction or learning experiences to the learner.

2. Mathemagenic behaviour is characterised by activities such as (i) transformation of a nominal stimulus into a effective stimulus (which is to take place within the organism); (ii) some form of elaboration (which, for instance, may take the form of echoic responses); (iii) process exemplified by problem Solving and inductive reasoning. These activities must take place before

any learning begins.

3. The essential elements of programmed instructions according to Wilbur L. Schramm are (a) an ordered sequence of stimulus items, (b) to each of which a student responds in some specific way, (c) his responses being reinforced by immediate knowledge of results, (d) so that he moves by small steps, (e) therefore, making few errors and practicing mostly correct responses, (f) from what he knows by a process of successively closer approximation, toward what he is supposed to learn from the programme.

4. Software approach refers to application of teaching-learning principles to the deliberate and direct shaping of behaviour.

5. The principles of programmed learning are (i) principle of small steps (ii) principle of activity responding (iii) principle of reinforcement (iv) principle of self-pacing (v) principle of student-evaluation or student testing.

6. The role of the teacher in the changed context of programmed learning may be stated as under:
    • As an adviser in helping students in the selection of programme learning material.
    • As a discussion leader for focussing the attention of the learners on important points.
    • As a guide to clarify doubts and elaborate on various points asked by the learner.
    • As an evaluator of the learning outcomes.
    • As a consultant to the various agencies engaged in production of programmed material.

7. The other name of linear programming is called extrinsic programming.

8. Branching or intrinsic programming was developed by Norman A. Crowder (1954) an American technician.

9. Backward branching is based on the principle of repeating the missed frames.

10. According to Gilbert, 'Mathetics is the systematic application of reinforcement theory to the analysis and construction of complex behaviour repertories usually known as subject-matter mastery, knowledge and skills. Mathetics, if applied diligently, produces materials that exceed the efficiency of lessons produced by any known method.'

11. The areas best suited for mathetics are (i) behaviour requiring chain (ii) skills and complex behaviour repertoirs (iii) behaviour which shows dependence of one on the other.

12. Important stages in programming. These are as given below:
    (i) Preparation
    (ii) Constructing or writing the plan (iii) Try-out and
    revision (iv) Evaluation

13. The skills needed at the planning stage are:
    (a) Skill in writing behavioural objectives
    (b) Skill in defining entry behaviour                    -
    (c) Skill in content analysis
    (d) Skill in preparing a criterion test

## 1.8 QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. What are the characteristics of programmed learning?
2. What are the merits and limitations of programmed learning?
3. What are the advantages of branching programming?
4. How can linear and branching programming be used jointly? Give your view.
5. Given an example of mathetics programme.
6. Briefly state PLM.

**Long-Answer Questions**

1. What is programmed learning? Explain its concepts.
2. Discuss the principles of programmed learning.
3. Can programmed learning replace a teacher? Give your views.
4. Explain linear programming.
5. Discuss the concept of branching programme.
6. Discuss mathetics as a programmed instruction in education.

## 1.9 FURTHER READING

Dwight, A. & Ryam, K.; *Micro Teaching,* Addison WesUy Publishing Co., London, 1969.

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# UNIT 2  CLASSIFICATION OF EDUCATIONAL TECHNOLOGY EQUIPMENT

**Structure**

## 2.0    INTRODUCTION

Educational technologies are not distinct technologies but intricate combinations ol hardware and software. These technologies may make use of some combination ol audio channels, computer code, data, graphics, video, or text. Technology applications are generally recognized in terms of their most noticeable hardware feature (e.g., a VCR or a computer). However, from the perspective of education, the kind of learning imparted is more significant than the equipment delivering it.

In this unit, you will learn about the multi-media approach and the classification of educational technology equipment.

## 2.1    UNIT OBJECTIVES

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

• Explain Edgar Dale's cone of experience

• Describe the use of audio-visual aids

• List the uses of blackboard

• State the types of charts

• Recognize the use of epidiascope, film strip, graphs and magic lantern

• Identify the various aspects of maps • • Interpret

three dimensional aids

• List the merits and demerits of radio school broadcasting programmes

• Discuss educational television

## 2.2 EDGAR DALE'S CONE OF EXPERIENCE

In 1946, Edger Dale developed the theory that a student is able to remember more information when they perform any task as opposed to what they hear, read or observe. His research led to the development of the 'cone of experience'. The Cone is a visual device that classifies systems of varied instructional design and learning processes.

The organizing principle of the Cone was a progression from most concrete experiences (at the bottom of the cone) to most abstract (at the top). The original labels for Dale's ten categories are: direct, purposeful experiences; contrived experiences; dramatic participation; demonstrations; field trips; exhibits; motion pictures; radio - recordings - still pictures; visual symbols; and verbal symbols. Today, learning by doing is known as experiential learning or action learning.

We have tried to explain Dale's Cone of Experience through a diagram below (Figure 6.1), though with slight modification. In the original Cone; the percentages given relate to how much people remember and is a recent modification. One should remember that Dale's intension was not to depict a value judgment of experiences; in other words, his argument was not that more concrete experiences were better than more abstract ones. Dale believed that any and all of the approaches could and should be used, depending on the needs of the learner.

**Interpreting the cone**

The figure above shows the performance ability of students at different level of the Cone, relative to the type of activity they are doing (such as reading, hearing and viewing images). The numerical figures on the left side of the image, what people will generally remember, indicate that practical, hands-on experience in a real-life context will allow students to remember best what they do. This, however, does not mean reading and listening are not valuable learning experiences. Experiencing, while doing a task, helps a learner retain maximum information. This is in part because those experiences near the bottom of the Cone, closer to and including real-world experiences, make use of more of our senses; it is believed that the more senses that are used, the greater our ability to learn from and remember an event or experience.

At the pinnacle of the 'Cone', the direct, purposeful experiences are represented. At the pinnacle of the'Cone', the verbal symbols are represented.

The experiences included in the cone are as indicated below:

1. ***Direct, purposeful experience:*** The experiences gained through the senses are direct and purposeful. It has been amply observed, 'An ounce of experience is better than a tonne of theory, simply because it is only as an experience that any theory has vital and verifiable significance.' This, direct experience is gained through the aids mentioned at the base of the cone.

2. ***Contrived experience:*** When the real thing cannot be perceived directly, its simplification

becomes necessary. Contrived experience is like a working model which is an editing of reality and differs from the original either in size or in complexity. The real object may be too small or too big, may be confused or concealed. In such a situation, imitation is preferred for better and easier understanding.

'3. *Dramatic participation:* In dramatics, certain real events are presented through the play, the pageant (kind of community drama, usually based on local history), pantomine (actors do not speak, make movements), tablean (pictureline scene in which the characteristics stand still, silently) and the puppets.

**Using Dale's cone to enhance second language (SL) learning**

While using the Cone theory, it should not be interpreted as indicating that tasks such as reading, listening and viewing experiences should not be put in practice. All of these are important parts of learning a second language and all have a place in the B-SLEVI (Success-Guided Language Instructional Model). What should be taken from reviewing Dale's Cone of Experience is that experiences at all levels described should be used in the second language classroom Just as Gardner describes the multiple intelligences and appealing to them all, Dale's Cone emphasizes learning experiences that appeal to the different senses and the different ways in which we learn. The real-world experiences at the bottom of the Cone relate directly to the 'proving it' stage; it is at this stage of the model that students are encouraged to use what they have learned in new, real-life contexts.

# 2.3   MASS AND MULTI-MEDIA APPROACH

Among the most significant forces for change in recent years is the technological sophistication we now possess, for this sophistication not only affects our lives in profound ways but also seems to hold a tantalizing promise for increasing our efficiency in education (Kinder, 1973). The last 80 years have seen the development of steam-driven, high-speed rotary presses, advanced optics, films, wire and tape sound recordings, simple and complex duplicating and copy machines, radio, television, computers, and communication lasers.

This technological escalation has bestowed upon education proliferation of equipment and materials which can assist in the reorganization and redefinition of educational experiences. In the past, most teaching depended almost entirely on verbal communication between teacher and student, or written communication to the student from printed materials. Although, these communication channels continue to play important roles in the learning process, today's students are learning facts, skills and attitudes from pictures, television, recorded words, programmed lessons, and other media. Once technology enters the school building, dramatic renovations usually begin. With the technological magic touch, a simple school-house turns into a systematized learning centre.

Today, many countries around the world use some form of technological media in education. In a few countries, the use is fairly widespread. Most technological devices and programmes, however, are structured around the needs of the teacher and are employed as teaching aids in the classroom. In other words, most educators are using technology to answer the question: how can technology help the teacher? In a few areas, however, focus is on the needs of the student. There, educators ask the question: how can technology help the learner?

In the instances, where the student is the centre of attention, technology is the catalyst for educational change. Its absence would make a significant difference to the educational process, because technology is an integral part of a well-thoughtout system, not merely a teacher's aid.

'Audio-Visual Aids', 'Educational Communication Technology', 'Audio-Visual Media', 'Learning Resources' and 'Instructional or Educational Media'. All these terms mean the same thing. Earlier the term used was audio-visual aids in education. With the advancement in the means of communication and that of technology, educators coined new terms. More specifically media refers to films, filmstrips, recordings, etc. The use of newer terms Educational Technology or Instructional Technology is primarily due to the dynamic expansion of programmed learning, computer assisted instruction and educational TV. This revolution in the field of audio-visual education is the outcome of the development in electronics, notably those involving the radio, tape recorder and computer.

The replacement of the older and perhaps more familiar term' audio-visual material' in education by the new term educational technology or instructional technology is primarily due to the dynamic use and expansion of TV and other existing new developments in the field of audio-visual education that promise much more for the future.

Locatis and Atkinson (1984) define media as the means (usually audio-visual or electronic) for transmitting or delivering messages. Media includes such things as prints, graphics, photography, audio-communication, television, simulating games and computer.

Schramm, Wilber (1973) in his book *Big Media—Little Media, Aid Studies in Educational Technology,* categories computer, VCR, TV as 'big media' and 'radio, filmstrips, graphic, audio cassettes and various visuals as 'little media'.

### 2.3.1 Audio-Visual Aids

Dutch humanist, theologian and writer Desiderious Erasmus (1466-1536) discouraged memorization as a technique of learning and advocated that children should learn through the aid of pictures or other visuals. John Amos Comenius (1592-1670) prepared a book known as *Orbis Sensulium Pictus,* (The world of Sense Objects) which contained about 150 pictures on aspects of everyday life. The book is considered to be the first illustrated textbook for childhood education. This book gained wide publicity and was used in childhood education centres all over the world. Jean Jacus Rousseau (1712-1778) and other educators stressed the need of pictures and other play materials. Rousseau condemned the use of words by teachers and he stressed 'things'. He pleaded that the teaching process must be directed to the learner's natural curiosity. Pestalozzi (1756-1827) put Rousseau's theory into action in his 'object method'. He based instruction on sense perception. The term 'visual education' was used as early as 1926 by Nelson I. Greene.

Eric Ashby (1967) identified four revolutions in education: education from home to school, written word as tool of education, invention of printing and use of books and lastly the fourth revolution in the use of electronic media i.e., radio, television, tape recorder and computer in education.

Definition of audio-visual **aids**

Some of the definitions of audio-visual aids are:

*Burton:* Audio-visual aids are those sensory objects or images which initiate or stimulate and reinforce learning.

*Carter V. Good:* Audio-visual aids are those aids which help in completing the triangular process of learning i.e., motivation, classification and stimulation.

*Edgar Dale:* Audio-visual are those devices which facilitate the communication of ideas between persons and groups in various teaching and training situations. These are also termed as multi-sensory materials.

*Good's Dictionary of Education:* Audio-visual aids are anything by means of which learning process may be encouraged or carried on through the sense of hearing or sense of sight.

*Kinder, S. James:* Audio-visual aids are the devices which can be used to make the learning experience more concrete, more realistic and'more dynamic.

*Mckown and Roberts:* Audio-visual aids are supplementary devices by which the teacher, through the utilization of more than one sensory channels is able to clarify, establish and correlate concepts, interpretations and appreciations.

**Psychology of using teaching aids/audio-visual aids**

In addition to reading, vicarious experience can be gained from still pictures, films, filmstrips, resource persons, simulations, mock-ups, television and the like. The more concrete and realistic the vicarious experience, the more nearly it approaches the learning effectiveness of the first level. Of course, unless the learner realizes that he is dealing with a substitute, his learning may not be comparable to that of real- life learning.

Interest in the role of the senses in learning was already there in educational circles when instructional media began their ascendancy. It has long been recognized that the various senses condition the reception of messages in the communication act. Research done by Cobun (1968) indicated that:

I per cent of what is learned is from the sense *of taste.*

1.5 per cent of what is learned is from the sense of *touch.*

3.5 per cent of what is learned is from the sense *of smell.*

II per cent of what is learned is from the sense of *hearing.*

83 per cent of what is learned is from the sense of *sight.*

Retention of what is learned is likewise related to th sense experience.

Observation and research by Cobun tended to show the holding time as nearly constant as possible, that people generally remember: 10 per cent of what they *read,* 20 per cent of what they *hear,* 30 per cent of what they *see,* 50 per cent of what they *hear and see,* 70per cent of what they *say,* 90 per cent of what they *say* as they do a thing.

**Meaning, significance and advantages of audio-visual aids**

Audio-visual aids or devices or technological media or learning devices are additional devices that help the teacher to clarify, establish, co-relate and co-ordinate accurate concepts, interpretations and appreciations and enable him to make learning, more concrete, effective, interesting, inspirational, meaningful and vivid. They help in completing the triangular process of learning viz., motivation, clarification and stimulation. The aim of teaching with technological media is 'clearing the channel between the learner and the things that are worth learning'. The basic assumption underlying audio-visual aids is that learning—clear understanding—stems from the sense experience. The teacher must' show' as well as 'tell'. Audio-visual aids provide significant gains in informational learning, retention and recall, thinking and reasoning, activity, interest, imagination, better assimilation and personal growtii and develop-ment. The aids are the stimuli for learning 'why', 'how.', 'when' and 'where'. The 'hard to understand principles' are usually made clear by the intelligent use of skilfully designed instructional

aids.

According to Gandhi, 'True education of the intellect can only come through a proper exercise and training of bodily organs— hands, feet, eyes, ears and nose.'

Commenting on the use of audio-visual aids, the Kothari Commission 1964-66 observed that it should indeed bring about an 'educational revolution' in the country. It further stated that the supply of teaching aids to every school was essential for the improvement of the quality of teaching.

The National Policy on Education, 1986, and as modified in 1992 has laid a great stress on the use of teaching aids, especially improvised aids, to make teaching-learning more effective and realistic.

In the words of Edgar Dale, 'Since audio-visual materials supply concrete basis for conceptual tliinking, they give rise to meaningful concepts enriched by meaningful association, hence they offer the best antidote for the disease of verbalism.'

Some of the important values of the proper use of audio-visual aids are given below:

1. *Best motivators:* They are the best motivators. The students work with more interest and zeal. They are more attentive.

2. *Antidote to the disease of verbal instruction:* They help to reduce verbalism. They help in giving clear concepts and thus help to bring accuracy in learning.

   As observed by Raymond Wyman (1957), 'We (teacher) tell students, and we provide them with written material most of the time. Words are wonderful. They are easily produced, reproduced, stored and transported. However, the overuse or excessive use of words can result in serious problem, chiefly, the problem of verbalism (using or adopting words or phrases without considering what they mean) and forgetting.'

3. *Clear images:* Clear images are formed when we see, hear, touch, taste and smell as our experiences are direct, concrete and more or less permanent. Learning through the senses becomes the most natural and consequently the easiest.

4. *Vicarious experience:* It is beyond doubt that the first-hand experience is the best type of educative experience. But it is neither practicable nor desirable to provide such experience to pupils.

   Substituted experiences maybe provided under such conditions. There are many inaccessible objects and phenomena. For example, it is not possible for the pupils living in India to see the eskimos. Similarly, it is not possible for an average man to climb the Mount Everest. There are innumerable such things to which it is not possible to have direct access. So, in all such cases, these aids help us.

5. *Variety:* Mere 'chalk and talk' do not help. Audio-visual aids give variety and provide different tools in the hands of the teacher.

6. *Freedom:* When audio-visual aids are employed, there is great scope for children to move about, talk, laugh and comment upon. In such an atmosphere the students work because they want to work and not because the teacher wants them to work.

7. *Opportunities to handle and manipulate:* Many visual aids offer opportunities to students to handle and manipulate things.

8. *Retentivity:* Audio-visual aids contribute to increased retentivity as they stimulate response of the whole organism to the situation in which learning takes place.

9. *Based on maxims of teaching:* The use of audio-visual aids enables the teacher to follow the

maxims of teaching like 'concrete to abstract', 'known to unknown' and'learning by doing'.

10. ***Helpful in attracting attention:*** Attention is the true factor in any process of teaching and learning. Audio- visual aids help the teacher in providing proper environment for capturing as well as sustaining the attention and interest of the students in the classroom work.

11. ***Helpful infixing new learning:*** What is gained in terms of learning, needs to be made definite up in the minds of students. Audio-visual aids help in achieving this objective by providing several activities, experiences and stimuli to the learners.

12. ***Saving of energy and time:*** *A* good deal of energy and time both of the teachers and students can be saved on account of the use of audio-visual aids as most of the concepts and phenomena may be easily clarified, understood and assimilated through their use.

13. ***Realism:*** The use of audio-visual aids provides a touch of reality to the learning situation. By watching a film show the life of the people of the Tundra region, students learn it more effectively in about two hours than by spending weeks by reading.

14. *Vividness:* Audio-visual aids give vividness to the learning situation. A film on Buddha provides a vivid picture of his life and teachings.

75. ***Meeting individual differences:*** There are wide individual differences among learners. Some are ear-oriented, some can be helped through visual demonstrations, while others learn better by doing. The use of a variety of audio-visual aids helps in meeting the needs of different types of students.

16. ***Encouragement to healthy classroom interaction:*** Audio- visual aids, through their wide variety of stimuli, provision of active participation of the students, and vicarious experiences encourage healthy classroom interaction for the effective realization of teaching-learning objectives.

/ 7. ***Spread of education on a mass scale:*** Audio-visual aids like radio and television help in providing opportunities for education to people living in remote areas. They also help in promoting adult education.

18. ***Promotion of scientific temper:*** **In** place of listening to facts, students observe demonstrations and phenomena and thus cultivate scientific temper.

19. ***Development of higher faculties:*** Verbalism promotes memorization. Use of audio-visual aids stirs the imagination, thinking process and reasoning power of the students, and calls for creativity, and inventiveness and other higher mental activities on the parts of students and thus helps the development of higher faculties among the students.

20. ***Reinforcement to learners:*** Audio-visual aids prove effective reinforcers by increasing the probability of reoccurrence of the responses associated with them and thus, render valuable help in the teaching-learning process.

21. ***Positive transfer of learning and training:*** Use of audio-visual aids helps in the learning of other concepts, principles and solving the real problems of life by making possible the appropriate positive transfer of learning and training received in the classroom.

22. ***Positive environment for creative discipline:*** Abalanced, rational and scientific use of audio-visual aids develops motivation, attracts the attention and interests of the students and provides a variety of creative outlets for the utilization of their tremendous energy and thus keeps them busy in the classroom work. In this way, the overall classroom environment becomes conducive to creative discipline.

**Characteristics**

1. They should be meaningful and purposeful.
2. They should be accurate in every respect.
3. They should be simple.
4. They should be cheap.
5. As far as possible, they should be improvised.
6. They should be large enough to be properly seen by the students for whom they are meant.
7. They should be up-to-date.
8. They should be easily portable.
9. They should be receptive to the mental level of the students.
10. They should motivate the learners.

**Principles**

1. *Principle of selection:* Teaching aids prove effective only when they suit the teaching objectives and unique characteristics of the special group of learners. Following points may be kept in view in this regard:

    (i) They should suit the age-level, grade-level and other characteristics of the learners, (ii) They should have specific educational value besides being interesting and motivating, (hi) They should be the true representatives of the real things, (iv) They should help in the realization of desired learning objectives.

2. *Principle of preparation:* This principle requires that following points should be attended to:

    (a) As far as possible, locally available material should be used in the preparation of an aid.
    (b) The teachers should receive some training in the preparation of aids.
    (c) The teachers themselves should prepare some of the aids.
    (d) Students may be associated in the preparation of aids.

3. *Principle of physical control: This* principle relatesto the arrangement ofkeeping aids safely and also to facilitate their lending to the teachers for use.

4. *Principle of proper presentation:* This principle implies the following points:

    (i) Teachers should carefully visualize the use of teaching aids before their actual presentation, (ii) They should fully acquaint themselves with the use and manipulation of the aids to be shown in the classroom, (iii) Adequate care should be taken to handle an aid in such a way as no damage is done to it. (iv) The aid should be displayed properly so that all the students are able to see it, observe it and derive maximum benefit out of it. (v) As far as possible, distraction of all kinds should be eliminated so that full attention may be paid to the aid.

5. *Principle of response:* This principle demands that the teachers guide the students to respond actively to the audio-visual stimuli so that they derive the maximum benefit in learning.

6. *Principle of evaluation:* This principle stipulates that there should be continuous evaluation of both audio-visual material and accompanying techniques in the light of the realization of the desired objectives.

## Problems

While all these aids are becoming more popular day-by-day, there are still some problems to be faced and solved. These are:

**(i)** *Apathy of the teachers:* Teachers in general are yet to be convinced that teaching with words alone is very tedious, wasteful and ineffective.

(ii) *Indifference of students:* The judicious use of aids arouses interest but when used without a definite purpose they lose their significance and importance.

(iii) *Ineffectiveness of the aids:* Due to absence of proper planning and lethargy of the teacher and without proper preparation, correct presentation, appropriate application and discussion and the essential follow-up work, the aids do not prove their full usefulness. A film like a good lesson has various steps— preparation, presentation, application and discussion.

(iv) *Financial hurdles:* The central and state governments have set up boards of audio-visual education and have chalked out interesting programmes for the popularization of teaching aids, but lack of finances is not enabling them to do their best.

(v) *Absence of electricity:* Most of the projectors, radio and television cannot work without supply of electricity which is still not available in a large number of schools.

**(vi)** *Lack of facilities for training:* Training colleges or specialized agencies should make special provision to train teachers and workers in the use of these aids.

(vii) *Co-ordination between centre and states:* Good film libraries, museums of audiovisual education, fixed and mobile exhibitions and educational' melas' should be organized both by the centre and the states.

(viii) *Language difficulty:* Most educational films are in English. We should have these in Hindi and other Indian languages, :

(ix) *Not catering to local needs:* Little attention is paid in the production of audiovisual aids to the local sociological, psychological and pedagogical factors.

(x) *Improper selection of films:* Films are not selected according to the classroom needs.

## Future of teaching aids

Today, the problem is not whether visual aids should have a place in education or not. Their place has been recognized long ago. The problem, now, is that of extending the benefits of these aids to all teachers and children. The future can be bright if there is proper planning on the part of the government and co-ordination between producers, teachers and students. Useful and effective aids can be produced after getting the reaction of the audience and doing research work in the field. A great deal is being done already but a lot more still remains to be done.

**Classification**

**Classification Number 2: Audio materials, visual materials and audiovisual materials**

*Audio Materials*

(1) Language laboratories
(2) Radio
(3) Sound distribution system sets
(4) Tape and disco recordings

*Visual Materials*

(1) Bulletin boards
(2) Chalkboards
(3) Charts
(4) Drawings etc.
(5) Exhibits
(6) Filmstrips
(7) Flash carts
(8) Flannel boards
(9) Flip books
(10) Illustrated books
(11) Magnetic boards
(12) Maps
(13) Models
(14) Pictures
(15) Posters
(16) Photographs
(17) Self-instructional
(18) Silent films
(19) Slides

*Audio-visual Materials*

(1) Demonstrations
(2) Films
(3) Printed materials with recorded sound
(4) Sound filmstrips
(5) Study trips
(6) Television
(7) Videotapes

**Classification Number 3: Hardware and software in teaching aids**

Educational technology can be classified into two categories, i.e., the hardware approach and software approach.

*Hardware approach:* It is based on the application of engineering principles for developing electro-mechanical equipments for instructional purposes. This approach is the result of the impact of scientific and technological development during the present century. Hardware approach mechanizes the process of teaching so that teachers would be able to deal with more students with less expenditure in educating them. Hardware devices include the following:

1. Computers
2. Epidiascope
3. Magic lantern
4. Motion pictures
5. Overhead projector
6. Radio
7. Slide and Film projector
8. Tape recorders
9. Teaching machines
10. Television

*Software approach:* This uses the principles of psychology for building in the learner a complex repository of knowledge modifying his behaviour. It has originated from the pioneering work of Skinner and other behaviourists. The programmes which such a technology produces, are often called 'software'. Software approach is characterized by task analysis, writing precise objectives, selection of appropriate learning strategies, immediate reinforcement of responses and constant evaluation. Newspapers, books, magazines, educational games, flash cards may also form part of software.

**Classification Number 4: Big media and little media**

Big media includes computer, VCR and TV. Little media includes radio, films strips, graphics, audio cassettes and various visuals.

**Classification Number 5: Three Dimensional Aids**

(i) Models (ii) Mock-ups (iii)

Specimens

Three dimensional aids are the replicas or substitutes of real objects.

**2.3.2 Blackboard**

Blackboard is a unique device which in spite of newer and better devices in vogue is irreplaceable as well as indispensable. It is the oldest and the best friend of a teacher. It is a mirror through which students visualize all about the teacher's mind, his way of explaining, illustrating and teaching as a whole. It is the cheapest and the most valuable teaching device and continues to be the 'sine qua non' of our educational system. It is the most universally used aid. Writing on sand and clay was the ancient form of blackboard writing.

The use of blackboard in class teaching creates an informal atmosphere and motivates learning. Teaching no longer confines to any one instructional device. It is ahelp to 'planning', to 'crystallizing' main points and to 'summarizing' and 'reviewing' results. Blackboard being a simple means of dealing with the whole class as a unit, is extensively used during the course of a lesson.

Following are the uses of blackboard:

1. The teacher can illustrate his lesson on the blackboard and draw the attention of the class to salient features in the lesson.
2. The lesson can be divided and summarized in the right manner. Abstract statement can be clarified in the expository stage and a summary containing important points can be given in the recapitulatory stage.
3. Questions and problems when planning class work or approaching a new subject can be listed by the teacher on the blackboard.
4. Pupils' interest in class work can be stimulated by blackboard writings and drawings.
5. It can be put to wide and varied uses. A teacher can use it for graphs, maps, graphic statistics, sketches and various types of drawings.
6. It provides a lot of space for decorative and creative work.
7. Jhe teacher can erase writings and drawings and start afresh.
8. It helps the teacher to focus the attention of his students on the lesson.
9. A teacher can review the whole lesson for the benefit of the class with the help of the blackboard.

**Types of blackboards**

*1. Fixed blackboard:* Fixed in the wall facing the class and normally made of wood or concrete cement.

*2. Blackboard on easel:* A portable and adjustable blackboard put on a wooden easel can be taken out of the classroom while taking classes in the open.

*3. Roller blackboard:* Made of thick canvas wrapped on a roller mostly used for teaching higher classes.

*4. Graphic board:* It has graphic lines and is used for teaching mathematics, science and statistics.

*5. Magna board:* A board which enables teachers to make three-dimensional demonstrations with objects on a vertical surface. Small magnets are used to hold suitable objects fixed wherever they are put on this vertical surface.

Following points may be kept in view while using the blackboard:

1. Blackboard should be kept clean so that writing on it could be easily read by the students from all parts of the room.

2. Writing on the blackboard should be legible.

3. Letters and drawings should be large enough to be seen from all parts of the room.

4. Begin writing from the top left corner.

5. Writing should be in straight rows.

6. Extreme lower corner of the blackboard should not be made use of as writing on it cannot be seen easily.

7. Material on the blackboard should not be covered by standing in front of it.

8. Only salient points of the subject-matter should be written on the blackboard.

9. Diagrammatic visual presentation involving many processes should be prepared before the beginning of the lesson.

10. It should be ensured that blackboard is well-lit by natural or artificial means.

11. Everything needed for the blackboard should be made available before the class begins i.e., collection of chalk, rulers, compass, and projector.

12. While writing on the blackboard, the teacher should ensure that the class is attentive.

13. Duster and not hand or handkerchief should be used in cleaning the blackboard.

14. Occasionally students may be asked to write or draw a diagram on the blackboard.

15. Teachers should develop the ability to draw freely on the blackboard. The map or chart or diagram that grows before the very eyes of the students is much more useful and valuable than a well finished map, chart or diagram.

16. It should be ensured that the blackboard is periodically serviced.

### 2.3.3 Charts

A chart is a combination of pictorial, graphic, numerical or vertical material which presents a clear visual summary. The most commonly used charts include outline charts, tabular charts, flow charts and organization charts. Other types of charts are technical diagrams and process diagrams. Flip charts and flow charts are also being used. Readymade charts are available for use in teaching in almost all

subjects. But charts prepared by a teacher himself incorporating his own ideas and lines of approach of the specific topic are more useful.

Charts serve the following purposes:

1. For showing relationship by means of facts, figures and statistics
2. For presenting material symbolically
3. For summarizing information
4. For showing continuity in process
5. For presenting abstract ideas in visual form
6. For showing development of structure
7. For creating problems and stimulating the thinking process
8. For encouraging utilization of other media of communication
9. For motivating the students

**How to use charts effectively**

1. Teacher-made charts should be preferred.
2. Students should be involved in the preparation of charts.
3. Charts should be so large that every detail depicted should be visible to every pupil in the class wherever he is sitting.
4. Charts should display information only about one specific area in a subject.
5. A chart should not contain too much written material.
6. A chart should not contain too many details.
7. A chart should give a neat appearance.
8. When a chart is to be used in the classroom, the teacher should make sure that there is provision for hanging the chart at a vantage point.
9. The teacher should have a pointer to point out specific facts in the chart.
10. Straight pins, staples, pegboard clips, gummed hangers, paper-clips, folded making tapes may all be used for fastening charts without damaging them.
11. Charts should be carefully stored and preserved for use in future.

**Types of charts**

The following is a list of basic types of charts in terms of arrangements and the kinds of ideas which they may express:

1. The narrative chart, an extended left-to-right arrangement of facts and ideas for expressing: (a) the events in a process such as shoe making, oil cracking, or the like, (b) the events in the development of a significant issue to its point of resolution or to the present status (sometimes a time limit). For example, the events leading to the separation of the Bangladesh from Pakistan, the events leading to the establishment of the idea that an individual should be free and that he should have a voice in his own government and the events leading to increased regulation of business by government (c) technological improvement over a period of years such as improvement in transportation, communication, manufacturing etc.
2. The tabulation chart, a left-to-right, top-to-bottom arrangement of facts and ideas for expression:

(a) numerical data for making comparisons, (b) lists of products, mountains, rivers, or the like in selected areas.

3. The cause and effect chart, usually a limited left-to-right arrangement of facts and ideas for expressing: (a) Relationship between standard of living and such factors as economic system, availability of natural resources, level of technological advancement, (b) relationship between a culture and neighbouring cultures, (c) relationship between rights and responsibilities, (d) relationship between a complex of conditions and change or conflict, (e) relationship between the elected and the electors, (f) relationship between community workers and the community which supports them.

4. The chain chart, a circular or semi-circular arrangement of facts and ideas for expressing: (a) Transitions, such as the transition from raw materials to useful products, (b) cycles, such as the water cycle.

5. The evolution chart, a left-to-right arrangement of facts and ideas for expressing: (a) changes in specific items from beginning to date, perhaps with projections into the future. For examples, automobile and its subsequent development, early basic homes and changes in basic homes to date, (b) change in the standard of food consumption, length of work, weak purchasing power of a rupee, or the like.

### 2.3.4 Epidiascope

The epidiascope is an instrument which can project images or printed matter or small opaque objects on a screen, or it can project images of a 4' x 4' slide. With the help of an epidiascope, any chart, diagram, map, photograph and picture can be projected on the screen without tearing it off from the book. No slide is needed for this purpose. An epidiascope serves two purposes. It works as epidiascope when it is used to project an opaque object. It works as diascope when it is used to project slides (by operating a lever). It works on the principle of horizontal straight line projection with a lamp, plane mirror and projection lens. A strong light from the lamp falls on the opaque object. Aplane mirror placed at an angle of 45° over the project, reflects the light so that

### 2.3.5 Film Strip

A film strip is 35 mm wide and has a series of 12 to 48 picture frames arranged in a sequence so that they develop a theme. A film strip can be prepared by taking a series of photographs using a 35 mm camera and then by taking a positive print of the negative film on another 35 mm film.

### Globe

Knowledge of map is unreal without the knowledge of globe—the true map. It is the true representative of earth's physical personality.

A globe gives a true idea of the total environment at a glance in a classropm situation. It'is through globe that a child can under-stand the concepts of time, and space. Hence, every school shall have globes. Four types of globes may be kept in every school. (1) political globes, (2) physical globes and (3) washable projection globes, (4) celestial globes.

### Graphs

Graphs are flat pictures which employ dots, lines or pictures to visualize numerical and statistical data to show relationships or statistics.

Graphs are of several types:

- *Line graph:* In a line graph, data is represented with the help of simple lines horizontally or vertically drawn. For increasing the interest and readability of concepts, pictorial illustrations and cartoons are occasionally used on the line graph.
- *Bar graph:* A bar graph consists of bars arranged, horizontally or vertically from a 'zero' base. The colour, length and size of the bars represent different values. (Fig. 6.3)
- *Circle graph:* Data may be presented in a circle graph. (Fig. 6.4)

**Magic lantern**

Magic lantern is the earliest invention in the history of audio-visual aids used for projecting pictures from a transparency (slide) on a wall or screen. When the figure or illustration is very small and it is required to be shown to the entire class, a transparent slide of the small figure is prepared. Then, this slide is placed into the slide carrier part of the magic lantern. This magic lantern device projects it on the screen by enlarging its dimension and making the vision more clear and sharp.

## 2.3.6 Map Study

In several subjects, especially social studies, learning of many geographical, historical and economic concepts remains unreal, inadequate and incomplete without a map. A resourceful teacher by motivating the pupils will turn the fear of map into a genuine love for them. This, however, pre-supposes the invariable use of maps at every possible opportunity by the teacher in the classroom, and the possession of individual atlases by the pupils. Every student should also know certain elementary aspects of map preparation such as copying, .enlarging and reducing, symbolizing, colouring, and preparation of key components. Most of the students develop an aversion to maps because they are not aware of the skills required for map preparation.

A map is an accurate representation plain surface in the form of a diagram drawn to scale, giving the details of boundaries of continents and countries.

Geographical details like location of mountains, rivers, altitude of a place, contours of the earth surface and important locations can also be represented accurately with reference to a convenient scale with suitable colour scheme.

**Identification of various aspects of maps**

1. Understanding and interpreting the key of index
2. Understanding the lines—boundary lines, lines of communication, lines indicating the rivers, contours, meridians and parallels
3. Understanding the colours, tints, shadows, symbols on a map or globe
4. The top of every map is not north, but the direction of north pole is north
5. Distinction between the various types of maps such as relief, political, and distribution maps
6. Understanding of the position of earth in the universe. Many students suffer from a notion that the earth leans in June towards the sun northwards and in December southwards and thus, seasons are formed. Earth never tills that way. The student shall understand that the inclination of earth is constant and the leaning effect changes due to its rotation around the sun.

**Types of maps**

1. *Relief maps* (regional and the world): This requires knowledge of colours, contours,

symbols and other concepts related to making maps.

2. *Historical maps:* Maps in history reveal the changing times and the growth and decline of various kingdoms. Knowledge of lines of boundaries and other symbols is necessary.

3. **Distribution maps:** Generally, the student shall associate with the following types of distribution maps:

   (1) Vegetation maps
   (2) Population maps
   (3) Economic maps
   (4) Statistical maps
   (5) Dot maps
   (6) Pictorial maps
   (7) Language, race and other human division maps, etc.

4. *Geographical maps:* Contour maps, weather maps, seismological maps, archaeological maps, rainfall maps, geological maps, etc.

## 2.3.7 Microfilm

The microfilm and microfiche are used widely for storage and retrieval of information. Microfilms contain photographed reading material on a 35 mm film, each frame being the reduced photograph of a printed page. Thus, printed matter of a book can be stored in a small loop of 35 mm film. When the microfilm is passed through a microfilm reader, an enlarged image approximately of the size of the printed page is formed on a ground glass (rear-view) screen and the observer can read the matter. By moving the film through the microfilm reader, images of different pages can be obtained and read.

### Models

Models are substitutes for real things. Amodel is a three-dimensional representation of a real thing. Models are concrete objects to explain clearly the structure or functions of real things. Amodel is a replica of the original. Models enable students to have a correct concept of the object.

Being three dimensional, models evoke great interest and simplify matter. Models enable us to reduce or enlarge objects to an observable size. It may not be possible or even practicable to make students see the whole of a large industrial unit or even a large machine unit, but a model will give the correct perspective. Prepa-ration of models could form a topic for project work. It is essential to create interest in creative activity in students.

Models are working as well as static. A working model will secure immediate attention and serve as motivation to learn.                                         -

A model can be prepared with several kinds of material like cardboard, plastic, plaster of paris, wood, clay, and thermocole.

## 2.3.8 Projector

These are different kinds of projectors, some of them are:

(a) *Micro-projector:* The combination of a microscope and a slide projector is an instrument called micro-projector. The microscope is used to see very minute parts of objects by magnifying the same hundreds of times. The minute part usually of a plant or an animal is put on a glass shde and a magnified image formed by a combination of lenses in a microscope which can be seen by an individual through the naked eye. The micro- projector attachment consists of a projection lens, a

plane mirror fixed at 45 degrees to the vertical plane and a vertical ground glass screen. It is very useful in teaching science. (Fig. 6.5).

**(b)** *Overhead projector (OHP):* Overhead projector is a device that can project $z$ chart, diagram, map, table or for that matter, anything written on transparent plates, upon a screen or the white wall before students in a class. This makes teaching illuminative, illustrative and impressive. It also saves a great deal of the teacher's time used in drawing or writing them. These transparencies can also be preserved b> the teacher for future display while taking up the same topic. It is very simple tc prepare such transparencies. All that a teacher has to do is to draw or write, as the case may be, upon transparent plates with any dark ink with a fibre tipped pen. Any material meant for display before the class while teaching can also be typed on such transparencies using a good carbon paper. In case transparencies are to be washed out for use, washable water colour can also be used for writing on the transparencies. (Fig. 6.6).

*Slide projector:* With a slide projector, photographic slides can be projected on the screen or the wall before the class. Photographs of relevant matter meant for teaching in the class can be developed on celluloid slides and displayed with the help of such a projector. The teacher's lesson can also be recorded on an audio cassette and played with a tape recorder suitably synchronizing with the slides by manipulating a remote control switch. Such an arrangement is called a tape-slide sequence. In case there are several slides to be shown in quick succession, the tape-slide sequence can bring as interesting an effect on the viewers as do the movie films.

An ordinary slide projector has a frame containing two slits into which slides are put for focusing. They are manually and continuously replaced by other slides one after another.

An improved type of a slide projector consists of a circular disc with more slits where even a hundred or more slides can be inserted in a sequential order which can be projected on the screen with the help of a remote control switch to be suitably manipulated by the teacher as he delivers the lesson. (Fig. 6.7)

## 2.3.9 Reprographic Equipment

Reprography is a branch of technology dealing with the methods of duplication or reproduction. Duplication involves making a number of identical copies of the original. Reproduction enables preparation of one or more identical copies of the original, same size or of different size in monochrome or colour. Equipment and processes included are duplicators, reflex printing and photography.

### Record player

Record players are a means of audio playback. They are older types of hardware using records of discs for the needed playback. Four sizes of records 7", 10", 12" and 16" are in common use. There are also high speed records played with standard stylus. The record players now in use are equipped with speed changer mecha-nisms permitting the playing of the slower long-playing 45, $33^{1/3}$ and $16^{2/3}$ r.p.m. records played by microgrove stylus. The use of recorded pieces in education has great value in language learning, appreciation of poetry and literature and presentation of brief dramatized episodes from history, from development of musical knowledge and discrimination. Long-playing records with 20 minutes of recorded information per side provide several diverse selections inscribed on each side and are very suitable for classroom instructional purposes. The needed selection for a particular learning situation can be easily identified by the specific microgrove ring it occupies on the record. 'Talking books' for the blind also consist of recordings of

essential literature for the visually handicapped. The older, manually wound spring powered gramophone's place now has been taken up by electrically powered multi-speed record players and changers with built-in amplifying unit or linked to separate amplifying units and speakers. Likewise, the older mechanical recording has given place to electrical imprinting involving greater clarity and fidelity.

*Tape-recorder:* A tape-recorder in its own can be very effective for classroom instruction. Pre-recorded tapes consisting of lessons by eminent teachers on any subject can be played in the class. Such instructions become impressive hot only because of the novelty but also because of their being well-thought out and planned.

The tape-recorder has proved to be a boon in teaching foreign languages like English. Pre-recorded tapes on English lessons can be played in the classroom to teach not only the contents of the lesson but also proper accent, pronunciation and intonation which an average English teacher very much lacks. (Fig. 6.8)

***Video tapes played through TV:*** Pre-recorded video tapes can be played through TV in the classroom. Video films on educational topics shown through TV in the classroom have a similar effect on students as the ordinary cinematic educational films. Video films have the added advantage over ordinary films in that the arrangement is compact and requires little space and time for manipulation. It is the most convenient of all audio-visual teaching-learning material.

## Video cassettes

The potential advantage of video cassette lies in the fact that control of the equipment and the learning process is placed in the hands of the learner through control over the mechanics of the machine, i.e. stopping, starting, timing, reviewing and previewing and consequently the capacity to order the sequence of events, controls the rate of learning, and facilitates practice sequences.

The potential exists for providing the basis for learning a wide range of motor, intellectual and cognitive and interpersonal skills, as well as affective aspects. These are important aspects which printed materials cannot deal with adequately.

This facility could be particularly useful where distance education programmes are involved with updating skills and techniques of workers in the field. For example, new horticultural techniques can be transmitted to field workers to improve farming techniques.

In some countries as a way of regionalizing a centrally produced programme, video cassette programmes are being built round the study centre concept, a location where several video machines are available to which students bring their study notes. The students run the programmes as individuals. Sometimes study centres provide for group sessions during which video cassettes are played. Unless some supplementary teaching is provided, this technique can become another version of broadcast technology.

In other countries, some institutions assume that students can gain access to such equipment and make programmes which will be used on an individual basis as either supplementary learning material or integral to the teaching programme.

The problems associated with video cassettes are of two kinds: (i) cost; and (ii) production of programmes.

(i) Equipment costs cannot always be kept down by using lower quality equipment. Cheaper equipment formats do not enable technical material such as animal or plant tissue to be

represented adequately or tapes to be reproduced in quantity without loss of fidelity.

(ii) Video production for educational purposes calls for new techniques different from the entertainment modes. Producers, directors, scriptwriters need to be knowledgeable about teaching and learning. Many of the old techniques of film and television will no longer be of use. For example, the very basic concept that programmes must have a beginning, a middle, and an end will no longer apply as a cassette could just as easily consist of a series of short video events which sets a problem, teaches a technique, or brings together a range of visual material to make concepts or principles clear.

## 2.3.10 Three Dimensional Aids

Three dimensional aids serve as good substitutes for the real objects. There is no doubt that an encounter with real objects serves as an unmatchable source of learning. But on account of several reasons it may not be possible to bring the real objects in the classroom. The real objects maybe too large to move or store in the classroom. It may be too small to be seen for a group of students. It can be too complicated in real form to be understood. It may be too swift for its operations to be understood. Its movements may be too slow to be studied completely. It can be too expensive to be purchased by an educational institution. Being handicapped in such situations a teacher has to search for some good substitute for the real objects.

Models, diagrams, mock-ups and specimens are the important three dimensional aids.

*Models:* Models are the replicas or copies of the real objects. Models are usually of three types: solid, cross-sectional and working. Models are concrete objects, some considerably larger than the real object. Sectional models explain clearly the structure or functions of the original. In some cases working models of the original are used where the specific function of the original is duplicated and could be explained easily.

Following are the important functions of models:
1. Models simplify reality
2. Models concretize abstract concepts
3. Models enable us to reduce or enlarge objects to an observable size
4. A model provides the correct concept of an industrial unit or a bridge or a dam like the Bhakra Dam, etc
5. A working model explains the various processes of objects and machines
6. Preparation of models could form a topic for project work. This in very helpful to create interest in creative activity among pupils

Cardboard, plastic, plaster of pans, wood, thermocole and metal can be used in the preparation of a model.

*Mock-ups:* A mock-up refers to a specialized model or working replica of the object being depicted. In a mock-up, a certain element of the original reality is emphasized or highlighted to make it more meaningful for the purpose of instruction. While a model is a recognizable imitation of an object (though larger or smaller than the original one), a mock-up may or may not be similar in appearance. Mock-ups of aeroplanes, auto-mobile engines, bridges, ships and tunnels, etc., maybe demonstrated for explaining their structure and actual working. Mock-ups are often used in technical institutions for training purposes.

***Dioramas:*** A diorama is a three dimensional scene in depth incorporating a group of modelled objects and figures in a natural setting. The diorama scene is set up on a small stage with a group of

modelled objects kept on the foreground which is blended into a painted realistic background. Dioramas are very effective in the teaching of biological and social sciences.

## Source of three dimensional objects

1. These objects may be borrowed from audio-visual aid centres, libraries and museums.
2. They may be purchased from the concerned commercial establishments.
3. They may be prepared by the teachers and students.

## Selection and use of three dimensional objects

1. Dimensional aids may be selected, keeping in view of the instructional needs and requirements.
2. As far as possible, they should be a true representative of the actual objects.
3. The complexity of the aids should match the level of maturity of the students.
4. The aids should make an appeal to as many of the five senses as possible.
5. As far as possible, aids should be prepared by the students under proper supervision of the teacher.
6. Every possible effort should be made to prepare students educationally as well as psychologically for receiving instruction or message to be conveyed by the use of these aids.
7. Aids should be inexpensive.
8. Aids should be prepared with locally available material as far as possible.
9. Necessary instructions should be given to students to handle aids with care.
10. Necessary clarification may be given by the teacher at the presentation of these objects in the class.
11. Necessary demonstration in the use of these aids should be given to students.
12. Students comprehension should be properly tested at the end of the use of aids.
13. Adequate storage arrangement should be made for their safe custody.

## Meaning and significance

Nelson Henry has very rightly observed in *Media and Symbols,* 'Educational institutions, left to themselves may not be successful in achieving the educational objectives of the developing societies without the support of the new media.' New media, implying mass media, as channels of education gain relevance from their capacity to disseminate information to a great number of people (masses) and make the present educational programmes more effective and meaningful.

According to Marshall McLuhan whose books *The Gutenberg* and *Understanding Mass Media* throw a lot of light on the subject of mass media—it is the medium which is the message. This means that the medium by which a piece of information or knowledge is communicated to us exerts a profound influence on us. The effec-tiveness of a piece of information depends upon the medium through which it is imparted. McLuham thinks that electronic media affect the sensibilities greatly because they tend to massage the senses. Thus, the medium is not only the message but also the massage because it massages the sensory organs and stimulates them to respond actively. Therefore, it is important that the mass media be utilized in classroom teaching so that the students may obtain sensory stimulation as apart of the process of instruction.

As observed by Wilbur Schramm in his book *Big Media-Little Media,* mass media can be

used in education 'as support models in two basic but overlapping ways.'

1. They can be made part of environment into which learning activities are designed as seen in distance teaching institutions.

2. They can be brought into the environment as indirect partners or as tools in the hands of the teachers, by supplementing additional or supportive information that is educationally important and useful.

Mass media are means of impersonal communication via some medium, imported through mediated situation. Mass media are means or instruments of communication that reach large number of people or pupils with a common message. The matter maybe printed like newspapers or it may take the form of radio, television and cinema. Carlton W.H. Erickson observes, 'In recent years, technology has swept through society from research laboratories into manufacturing, communications, the space age, and finally now, into education.'

In early times, the teacher was the only medium of communication for children. He taught his students orally. During the course of time the invention of the printing press led to the printing of books. Then came newspapers. Now for quite some time new mass media like radio and TV are increasingly used in education. They reach large members and also help in improving the quality of education.

Schools and colleges for long have been the sole medium for imparting information and aiding in the acquisition of knowledge. But with the technological development and fast expanding knowledge, new avenues of education have come up. These media disseminate information which the schools no longer possess but needs to be integrated into the teaching-learning process.

The National Policy on Education 1986 and modified in 1992 has observed, 'The media has profound influence on the minds of children. The mass media make the constraints of time and distance manageable. Modern educational technology must reach out to the most distant areas and the most deprived section of beneficiaries simultaneously with the areas of comparative affluence and ready availability.'

Mass media serve some important functions. They are helpful in reaching large number of people. They are helpful in the spread of compulsory education and adult literacy. Recently their use has increased in distance education. They are useful in making instruction more effective and meaningful.

The use of radio, supplemented by correspondence programme has proved to be very successful in Kenya. Radio forums as a means of adult and continuing education have proved to be extremely successful in Canada, India, Nigeria, Sweden, Tanzania and many other countries.

It is sometimes felt that the mass media tend to diminish the importance of the teacher. It is also claimed in certain circles that they are likely to replace classroom teachers. A close look at the use of these media of education indicates that they are supplementary media. A lot of work by way of pre-telecast, during telecast and post telecast remains to be done by the teachers. Many gaps are to be filled up by them. In spite of the explosion of technological media in the developed countries, the teacher still occupies the place of importance. Fears about the replacement of teachers are unfounded.

### 2.3.11 Radio's School Broadcast Programmes

There is hardly any doubt regarding the potential of radio as an instructional aid. Frederic Wittis has rightly remarked: 'I like to think of education by radio as a timely, vital and dramatic thing; a system of learning or acquiring more information, a means • of widening one's horizon or enriching one's life and breaking down prejudices through inspiration and not perspiration; an education by desire and not by discipline; a pattern or swiftly changing pictures, events with keen interpretations, not statistics and. formulas; a moving panorama of the world in which we live—right now, while we are living in it—not a dreary drill of textbooks and tests. In short I feel that one of the most helpful contributions of broadcast to education and one of its real responsibilities to itself and its listeners is the popularizing of education itself.'

R.G. Reynolds writes: 'Radio is the most significant medium for education in its broadest sense that has been introduced since the rum of the century. As a supplement to classroom teaching its possibilities are almost unlimited. Its teaching possibilities are not confined to five or six hours of the school. It is available from early morning to midnight. By utilizing the rich educational and cultural offerings of radio, children and adults in communities, however remote, have access to the best of the world's stores of knowledge and art. Some day its use as an educational instrument will be as common place as textbooks and blackboards.'

### Merits

1. Bringing the school into contact with the world around
2. Helping in the spread of elementary education
3. Helping in the promotion of adult education
4. Assisting in the spread of non-formal education
5. Enrichment of school programme
6. Furnishing up-to-date material
7. Developing critical thinking
8. Developing leisure time interest and appreciation
9. Providing opportunities for student participation
10. Providing an alternative approach to the education of out of school children
11. Imparting vocational skills
12. Popularizing science with a view to develop a scientific outlook
13. Promoting emotional and national integration
14. Providing information about population education, energy conservation, and preservation of wild life
15. Serving as a training component for teachers.

### Demerits

1. Radio broadcast is a one-way communication. Students cannot put questions to the broadcaster.
2. The educational value of radio broadcasting depends merely on the use of sense of hearing.
3. The students have little opportunity to participate in the instructional activity. They are passive listeners for most of the time.

4. In several cases, broadcasting time does not suit all educational institutions.

5. The number of receiving sets is not adequate in the case of several educational institutions,

6. It becomes very difficult to integrate school programmes with radio broadcasts.

7. continuous listening on the part of the students may make them inattentive and uninterested in the task of gaining learning experiences.

8. Usually there is paucity of adequate pre-information, manual or guides regarding radio broadcasts with the result that the students and teachers both face difficulties in making necessary preparation for the utilization of these programmes.

## Suggestions for effective school broadcasting programmes

1. The school broadcasts should not be merely course lessons but should have a wider horizon of application in day-to-day life.

2. The school broadcasts should be planned according to the needs of the syllabus, students and concerned teachers.

3. Teachers should occasionally meet, discuss and plan the type of assistance required on mass media instructional facilities.

4. The radio programmes should be intended to give supplementary information to various topics in the syllabus.

5. Good planning and administration is highly needed so as to make the programmes effective and worthwhile.

6. Broadcasting tune should be suitable to schools. Adequate feedback should be provided.

8. There should be proper follow-up on school broadcasting programmes.

9. Adequate listening facilities should be provided in schools.

10. Broadcasts should be made in easy and simple language.

11. Broadcasts should be made in a pleasing style.

In short all the six main stages of a radio broadcast namely, production, preparation, listening to the programme, feedback, consolidation of acquired knowledge and evaluation should be carefully attended to.

*History:* Ever since the start of school broadcasting by British Broadcasting Corporation (BBC) in 1920, it has made rapid strides in making sound contribution to formal education, hi USA, in 1923, there were programmes in accounting from New York programmes in arithmetic and literature from Oakland in 1924 music appreciation lessons in 1925 from Cleveland. By 1952-20 states in USA had provision for educational broadcasting. Around the same time about 98 per cent of the schools in the UK were equipped with radio and therewere regular daily programmes.

Bombay Station started broadcasting programmes of special interest to school children occasionally from January 1929. From April 30, the Corporation of Madras had regular school broadcasts for half an hour on all weekdays. Similar programmes were introduced by the Calcutta Station in 1932.

The programmes for schools produced by Akashwani Stations are for the following categories of people: (a) children of primary classes; (b) children of secondary and higher secondary classes; (c) preparing lessons for secondary and higher secondary classes near examination time; (d) teachers; (e) general enrichment programme for children.

These broadcasts can either be 'live' or 'transcribed' depending on the physical presence of the person broadcasting or his recorded speech. Broadcasting organizations throughout the world, including AIR, include in their output various school broadcasts. Such programmes are normally arranged in consultation with the heads of various institutions. This liaison between the radio and educational authorities helps in bringing out effective and useful programmes for the pupils. The planning of such talks is undertaken with great care and by persons of repute. The programmes are prepared term wise and copies are supplied to schools sufficiently in advance to enable the teachers to discuss the subject with the pupils.

## 2.3.12 Educational Television (ETV) or Instructional Television (ITV)

TV has become a child's third parent and a first teacher. The history of television shows that it is a very powerful, informative, socializing and mobilizing force. Most of the countries of the world have opted for television to solve their difficulties and problems relating to education. Direct television instruction started four decades back in progressive countries like the UK and the US A. The regular programmes were on air in November 1936 by BBC. Remote areas were provided with television sets. By 1958 more than 98 per cent of the population was covered by television transmission. By 1961 Moscow and the UK shared programmes with each other. By 1962 American engineers, succeeded in bouncing television waves across the Atlantic on a Satellite-Telestor. In 1967 the first regular service of coloured television in Europe began on BBC-2.

For the first time, television for instructional purposes was used in the USA. A large number of experiments in instructional television were conducted there. In 1958, a project entitled continental classroom started instructional television for the whole of the USA. It telecasted a programme *Physics of the Atomic Age* for science teachers. About 40,000 teachers received instruction through this programme. Later on, several programmes such as modern chemistry, contemporary mathematics and new biology were also telecast by this project. In 1961, a project called *Mid-west Airborne Instructional Television* started instructional television. About 13,000 schools received the programmes benefiting about five million students, at a cost of 7.5 million dollars or at an expenditure of 1.5 dollar per student. At present there are hundreds of instructional television programmes being telecast in USA and other countries.

*Significance:* Television is the most potential instrument in educating masses and thereby narrowing down the gap of progress between the developing and developed countries of the world. For a country like India which has vast and inaccessible areas, different climatic conditions, large and ever growing population, T.V. can be an important central media in providing functional, formal and non-formal education to the masses. It can also help in bringing about social and cultural changes bearing on art, music, drama and literature. It is through television that stimulating and thought-provoking views of renowned statesmen, scientists, educationists, artists and teachers can be shared by all. Television helps in enforcing the public understanding of social, political and scientific advancement of a country.

**Merits**

1. It permits the use of the best available teacher to teach a subject for a large number of student viewers. It preserves the expert teaching skills of such teachers on video tape or film for later use.
2. It provides a common experience to all students when they all see the same basic ideas or techniques on television.

3. It provides the teacher an opportunity to observe the instructional methods and ideas of their experts and to increase his own knowledge of teaching methods and stimulate new ideas.

4. It provides technical advantages not readily available in normal classrooms for illustration or demonstration.

    (a) It makes possible close-up magnification of small objects, components, intricate mechanisms, diagrams, etc., giving student a 'front-row seat.'

    (b) It allows instantaneous change of perspection by switching from a wide camera angle to a close-up or by 'zooming' in.

    (c) It permits relationships between two illustrations or time-lapse between two stages of a process by dissolving one picture into another.

    (d) It provides for comparison of two or more illustrations by superimposure or 'spilt screen' effects.

5. It directs the attention of the student to the exact detail of object which he should see by eliminating distracting surroundings.

6. It makes quick and lasting visual and rural impressions which can often reduce the time necessary to teach an idea or technique.

7. It makes it possible to bring large, scarce, new or confined equipment 'into the classroom' electronically.

8. It incorporates useful film sequences, slides, graphic art and makes available teaching aids within a television presentation, tailored to meet the needs of a particular course or subject.

9. It saves time, effort and cost of setting up classroom projection equipment.

10. It brings instructional films into classrooms as needed with no special classroom preparation, no darkening of rooms or use of special ventilation in the room.

11. It provides more 'immediacy' than instructional films.

12. It brings live demonstrations, video-tape or film presentations to the classroom at the instant or immediately after they occur.

13. Itpermits inclusion of up-to-date information, modifications, new equipment or techniques into the classroom instruction.

14. It allows the teacher time to observe individual students or to assist them during the television presentation, or to determine what needs further application after the presentation.

## Limitations of ETV

1. The medium is limited to one-way communication from teacher to students. Students cannot put any question.

2. The total cost of teaching by television is more than normal classroom instruction, unless television is used to reach large number of students at one time or sequentially over a period of time.

3. Television has special and unique techniques and requires occasional rearrangement of subject sequence.

4. Individual differences of the students are not attended to in a TV lesson.

5. TV lessons may not suit the school timings.

6. TV lessons are not flexible.

7. Instruction through TV is not child or learner centred.

## Kinds of educational TV programmes

1. Total TV teaching.
2. TV as a complementary basic resource.
3. TV as a supplementary environment.

## Role of the teacher in school TV programmes

School TV programmes have five main stages and it is necessary that the teacher should be associated with each stage.

1. Planning and Preparation
2. Presentation
3. Production
4. Utilisation
5. Evaluation

1. *Planning and preparation of programmes:* No TV programme for schools can be planned and prepared unless the classroom teacher is effectively associated with this work. To plan and prepare a good TV lesson, a thorough knowledge of the requirements of the students of different age levels, the suitability of the materials, the sequence and the contents are very vital and this can be met fully only by the classroom teacher. Experience tells that the classroom teacher can contribute effectively in this area if he has a good grounding and knows very well the mechanics of a good TV lesson.

2. *Production:* Production is a technical thing but the knowledge about the mechanics of production must be known to the classroom teacher if he is to appreciate a good lesson, i.e., to locate its strong and weak points and suggest improvements.

3. *Presentation:* Again, in the presentation of a TV lesson it is only the classroom teacher who can deliver the goods—no doubt a teacher with initiative, imagination and subject competency is required. The presentation involves only a selected number of teachers but the scope of selection involves all the teachers of a subject. A good selection can be possible only from a TV trained group. It is noted that without necessary training in this field even a very good and competent teacher in a school fumbles and stumbles in the studio.

4. *Utilisation of TV programme and the teacher—Pre-telecast and post-telecast:* Utilization is the area where the teacher is the master of the situation. It may be emphasized that no TV lesson is complete without the introduction and follow-up exercises in the classroom by the subject teacher. An average lesson with proper and well-thought introduction and follow-up can become a very effective lesson whereas a good lesson in the absence of one or both can go flat. The teacher has to inspire the students, prepare them and arouse their curiosity before the telecast of the lesson and afterward has to clarify the doubts, if any, provide the missing links and reinforcement in the follow-up. He also has to integrate the TV lesson with his classroom teaching. He also has to take care of many other factors and provide congenial conditions to enable his students to really benefit from a TV lesson.

5. *Evaluation:* Evaluation is another important area. If tackled properly, it contributes consid-erably to the quality and usefulness of TV lessons. No evaluation is possible or worthwhile without the involvement of the classroom teacher. Moreover, simply involvement of the classroom teacher

does not help much unless he is fully conversant and properly trained to evaluate and assess the TV lesson from all angles and has acquired competency to do the job well. Without proper training the teachers even fail to fill up the check-sheets properly—an exercise to be completed by the classroom teacher after every lesson.

**Physical facilities for effective television education**

Once the television becomes an integral part of classroom teaching, the physical facilities available in the schools are as important as the quality of the programme, from the utilization point of view. No matter how rich and valid the TV programmes are, they cannot reach the audience unless optimum physical facilities are available to the viewers. The availability of physical facilities appears to be quite simple yet it requires a constant vigil to keep them all in operational readiness.

Broadly speaking we can classify the physical facilities into three categories:

   (a)  Space and seating arrangements

   (b)  TV sets, antenna and other accessories

   (c)  Literature

 (a) In each TV viewing school suitable space area must be earmarked for television viewing depending upon the number of viewers. Ideally speaking each class that has to view a TV lesson, should have TV set, fitted in the classroom itself but it is not possible. Therefore, provision of a room, which can be converted into a TV room should be made. Hall is another alternative for large number of viewers. Other points to be taken care of are: (i) Placement of TV set and its adjustment.

   (ii) Seating arrangement.

   (ii) Lighting.

   (iv) Ventilation.

   (v) Space for demonstration, pre-telecast and post-telecast activities.

 (b) It is needless to say that the TV sets should always be in operational condition so that these can be switched on at a very short notice. The various factors that put operating off are:

   (i) Defective power points and plugs

   (i) Defective Antenna

   (ii) Misadjustment of TV controls

   (iv) Major defect in the TV

   (v) Voltage fluctuations

   (vi) Operational procedures like locked cupboards etc.

 (c) The school television programmes by and large are syllabus-based programmes and therefore the students must know the connecting links between their classroom teaching and the television programmes. These should reach the classroom teacher in the beginning of the session or term as the case may be.

**Films**

Broadly speaking, a film is a multiple media of communication. It presents facts in a realistic way, dramatizes human relations, arouses emotions and transmits attitudes. It maybe used for the communication of ideas, attitudes and experiences to the masses of people. It is very effective in adult education. An educational film has been described as the greatest teacher because it teaches not only through the brain but through the whole body. It has a very powerful influence on the minds of

children and in shaping their personality. The main aim of educational films is to elevate and educate them according to the patterns and principles set by the society. A good educational film should help the students to develop a sense of citizenship. A film on national integration can be prepared to help inculcate ideas of oneness and unity. 'Live and Let Live' can be the theme. A variety of topics—historical, biographical and of current interest can be covered.

Some of the main advantages of motion pictures are given below:

*Increased reading interests of the students:* Various investigations conducted in USA show that film producers arouse increased reading interest in children. They are stimulated to get more information about the fact they have been observed in a film show.

*Real learning situations:* The film puts before us the learning situations which look to be quite real and actual. The child sees something happening and his experience is direct. Therefore, he is deeply impressed.

*Selected learning situations:* A child learns from his actual life experience more than he learns from the lessons which he gets passively in the school. But life experience comes as a routine. Sometimes it has no educative value. Sometimes, it may have an adverse influence. But in an educational film, all the learning situations are the selected ones. They have a great educational value.

*Quickness of movement:* The events in a film show run very swiftly but without losing continuity and essence of development. Therefore, the effects are also received swiftly in a concentrated form.

*Vividness:* The learning situation is quite vivid. Everything is happening in such a way as if it is more than living and actual. All the activities are quite vivid.

*Motivation:* The film motivates teaching. The child takes a great interest. A long study of many weeks may not be able to bring home the facts of the French Revolution to a child but he will at once understand and learn everything about the movement if he is shown a film of the events.

*Recreation:* A film show is recreational as will. Thus, he learns through play. He feels light and happy after the show.

*Development of study habits:* Educational films develop study habits as children like to know more about the facts they have learnt in the show.

*Illustration of all learning situations:* We cannot give an adequate idea of an ocean to a child who has never seen even a lake. A child cannot understand what a mountain is like if he has never come across a hill in his life. But it is not possible for us to take every child to the ocean and mountains, to the deserts and valleys, to the Tundras and the Tropics. The film serves us here wonderfully. It brings the ocean, the mountains, the deserts, the valleys, the Tundras and the Tropics, all in their form and with all their grandeur into the school hall.

Charles F. Hoban and E.B. Ormer summarize the educational advantages of films as: means of imparting information, development of skills, development of attitudes, enlarging interests and development of the will to solve problems.

**Disadvantages**

1. Educational films sometimes include an element of fiction in historical events.
2. Recapitulation is not possible on the spot. Sometimes the teacher likes and the pupils too wish to dwell longer on a particular shot in the show. But the film does not wait; it goes on.
3. Really good educational films are not available in our country.

4. The whole process is very costly. All the schools cannot afford to have good halls, the projectors and other equipment for the purpose.

5. It may have some bad effect on eyesight.

6. Generally teachers are not trained in handling handle the projectors and organizing shows.

7. It needs electricity. Many village schools have no electricity.

## Suggestions for making the optimum use of educational films

The most important point to be taken into consideration is that the film must be relevant and purposeful.

When a film show is going to be arranged, the teacher should see that it is really needed in connection with the topic which being taught. He must discuss the background of the learning situations to be presented in the film show, prior to the presentation. It should serve the purpose of recapitulation. The whole process maybe arranged in the following steps:

1. Preliminary talk about the film.
2. Presentation of the film.
3. Discussion and follow-up on the film.
4. Recapitulation and recording of salient features.

## Children's Film Society

The Children's Film Society India (CFSI) was established in 1955 as an autonomous body with the objectives of promoting and encouraging the Children Film Movement in the country. It also aims at providing children and the young people, films with clean and healthy entertainment. The organization is engaged in production, acquisition, distribution and exhibition of the films suitable for the children and young people. The main office of the society is in Mumbai and zonal offices are in New Delhi, Chennai and Kolkata. Since its inception, the society has produced and purchased about 100 feature films and 104 short films.

A pilot project to reach the rural children in Maharashtra by means of Mobile Film Unit has been in operation for a number of years. Four children film clubs are functioning, viz., one in Kolhapur (Maharashtra), two in Porbandar (Gujarat) and one in Mumbai.

The society organizes film festivals and participates in important international film festivals abroad. In India, the first international film festival was organized in Bombay in 1979. In 1981, the Indian festival was accorded 'A' category status bythe International Centre of Films for Children and Young People (ICFCYP), Paris. The society has set up a National Centre of Films for Children affiliated to the International Centre of Films set up at Brussels under the sponsorship of UNESCO. Some of the important films a teacher can make use are: (1) *Scout Camp* (2) *Guru Bhakti* (3) *Ganga Ki Lahren* (4) *Bachon se Batten* (5) *Gulab Ka Phool* (6) *Ekata* (7) *26 January*.

## Press as medium of education

The press is an informal but a very influential agency of education. The press includes newspapers and magazines. They provide a variety of information. They cover almost all areas of knowledge. They keep us well-informed. They are very useful in the teaching of various subjects. Instruction through newspapers introduces variety and an element of 'play-way'.

' The newspapers are very useful for the study of languages. Pupils learn many new words and

many new expressions. They learn how to express themselves and how to follow the expression of .others. As regards social studies they learn how the society is developing day by day. They learn a lot about the society. There is much geographical and scientific information available in daily papers and magazines.

For international understanding the study of newspapers is essential. Children come to know how the world is progressing, how we are woven internationally, how the events occurring in one country affect all the other countries of the world and how we shall have to suffer if a third world war breaks out.

## 2.4    SUMMARY

In this unit, you have learnt that:

- In 1946, Edger Dale developed the theory that a student is able to remember more information when they perform any task as opposed to what they hear, read or observe. His research led to the development of the 'cone of experience'.
- The original labels for Dale's ten categories are: direct, purposeful experiences; contrived experiences; dramatic participation; demonstrations; field trips; exhibits; motion pictures; radio - recordings - still pictures; visual symbols; and verbal symbols.
- While using the Cone theory, it should not be interpreted as indicating that tasks such as reading, listening and viewing experiences should not be put in practice.
- The real-world experiences at the bottom of the Cone relate directly to the 'proving it' stage; it is at this stage of the model that students are encouraged to use what they have learned in new, real-life contexts.
- Media includes such things as prints, graphics, photography, audio-communication, television, simulating games and computer.
- In addition to reading, vicarious experience can be gained from still pictures, films, filmstrips, resource persons, simulations, mock-ups, television, and the like. The more concrete and realistic the vicarious experience, the more nearly it approaches the learning effectiveness of the first level.
- Audio-visual aids or devices or technological media or learning devices are additional devices that help the teacher to clarify, establish, co-relate and coordinate accurate concepts, interpretations and appreciations and enable him to make learning more concrete, effective, interesting, inspirational, meaningful and vivid.
- Some of the principles in the use of teaching aids are: (i) principle of selection (ii) principle of preparation (iii) principle of physical control (iv)principle of proper presentation (v) principle of response (vi) principle of evaluation.
- Some of the problems in the use of teaching aids are: (i) apathy of the teachers (ii) indifference of students (iii) ineffectiveness of the aids (iv) financial hurdles (v) absence of electricity (vi) lack of facilities for training (vii) co-ordination between the centre and states.
- Educational technology can be classified into two categories, i.e., the hardware approach and software approach.

- Blackboard is a unique device which in spite of newer and better devices in vogue is irreplaceable as well as indispensable. It is the oldest and the best friend of a teacher.

- Different types of blackboards are: (i) fixed blackboard (ii) blackboard on easel (iii) roller blackboard (iv) graphic board.

- A chart is a combination of pictorial, graphic, numerical or vertical material which presents a clear visual summary. The most commonly used types of charts include outline charts, tabular charts, flow charts and organisation charts.

- The epidiascope is an instrument which can project images or printed matter or small opaque objects on a screen.

- A film strip is 35 mm wide and has a series of 12 to 48 picture frames arranged in a sequence so that they develop a theme.

- Graphs are flat pictures which employ dots, lines or pictures to visualize numerical and statistical data to show relationships or statistics.

- Magic lantern is the earliest invention in the history of audio-visual aids used for projecting pictures from a transparency (slide) on a wall or screen.

- Different types of maps are (i) relief maps (ii) historical maps (iii) distribution maps (iv) geographical maps.

- The microfilm and microfiche are used widely for storage and retrieval of information. Microfilms contain photographed reading material on a 35 mm film, each frame being the reduced photograph of a printed page.

- A model is a three-dimensional representation of a real thing. Models are concrete objects to explain clearly the structure or functions of real things. A model is a replica of the original. Models enable students to have a correct concept of the object.

- Different kinds of projectors are: (i) Micro-projector (ii) Overhead projector (iii) Slide projector.

- Reprography is a branch of technology dealing with methods of duplication or reproduction.

- Record players are a means of audio playback. They are older types of hardware using records of discs for the needed playback.

- Three dimensional aids serve as good substitutes for the real objects. Models diagrams, mock-ups and specimens are the important three dimensional aids.

- Most of the countries of the world have gone for television to solve their difficulties and problems relating to education. Direct television instruction started four decades back in progressive countries like UK and USA.

- Television is the most potential instrument in educating masses and thereby narrowing down the gap of progress between the developing and developed countries of the world.

- Once the television becomes an integral part of classroom teaching, the physical facilities available in the schools are as important as the quality of the programme, from the utilization point of view.

  - A film is a multiple media of communication. It presents facts in a realistic way, dramatizes human relations, arouses emotions and transmits attitudes. It may be used for the communication of ideas, attitudes and experiences to the masses of people.

  - The Children's Film Society India (CFSI) was established in 1955 as an autonomous body with the objectives of promoting and encouraging the Children Film Movement in the country. It also aims at providing children and the young people, films with clean and healthy entertainment.

## 2.5 KEY TERMS

- **Audio-visual aids:** Are those sensory objects which initiate or stimulate learning.
- **Chart:** A chart is a combination of pictorial, graphic, numerical or vertical material which presents a clear visual summary.
- **Epidiascope:** The epidiascope is an instrument which can project images or printed matter or small opaque objects on a screen.
- **Graphs:** Are flat pictures which employ dots, lines or pictures to visualize numerical and statistical data to show relationships or statistics.
- **Micro-projector:** The combination of a microscope and a slide projector is an instrument called micro-projector.
- **Overhead projector:** Is a device that can project a chart, a diagram, a map, a table or for that matter, anything written on transparent plates, upon a screen or the white wall before students in a class.

## 2.6 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Learning by doing is known as experiential learning or action learning.

2. The original labels for Dale's ten categories are: direct, purposeful experiences; contrived experiences; dramatic participation; demonstrations; field trips; exhibits; motion pictures; radio - recordings - still pictures; visual symbols; and verbal symbols.

3. Some of the characteristics of good teaching aids are:
   (i) They should be meaningful and purposeful
   (ii) They should be accurate in every respect (iii) They should
   be simple (iv) They should be cheap


4. Some of the hardware devices which are used as teaching aids are:
   (i) Computers
   (ii) Epidiascope (iii) Magic lantern (iv)
   Motion pictures
   (v) Overhead projector
   (vi) Radio
   (vii) Slide and Film projector
   (viii) Tape recorders


5. Some of the points that need to be kept in mind while using the blackboard are:
   (i) Blackboard should be kept clean so that writing on it could be easily read by the students from all parts of the room, (ii) Writing on the blackboard should be legible, (iii) Writing should be in straight rows, (iv) Extreme lower corner of the blackboard should not be made use of as writing on it cannot be seen easily, (v) Material on the blackboard should not be covered by standing in front of it. (vi) Only salient points of the subject-matter should be written on the blackboard.

6. The different kinds of charts that can be used for teaching-learning process are:
   (i) The narrative chart (ii) The tabulation chart
   (iii) The cause and effect chart (iv) The chain
   chart (v) The evolution chart

7. Some of the sources of three dimensional objects are:
   (i) These objects may be borrowed from audio-visual aid centres, libraries
   and museums, etc. (ii) They may be purchased from the concerned commercial
   establishments, (iii) They may be prepared by the teachers and students.

## 2.7 QUESTIONS AND EXERCISES

**Short-Answer Questions**

1. What are audio-visual aids?
2. What is the significance of audio-visual aids?
3. What are the characteristics of good teaching aids?
4. What are the problems in the use of teaching aids?
5. Write short notes on (a) epidiascope (b) film strip (c) graphs.
6. Identify the various aspects of maps.
7. Write short notes on (a) microfilm (b) models (c) projectors.
8. What do you understand by three dimensional aids?
9. What is the significance of educational television?

**Long-Answer Questions**

1. ExplainEdgar Dale's'cone of experience.'
2. Elaborate the advantages of audio-visual aids.
3. Describe the use of blackboards in the teaching-learning process.
4. Identify the different types of charts? Also mention the uses of charts.
5. Explain the use of models, mock-ups and dioramas in the teaching-learning process.
6. What are the merits and demerits of radio school broadcasting programmes?
7. Describe the role of the teacher in school television programmes.

## 2.8 FURTHER READING

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# UNIT 3 BEHAVIOURAL TECHNOLOGY

## 3.0 INTRODUCTION

Teaching behaviour refers to the behaviour demonstrated by a teacher at the time of carrying out teaching activities in the classroom. A teacher's behaviour is exhibited through skills used by him in a classroom. These skills are known as 'teaching skills'.

Micro teaching is a brilliant method for developing aptitude and self-confidence to experience a variety of lecturing/tutoring approaches, and become skilled in providing constructive feedback. It offers instructors with an opportunity to safely let themselves be scrutinized by a small group of audience. They can also scrutinize and comment on other people's performances. In order to prepare teachers, micro teaching trainings are supported by video-recordings. In a sheltered atmosphere of friends and colleagues, it is easy for teachers to practice what they usually do with their students and get expected positive feedback. A micro teaching session is an opportunity to take on new teaching and learning strategies, and as a student learns about his requirements and expectations. It facilitates learning from others and enriches one's own teaching methods.

According to Flanders, teaching is interactive in nature. When teachers and students interact, they participate in the process of teaching. In this process, students are also influenced by the teacher. Students also interact among themselves. Thus, the process of teaching is where every person interacts with every other person in a class. Simulation is an important strategy of teaching where complex and changing situations are illustrated. They are simpler, in comparison to the actual situations that they represent. In simulation, language is used to make students learn and develop ideas about the world. It prepares them with crucial skills for thinking and leadership.

In this unit, you will learn about micro teaching, simulation social skill training (SSST) and Flander's interaction analysis (FIACS)

## 3.1 UNIT OBJECTIVES

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

- Differentiate between teacher behaviour and teaching behaviour
- List the chief characteristics of teaching behaviour

- Interpret micro teaching
- State the characteristics of micro teaching
- Analyse the micro teaching cycle
- Compare micro teaching and traditional teaching
- Explain some of the important skills of micro teaching
- List the advantages and disadvantages of micro teaching
- Discuss Flander's interaction analysis

## 3.2 MODIFICATIONS OF TEACHING BEHAVIOUR

Behaviour of the teacher in general and in the classroom in particular has a great bearing on the development and shaping of the behaviour of the students and in their participation in the teacliing-learning process. A teacher's behaviour has two components: verbal as well as non-verbal. According to Ryans (1969), teacher behaviour is the behaviour or activities of persons as they go about doing whatever is required of teachers, particularly those activities which are concerned with the guidance or direction of the learning of others.

Mc Nergency and Carner (1981) regard teacher behaviour as a function of the characteristics of the teacher, the environment and the tasks in which the teacher engages.

**Teacher Behaviour and Teaching Behaviour:** Teacher behaviour has a wider connotation than teaching behaviour—a concept which is of recent origin. Teaching behavieur is a new entry in the field of educational thought and practice. Teacher behaviour includes teaching behaviour with all its activities or acts or operations relevant to the achievement of specific goals of teaching. Teacher behaviour includes personality characteristics, dispositions, attitudes, dominance or submission, sensitiveness or shyness and the number of greetings. Teaching behaviour on the other hand refers specifically to a number of acts or activities of operations of teaching of a teacher in the presence of pupils with the intention of achieving teacliing-learning goals. It comprises saying or writing something on the blackboard, explaining, demonstrating, asking questions, responding, reacting, directing, praising, encouraging or reprimanding. The teaching behaviour conceived in this way becomes a system of activities or acts or operations which can be analysed in terms of each specific activity or act or operation. It employs the intellectual process in a well organized form.

**Characteristics of teaching behaviour**

Some of the main characteristics of teaching behaviour are given below:

1. ***Teaching behaviour is an interactive process:*** Teaching behaviour is a social phenomenon arising out of the interaction between a teacher (T), a student (S) and a specific content (C). A teacher (T) in his/her teaching behaviour plans, organizes and implements the instructional strategies to bring about appropriate changes in the student (S) by organizing the content (C). The content is also designed as a subject of study or discipline.

2. ***Teaching behaviour is a goal-directed activity:*** A teaching activity loses its relevance and rationality without a specific goal. Behavioural objectives form an important part of teaching behaviour. Behavioural objectives imply the changes that are envisaged to be brought about in the students through teaching behaviour of the teacher. The behavioural objectives of teaching

determine the levels of achievement of the students. Teaching behaviour is thus, a goal-directed activity.

3. ***Teaching behaviour includes several skills:*** Teaching behaviour draws heavily from the cognitive powers and scholastic achievements of the person engaged in it. Teaching behaviour includes a variety of cognitive, social, managerial and manipulative skills. The cognitive skills relate to the logical, linguistic and the subject matter control, the social skills involve the manner or method of handling the questions and responses of the students, the managerial skills refer to the particular way in which the problem of relationship or adjustments among students is tackled and the manipulative skills involve the various physical movements or performances which help in focussing attention and arousing motivation and sustaining it. All these skills are interrelated.

4. ***Teaching behaviour is a social act:*** Teaching behaviour exists in a context of social interaction. The acts of teaching lead to reciprocal contacts between the teacher and the pupils and the interchange itself is called teaching.

5. ***Teaching behaviour is a moral act:*** Philip W. Jackson has rightly observed, 'Teaching characteristically, is a moral enterprise. The teacher is out to make the world a better place and its inhabitants better people. He may not succeed of course, but his intention, nonetheless, is to benefit others.

6. ***Teaching behaviour is a linguistic act:*** Language is an important and critical factor in the effectiveness of the teaching behaviour. Broadly speaking teaching behaviour in the classroom maybe sorted out in the following five categories:
    (i) Verbal fluency
    (ii) Optional information amount.
    (iii) Number of principles, concepts, comparisons, and contrasts
    (iv) Interest developing or attention seeking statements
    (v) Vagueness

7. ***Teaching behaviour is a logical act:*** Each variety of teaching behaviour involves logical operations in the form of defining, describing, stating, reporting, substituting, evaluating, opining, classifying, comparing and contrasting, conditional inferring and explaining. Socrates provided us a model for the use of logic in instruction. In recent times other logical models were advocated by Dewey, Kilpatrick and Piaget. John Dewey argued that me rules of successful enquiry are in fact, the rules of logic. The concern for enquiry and discovery in problem solving method of education is the contemporary manifestation of the trend of rules of logic.

8. ***Teaching behaviour is a unidirectional activity:*** **In** a given teacliing-learning situation, it is the teacher (T) who tries to influence the student (S). It is very rare that the students influence their teachers. It is, therefore, a one-side directed activity. Direction is from the side of the teacher. Teaching behaviour, is therefore, called a unidirectional activity.

9. ***Teaching behaviour is non-symmetrical:*** Effect of teaching-learning is not the same on the teacher and the students. Rarely do the students intend to influence their teachers. If at all, a teacher is influenced by his/her students, it is just a casual or incidental effect. It is not deliberate. Smith calls the teaching behaviour non-symmetrical as the teacher influences the students and students may 'sometimes but not always' influence the teacher.

10. ***Teaching behaviour is molecular rather than molar:*** Teaching behaviour is a series of activities organized into a harmonious whole. It is, therefore, called molecular. 'Molecular'

concept of teaching behaviour refers to the plurality of activities. Teaching behaviour is not a single operation and hence not 'molar'. Teaching behaviour involves a number of operations or activities such as speaking, demonstrating, asking questions, response by the students and so on.

11. ***Teaching behaviour has three stages:*** The three stages of teaching behaviour are: (i) pre-active, (ii) inter-active, and (iii) post-active. In the pre-active stage, there is no face to face encounter between the teacher and the student. The teacher prepares the blueprint of the acts or activities or operations of teaching to be carried out during his teaching in the class. All these activities are planned behind the scene. The second stage is very crucial in the teaching learning process. It is a face-rto-face encounter. Here both the teacher and the students are active. This stage consists of activities which the teacher performs with the pupils. The post-active stage comprises activities of the teacher after the interactive stage. The teacher no longer faces the pupils at this stage. The teacher is concerned with the retrospective analysis of the events, or incidents which occurred during the inter-active stage.

12. ***Teaching behaviour*** **is** ***a dynamic act:*** Teaching behaviour is dynamic in nature for it is not concerned with mechanical or static situations. It is concerned with human beings who feel and act differently in different situations.

13. ***Teaching behaviour is a complex act:*** Teaching behaviour is a complex act involving a network of skills relating to the control and mastery of the subject matter, communication, evaluation and feedback. For analysing teaching behaviour, we begin with the simple skills as is done in the case of micro-teaching situations.

14. ***Teaching behaviour can be analysed:*** Flander's interaction technique is an important means of analysing teaching behaviour.

15. *Teacher behaviour can be modified:* Teachers are made as well as bora. Teaching behaviour is acquired through training as well as experience and as such it can be modified. Some teachers may possess natural capacities or aptitudes but the scope of their modifiability is quite considerable. Situations are not static. They change from time-to-time. So teaching behaviour also needs modification in order to meet the challenges of the new situations effectively. Programmes of teacher training all over the world have been planned on the assumption that it is economically, educatiomUyandpsychologicaUysoundtomodifyteaching behaviour so as to achieve desirable goals. Various strategies used for modifying and improving teaching behaviour are: (i) Simulation and gaming (ii) Micro-teaching (iii) Action research.

Teaching activities are understood as related or sequential pattern of behaviour and not as a discrete or independent set of behaviour.

Sequential pattern of teaching behaviour in the classroom may be described by using the strategic and tactical concepts. It may be kept in view that strategic and tactical concepts are related with each other and are not contradictory or independent.

A strategy denotes a generalized plan of a lesson which includes structure, desired learner behaviour and an outline of planned tactics.

A tactic may be described as a goal-linked influencing behaviour of the teacher— the way a teacher behaves in the instructional situation. A tactic is, therefore, a short term device and it may range from one question or statement to a complex or verbal or purposeful non-verbal teacher behaviour interlaced with student behaviour.

### 3.2.1 Micro Teaching

Atrainee teacher is bewildered by the complexity of teaching a large class of students and finds it very difficult to learn all aspects of teaching at the same time. It is easier for him to practice and learn one skill of teaching at a time. This problem was resolved by a process of training teachers in practical teaching. It came to be known as Microteaching. Micro teaching is an excellent way of helping teachers and students to understand the process of teaching and learning better. It provides constructive feedback which helps teachers scrutinize their own teaching in order to discover their strengths and weaknesses. As a tool for teacher preparation, micro teaching trains teaching behaviours and skills in small group settings, aided by video-recordings. Micro teaching is a kind of real teaching which takes place in reduced time, number of students and range of activities. It provides teachers with ample opportunities to explore and reflect on their own and others' teaching styles and to acquire new teaching techniques.

The history of micro teaching goes back to the mid-1960s when Dwight Allen and his. colleagues from the Stanford University developed a training programme. This programme was aimed at improving verbal and non-verbal skills and general performance of teachers. The Stanford model had a three-step approach using actual students as authentic audience. The model was first applied to the teaching of science, but later it was introduced to language teaching. A very similar model called Instructional Skills Workshop (IS W) was developed in Canada during the early 1970s. It was a training support programme for college and institute faculty. Both these models were designed to enhance teaching and promote open collegial discussion about teaching performance.

### Characteristics of micro teaching

The characteristics of micro teaching are as follows:

  (i) Micro teaching is an experiment in the field of teacher education, which has been incorporated in the practice of teaching schedule.

 (ii) Micro teaching is a highly individualized training device.

(iii) It is a student teaching skill training technique and not a teaching technique or method.

(iv) The main objective of the micro teaching session is to provide participants with an environment for practice-based teaching and to instil self-evaluative skills.

 (v) Micro teaching is a scaled down teaching encounter which reduces the complexities of real teaching such as: (i) practising one skill at a time (ii) reducing the class size to 5-10 students (iii) reducing duration of the lesson to 5-20 minutes (iv) limiting the content to a single concept.

(vi) Students are provided with an immediate feedback that helps in improving and motivating learning.

### Assumptions of micro teaching

Some of the important assumptions underlying the process of micro teaching are as follows:

  (i) Teaching is a complex process but can be divided into simple skills.

 (ii) Teaching skills can be practised one by one up to the mastery level, under a specific and simplified situation.

(iii) Appropriate feedback, if systematically given, proves very significant in mastering each skill.

(iv) When all skills have been mastered, they can be integrated for real classroom teaching.

(v) Skill training can be conveniently transferred from simulated teaching situation to actual classroom teaching situation.

## Objectives of introducing micro teaching in colleges

Duggal and Sharma have listed the following objectives of introducing micro teaching in colleges:

(i) To initiate trainee teachers to analyse and develop teaching behaviour under laboratory conditions.

(ii) To land novice teachers gradually in the real classroom after gaining enough confidence.

(iii) To impart intensive training in the component skills of teaching to teacher trainees at pre-service level.

(iv) To involve the academic potential of teacher trainees for providing feedback to peers.

(v) To lessen the workload of teacher educators with the involvement of peer supervisors.

(vi) To lessen the burden on practising schools.

(vii) To explore human resources and economy to the maximum with respect to time, money and materials.

## Micro teaching cycle

The six steps generally involved in the micro teaching cycle are: (i) plan (ii) teach, (iii) feedback (iv) re-plan (v) re-teach and (vi) re-feedback. There can be variations as per the requirement of the objective of the practice session. These steps are diagrammatically represented Figure 7.1.

(i) **Plan:** This involves selection of the topic and related content of such a nature, in which the use of components of the skill under practice may be made easily and conveniently. The topic is divided into different activities for the teacher and the students. Activities are planned in a logical sequence where maximum application of the components of a skill is possible.

(ii) **Teach:** This involves the attempts of the teacher trainee to use components of the-skill in suitable situations, taking place in the process of teaching. If the situation is different and-not as visualized, the teacher should modify his behaviour as per the demand of the situation in the class. The teacher should have the courage and confidence to handle the situation arising in the class effectively.

(iii) **Feedback:** This term refers to giving information to the teacher-trainee about his/her performance. The information includes strength as well as weaknesses related to his/her performance. This helps the teacher-trainee to improve upon his/her performance in the desired direction

(iv) **Re-plan:** The teacher-trainee re-plans his/her lesson, incorporating the points of strength, and removing the points not skillfully handled in the previous attempt.

(v) **Re-teach:** This involves teaching the same group of students, if the topic is changed, or a different group of students, if the topic is the same. This is done to remove boredom or monotony of the student. The teacher-trainee teaches the class with renewed courage and confidence to perform better than the previous attempt.

(vi) **Re-feedback:** This is the most important component of micro teaching for behaviour modification of teacher-trainee in each and every skill practice.

**The Indian Model of Micro Teaching**

After several years of research and experimentation in micro teaching, NCERT concluded that micro teaching can be practised effectively in India without using any hardware, since symbolic and Uve modelling and verbal feedback have been found to be quite effective. Further, it is not necessary to use school students for micro teaching; peers can act as students which have also been found to be very effective in bringing about improvement in the skill of teaching. NCERT has proposed the Indian model of micro teaching, which has following salient features:

(i) The mode of presentation of theory and modelling is generally done through the written material, lectures, demonstrations and discussions and not through electronic gadgets like VCR, audio-tapes and films. Teacher educators give model lessons on various teaching skills. However, with the increased availability and use of video-camera, new technology in the use of CD for modelling and feedback purposes has been suggested.

(ii) Live observers are used to observe teaching and for providing immediate feedback to student-teachers. Teacher-educator and peers participate in feedback sessions.

(iii) College-based teaching practice is organized under simulated conditions. Peers are used as students instead of real students. Training in role playing is given to student-teachers.

(iv) The micro teaching laboratory can function with minimum facilities according to the available space, material and equipment.

(v) The duration of micro teaching cycle is:

| Teach | 6 Minutes |
|---|---|
| Feedback | 6 Minutes |
| Re-plan | 12 Minutes |
| Re-teach | 6 Minutes |
| Re-feedback | 6 Minutes |

(i) Two half cycle lessons are also practised instead of one full cycle. The Indian model has been successfully tried out, and is being used in many universities and teacher education institutions in the country.

*Table* 7.1 Comparison between Micro Teaching and Traditional Teaching

| Microteaching | Traditional Teaching |
|---|---|
| Teaching is relatively simple. | Teaching is comparatively complicated and difficult. |
| The number of students is less. A class consists of a small group of 5-10 students. | The number of students is much more; a class usually has more than 40 students. |
| There is provision of immediate feedback, which helps the teacher know his drawbacks. | There is no provision of immediate feedback. |
| The teaching time is 5-10 minutes. | The duration of traditional teaching is 40^-5 minutes. |
| The student-teacher practises only one skill at a time. | The student-teacher practises a combination of skills. |

| | |
|---|---|
| In microteaching, the role of a supervisor is specific and definite. | The role of a supervisor is quite vague in the case of traditional teaching. |
| The patterns of classroom interaction can be studied objectively. | The patterns of classroom interaction cannot be studied objectively. |
| Microteaching is done in fully controlled conditions. | This teaching does not take place in controlled conditions. |

**Teaching skills through micro teaching**

We know that micro teaching is a controlled practice which makes it possible to concentrate on a specific teaching behaviour. Competence is acquired in one skill before proceeding to another skill. Micro teaching can be practised only after a teacher's behaviour has been analysed and specific skills of teaching have been identified. A teaching skill is a set of interrelated components of teaching behaviour for realization of specific instructional objectives (Jangira *et al,* 1982). Allen and associates (1967), at Stanford University identified a set of fourteen skills of teaching. In India, Passi and associates (1974) working at the Centre for Advanced Studies in Education at M.S. University, Baroda, identified twenty-one skills of teaching. Some of the important skills of teaching have been explained below:

(i) **Skill of stimulus variation:** Skills of stimulus variation are used to bring desirable changes of variation in the stimuli used to secure and sustain student's attention towards classroom activities. Some of the things a student-teacher is trained in are the use of movement in a systematic way, use of gestures, development of verbal and non-verbal methods of focusing children's attention, systematic use of pauses, and controlled use of sensory channels. This skill helps to increase active participation, enthusiasm and spirit of study.

(ii) **Skill of introducing the lesson:** This skill is mainly concerned with the establishment of rapport between the teacher and students for involving students in the lesson. The main components of this skill are utilization of previous experience and appropriate devices, maintenance of continuity in the main parts of the introduction and relevance of verbal and non-verbal behaviour.

(iii) **Skill of explaining:** Explanation is the use of inter-related facts, concepts with a view to develop understanding among the students towards the content under study. In order to become an effective explainer in the classroom, the teacher should practise more.

(vi) **Skill of reinforcement:** Every responding student of the class needs social approval of his behaviour. To satisfy this need, he is always eager to answer every question known to him. If the teacher encourages students, their participation in the class is maximized. The main purpose of the skill is to increase student participation, facilitate learning, motivate the learner, modify undesirable behaviour and develop desired behaviour.

(v) **Skill of questioning:** Questions are helpful in stimulating thinking and hence, significantly contribute in classroom teaching. It helps a teacher in gaining knowledge about the entry behaviour of students, their interest and attitude towards the subject and the topic in hand. Adequate questioning skills may help the teacher in carrying out effective interaction among the students, including motivation and drawing their attention towards teaching.

(vi) **Skill of lecturing:** This skill is concerned with effective presentation of the content. The teacher leaves his impression by using many techniques and tactics through this skill. Sometimes, it is also known as the communication skill.

(vii) **Skill of illustrating with examples:** This skill is mainly concerned with the selection of

examples relevant to the concept so that the content under study may be clear and understandable to students. Examples contribute significantly in the teaching-learning process and are helpful in sustaining the attention of students.

(viii) **Skill of classroom management:** Skill of management involves efforts made by the teacher to compel a child to participate actively in classroom activities. In this skill, the teacher supervises the activities of students, sets norms for their classroom behaviour, asks questions, etc.

(ix) **Skill of using audio-visual aids:** Audio-visual aids attract and hold attention of students and makes teaching more interesting and effective. Use of these aids breaks the monotony of ordinary instructions, helps in forming the right mental images, stimulates critical thinking and increases the power of retention.

(x) **Skill of using blackboard:** Blackboard is a very essential component of the teaching-learning process. It is a cheap device and plays a very important role in attracting the attention of students. The skill of writing on the blackboard requires neatness, appropriateness of written work, simplicity and brevity in the points presented, and legibility.

(xi) **Skill of closure:** Closure is attained when major objectives, principles and topics of a lesson or portion of the lesson have been learnt and the students are able to relate the new with the past knowledge. It is more than a quick summary of the portions covered.

**Some important skills of micro teaching**

**(a) Skill of stimulus variation**

The main aim of teaching is to bring a desirable change in the behaviour of students. A teacher should always try to make lessons more effective. For this, he should use various methods and techniques. He should present multiple stimuli just to gain the attention of students. In these stimuh, the teacher should himself function as a stimulus, in the form of gestures, movement of the body, change in the pitch of voice, change in the interaction style, pausing and sequencing of different aids of teaching. All these aspects act as stimuh in the class. The use of these stimuh during teaching is known as ' skill of stimuh variation.'

Following are the main components of stimulus variation skill:

(i) **Body movements:** Body movements of the teacher play an important role in the class. Body movements should be in balance because their excessive use may distract students and similarly less body movement will make the teacher look like a dull statue. (ii) **Gesture:** Gestures play a very important role in making the lesson effective. These include facial expression like laughing, raising eyebrows, and emotions. Some other gestures like movement of eyes, nodding and movement of hands also play a significant role in drawing the attention of students.

(iii) **Change in the pitch of voice:** The students feel boredom due to the teacher's speech at the same pitch, and they also get distracted from the lesson being taught. Thus, the teacher should bring about a change in his voice. Too high or too low pitch should be avoided. Important points should be stressed by changing the pitch of voice.

(iv) **Focusing:** It is very important to stress on some specific points or events. This process of focusing includes verbal focusing, gesture focusing and oral-gesture focusing. Verbal focusing draws the attention of the student by using and repeating certain words. Gesture focusing draws their attention by pointing fingers at written words or pictures. In some situations, the teacher uses both of them simultaneously. >

(v) **Change in the style of interaction:** In a classroom, interaction between the student and teacher is a must otherwise the classroom environment will become monotonous. But

this interaction should be different. It can be between a teacher and the whole class, a teacher and a student or between students. All these types of interactions can be arranged by teachers. A teacher should ask questions in an interactive manner so that his class becomes more interesting and effective.

(vi) **Change in teaching aids:** Different types of teaching aids should be used by the teacher during teaching. This will help in maintaining the attention of the student towards the teacher. He should also use audio and visual aids alternatively.

(vii) **Pause:** The teacher should not talk in the class continuously. There should be regular pauses in the process of explanation in the class. If the teacher speaks continuously, students will get bored. Hence, pauses are important to maintain attention of students.

Thus, we can easily generalize that skill of stimulus variation plays a significant role in teaching, and is utilized by the teacher to make his teaching effective as well as interesting.

## (b) Skill of explaining

Explaining concepts is very important in classroom teaching. Hence, a teacher has to learn the skill of explaining in order to make students understand many ideas, concepts or principles that need explanation. Explanation is nothing but a few interrelated appropriate statements.

The skill of explanation can be developed by using the following components:

(i) **Appropriate statement:** During a lecture, the statements used should be appropriate. The beginning statements prepare the student mentally to receive the explanation. On the other hand, concluding statements are made after the end of the explanation. Both are important and should be appropriate.

(ii) **Explaining links:** Explaining links in the form of words and phrases are meant for establishing continuity of statements used for explaining a concept, phenomena or principle. Some of these are: hence, therefore, since, because, as a result of, due to. (iii) **Covering essential points:** The explanation given for understanding a given concept or principle should be as complete as possible. The ' completeness is determined by the scope of concept or principle as specified in the instructional objectives. It should cover all essential points leading to clear understanding of the desired concept or principle, (iv) **Fluency in language:** For explaining the teacher should speak fluently. The fluency should be such that a student may listen and understand the ideas of the teacher easily, (v) **Testing the student:** While explaining, questions should be put across to students for their clarity and understanding.

Precautions for the skill of explaining are as follows:
- The explanation should not include irrelevant statements.
- It should be in simple language which students can easily understand.
- It should be in a proper sequence.
- The teacher should not stammer; his language should be fluent and continuous,
- Use of inappropriate vocabulary, vague words and phrases should be avoided.

## (c) Skill of reinforcement

Reinforcement denotes an event that influences the probability of a response to a stimulus being produced under similar conditions. It belongs to the psychology of learning. It is of two types: positive and negative. Use of positive reinforcement contributes towards strengthening the

desirable response or behaviour and use of negative reinforcement contributes towards eliminating undesirable responses.

Following are the main components of skill of reinforcement:

(i) **Positive verbal reinforcement:** The teacher uses the accepting statements in order to make the learning of the students permanent such as 'I understand what you mean[1] and 'you should express yourself. In this way, the suggestion of students and use of encouraging language is supported, (ii) **Positive non-verbal reinforcement:** Sometimes, the teacher uses nonverbal cues to encourage students in the class such as smiling, nodding, listening carefully, or writing the correct answer given by a student on the blackboard. All these acts are positive non-verbal reinforcements.

(iii) **Negative verbal reinforcement:** Sometimes, it is necessary to remove some stimuli in order to make the learning permanent. Words like: 'wrong', 'absurd' or 'I do not like your statements' may look like criticism to the student.

(iv) **Negative non-verbal reinforcement:** On some occasions, a teacher uses negative non-verbal reinforcements like angry glares, threat of a slap, etc. Such negative non-verbal reinforcements too should be avoided.

Precautions for the skill of reinforcement are as follows:

- Same words or statements should not be repeated again and again. There should be a variety of words.
- Excessive use of reinforcement should be avoided. It may remove its effectiveness.

  It should be used for all the students and not only for the intelligent ones.

  Appropriate words and statements should be used.

  While using reinforcement for one student, it should be kept in mind that other student should not feel inferior because of the statement made.

## (d) Skill of questioning

The process of asking questions during classroom teaching is considered as the most important part of teaching. It makes students more thoughtful and they become able to understand the depth of the subject. Various aspects are studied by asking questions. It makes the student active and alert in the ongoing process of teaching. It also helps a teacher in gaining knowledge about previous awareness and entry behaviour of students, their interest and attitude towards the subject, and the topic in hand. Adequate questioning skills may help a teacher in effectively interacting with his students.

Following are the main components of the skill of questioning:

(i) **Quality of questions:** Questions can serve the required purpose only when they are framed with care by the teacher. So the following points should be kept in mind while asking questions:

- *Relevant:* The questions asked should be relevant to the topic being taught. Irrelevant questions may confuse the students and hinder the process of teaching-learning.
- *Clarity:* The questions should be asked in a simple and clear language.
- *Specificity:* The questions asked should be specific and to the point.
- *Grammatically correct:* The framed questions should be grammatically correct, otherwise the students will not be able to understand them.

**(ii) Presenting questions in class:** A teacher should try to ask questions in a clear and audible voice, accent, tone and pitch. Moreover, the speed of asking questions should not be too fast or too slow, and enough time should be given to the students for answering.

(iii) **Involvement of all students**: Questions should be addressed to all students in a class, rather than one individual student. This will ensure the participation of all the students in the class in answering questions.

(iv) **Behaviour of the teacher:** The behaviour of the teacher should be natural while asking questions. There should be patience and sweetness in the voice and in the style of asking questions.

(v) **Prompting:** When a student expresses his inability to answer a question, the teacher can give clues to help him recall what he learnt.

In this way, proper art of asking question along with proper behaviour and presentation can help teachers in learning and acquiring the skill of questioning for bringing effectiveness to their classroom teaching. However, acquisition of this skill requires a lot of practice on the part of the teacher through micro teaching.

Precautions during the use the skill of questioning are as follows:

- Questions should not be irrelevant or confusing.

- A teacher should not ask questions to a handful of students.

- The teacher should wait patiently for a student to answer until he accepts that he does not know the answer.

- While asking questions, the teacher should show pleasant behaviour.

- He should not criticize the student, if the given answer is wrong.

## (e) Skill of introducing the lesson

This skill is concerned with the art of initiating the lesson. If lesson starts properly and proceeds smartly, then the teacher is successful and effective. The utilization of previous experience and maintenance of continuity in the main parts of introduction are the major points to remember, while using introductory skills in teaching. Following are the main components which are utilized in the skill of introduction:

(i) **Use** of **previous knowledge:** One cannot teach in vacuum. So before starting a lesson, it is essential to know about the previous knowledge of students. The new learning is thus based on previous knowledge or experience acquired by students.

(ii) **Maintenance of continuity:** Proper introduction requires continuity in ideas presented to students. There should be a logical sequence between main parts of the introduction. One activity by the teacher should lead to the other one in a chain of continuity creating the need to study the lesson.

(iii) **Objectives and aids:** It is also necessary to select various teaching aids, keeping in mind the objectives of the lesson. The student feels bored as a result of monotonous teaching. Disinterest edness develops in the student. A proper selection of audio-visual devices unleashes life in the introduction of the lesson and the student begins to show interest. The teacher can use various means like questioning, lecturing and storytelling. However, selection of the method should be according to the maturity level of students.

**(iv) Duration of introduction:** The introduction of the lesson should neither be too long nor too short. The duration of introduction should arouse the interest of students.

(v) **Capability of the teacher:** The teacher should have the capability to arouse interest and encourage motivation in students, without which they shall not show interest in the lesson.

## (f) Skill of illustration with examples

This skill is mainly concerned with the selection of examples relevant to the concept. Examples contribute significantly in the teaching-learning process and are helpful in sustaining the attention of students.

Components of the skill of illustration with examples are:

- **Use of media for examples:** These examples are conveyed to the students through media. For illustration, basically two types of media are used: nonverbal and verbal. Non-verbal media includes flowers, models, pictures, plant, videos, etc. On the other hand, when a teacher explains everything verbally by making use of words and thoughts, it is called 'verbal medium'. It is used most commonly by teachers in classrooms. The subject matter is made more interesting by giving examples of daily life. The teacher may draw pictures on the blackboard and then can explain the concept the more clearly. Sometimes, a teacher may use the storytelling method for making the teaching-learning process more effective.

- **Inductive-deductive approach:** It is very important to understand the concept first and then use it. While the former can be properly realized through inductive approach, the deductive approach helps in the latter. The task of illustrating with example requires the use of both approaches; hence a teacher should learn to use both inductive and deductive approaches for development of the skill.

- **Proper examples:** Various types of examples are used by teachers in the classrooms, but while using these examples some points should be kept in mind like:

    (i) Examples should be relevant to the concept being explained.

    (ii) Examples used should be simple, based on the student's past experience and according to the maturity level of students.

    (iii) An example should be interesting so that it could retain the attention, interest and curiosity of students for better understanding.

    (iv) Whether a teacher is giving interesting examples or not can be judged through the overt behaviour of students and the overall classroom environment.

Precautions while the using skill of illustration with examples are:

(i) The objectives of the lesson being taught should be kept in mind while using this skill, (ii) The illustration used should be related to the main concept or idea, (iii) The examples used should be according to the maturity level of students. (iv) Multiple media should be used for explaining the concept, (v) Examples used by the teacher should be interesting and motivating so that students pay attention.

## Advantages of micro teaching

Micro teaching is very helpful for making the process of teaching more effective and successful. Some advantages of micro teaching are:

- It enables teachers to focus on certain areas of teaching and to view them from different perspectives.

- It increases training-effectiveness using a scaled down teaching simulation environment, which reduces the complexities of normal classroom teaching and eliminates the pressure resulting from real classroom settings.
- One major advantage of micro teaching is the provision of immediate feedback to bring improvement in the teacher's behaviour.
- The main objective of the micro teaching session is to provide the participants with an environment for practice-based teaching to instil self-evaluative skills.
- It caters to the need of individual differences in teacher training. Each trainee develops teaching skills at his own pace.
- It employs real teaching situations for developing skills.
- Micro teaching gives instructors an opportunity to be analysed by a small group of audience, and also to observe and comment on other people's performances.
- It is hardly a substitute for teaching practice, but it offers advantages such as close supervision, manageable objectives established according to individual trainee needs and progress, continuous feedback, an unprecedented opportunity for self-evaluation, immediate guidance in the areas of demonstrated deficiency and the opportunity to repeat a lesson whenever desired.
- Through micro teaching, teachers are able to pursue self-initiated, self-directed and self-observed growth.
- It is a very useful method for both pre-service and in-service teacher education.
- Micro teaching offers the advantages of both controlled laboratory environment and realistic practical experience.
- A micro teaching session is a chance to adopt new teaching and learning strategies.
- It is well suited to help teachers identify single concepts, and learn how to create learning modules to build longer lessons.
- Micro teaching can also be used in research work in various situations related to teaching.

**Disadvantages of micro teaching**

The disadvantages of micro teaching are as follows:
- It is skill-oriented rather than content-oriented. The main emphasis in this technique is on learning the teaching skills and content, which is an important part of teaching-learning process.
- It is performed in artificially controlled conditions.
- The main emphasis of micro teaching is on mastery of one teaching skill at a time, whereas actual teaching is a combination of many skills that operate simultaneously.
- It is a time-consuming technique since one trainee practises a skill in about 35 minutes.
- An effective micro teaching technique requires tape records, video remove tapes and closed circuit cameras. Thus, it is costly for Indian schools.
- For successful implementation, micro teaching requires competent and suitably trained teacher educators.
- Micro teaching alone is not sufficient to attain perfection in teaching. It needs to be supplemented and integrated with other teaching techniques.
- It cannot be a substitute for real classroom lesson.

## 3.2.2 Simulation Social Skill Training (SSST)

Educational games are a recent addition to the array of instructional techniques made availabe to teachers. Educational games, it is observed, usually stimulate social skills and help students to understand human behaviour. Games focus on human interaction within a social structure. For instance, children may be taught to simulate most of the social etiquette through toys and their manipulation. Role-play games can help students to learn the norms for various types of human interaction in the society. Simulated games are very helpful in removing student-teacher polarization usually associated with traditional teaching in which students are passive listeners.

Educational games serve the following important purposes:

1. Games are valuable during the application category of transfer of training or learning. Through games students can transfer concepts, facts and skills learned in one context to another. It is of interest to note that in ancient India, Rajas and Nawabs used to play the game of chess in their palaces and from this learnt military techniques. In due course, military games have become very sophisticated and several types of war games have been developed to train the military recruits.

2. Educational games can be used to raise questions and to generate hypotheses.

3. Educational games may require students to make value judgements and to act in terms of their values.

4. Educational games make learning interesting.

5. Simulation games are introduced for the purpose of introducing the elements of competition, cooperation and conflict as they normally occur in real life.

Hoover (1980) has mentioned the following steps in applying simulation games to teaching situations:

Step 1.   Identifying the problem to be used in simulation.

Step 2.   Developing the outline of the simulation game.

Step 3.   Identifying the actors or teams of simulation.

Step 4.   Identifying game resources.

Step 5.   Playing the simulation games.

Step 6.   Conducting post-game discussions.

***Role playing:*** Role playing is often referred to as 'practice in reality'. Role playing provides practice in 'how to behave in selected situations'. Role playing enables learners to understand the attitudes, feelings or situations of those persons whose roles they assume. In role-play games, participants are assumed to play realistic social roles. They interact with one another in terms of a common social situation. Important objectives of designing role-play games are to enable participants to learn to bargain, negotiate, compromise and make decisions.

**Problems of using Simulated Social Skill Training (SSST)**

Flander has suggested the following problems:

(1) The ability to ask open or closed questions at the appropriate time.

(2) The ability to ask a question which lifts the current level of abstraction or a question which lowers it.

(3) The ability to ask questions from the areas in which concepts and logical connections

have been expressed by the students previously.

(4) The ability to summarize what students have said previously.

(5) The ability to ask a question which may move the discussion to the next step in a logical sequence of problem solving.

(6) The ability to make the appropriate use of ideas expressed previously by the students.

(7) The ability to make constructive use of positive and negative feels of the students.

(8) The ability to provide reasons for using 'praise' or 'blame'.

(9) The ability to predict the consequences which follow from alternative actions.

(10) The ability to assist pupils to compare consequences of alternative actions through speculation before arrived at decisions.

(11) The ability to guide constructive discussions.

(12) The ability to clarify the first steps needed to start work in ways that are in accordance with the interests and abilities of the pupils.

(13) The ability to organize pupils' ideas in terms of teaching objectives for reinforcing selectively those ideas which are in target.

(14) The ability to demonstrate and explain the use of logic in classroom discourse.

(15) The ability to assist pupils to maintain consistency in the meaning of words and to assist to distinguish matters of fact, opinion and value.

To sum up, it can be said that simulation can be made a powerful tool in solving some of the problems that hinder effective teaching and it can also impart training of certain skills which are necessary for teaching and its effectiveness. Needless to mention that simulation exercises can be improved by a systematic experimentation around it. SSST (Simulated Social SMI Training) maybe given a fair trial.

**Role of the teacher in simulation games**

In simulation games, a teacher is expected to play a relatively non-directive role. His role is that of a consultant or a referee or both. He explains the main purpose of introducing the game and its procedure. He plays the role of a referee. After the game is over,, he guides the discussion to determine the extent to which students understand the main ideas that structure the game. He may put questions to the students to focus on the key features of the game.

## 3.3  FLANDER'S INTERACTION ANALYSIS (FIACS)

Several techniques have been devised to observe teacher behaviour and interaction analyse in the classroom. One of the most important technique is the one developed by Ned. A Flander. It was used by Flander in 1959 in the University of Minnesota as a teacher training technique.

In Flander's interaction analysis system, the entire classroom interaction is divided into three main sections: (a) teacher talk (b) student talk and (c) silence or confusion. In this method an observer observes a teacher's verbal behaviour and puts a tally every three seconds against one of the ten categories of teacher behaviour as they may occur. After observation, the total number of tallies in each category are counted and the ratio between teacher talk and student talk is determined. We have better student teacher interaction, if a teacher talk is more often followed by student talk and student talk by teacher talk. Teaching is an interactive process which is mainly influence directed. A teacher tries to influence the

students. However, this influence is not only one way. Both the teachers and students influence each other but the influence exerted by the teacher on the students is of greater and far reaching significance. But the question arises, how to describe the teacher's behaviour which is not only complex but variable as well. Flander's 'Interaction analysis is an observation procedure designed to minimize these difficulties, permitting a systematic record of spontaneous act, and scrutinizing the process of instruction by taking into account every small bit of interaction.'

<div align="center"><strong>Categories of Interaction Analysis</strong></div>

| Teacher Talk | Indirect Influence | |
|---|---|---|
| | | 1. *Accepts feeling:* Accepts and clarifies the feeling tone, of the students in a non-threatening manner. Feeling may be positive or negative. Predicting or recalling feelings are included. |
| | | 2. *Praises or encourages:* Praises or encourages students' action or behaviour. Joke that releases tension, not at the expense of another, individual nodding head or saying 'Um him' or 'go on' are included. |
| | | 3. *Accepts or uses idea of the student:* Clarifying, building or developing ideas suggested by a student. As a teacher brings more of his own ideas into play, it shifts to category five. |
| | | 4. *Asks questions:* Asking a question about content or procedure with the intent that a student answers the question. |

***Indirect influence of teacher behaviour concepts:*** This is defined as actions taken by the teacher which encourage and support student participation. We can define indirect behaviour operationally by noting down the percentage of teacher statements falling within categories 1, 2,3 and **4.**

***Direct influence:*** This refers to actions taken by the teacher which restrict student participation. This increases the control of the teacher and stimulates conformity and compliance. In direct influence, the net result is the decreased extent of freedom of action for the students.

## 3.4  SUMMARY

In this unit, you have learnt that:

- Mc Nergency and Carner (1981) regard teacher behaviour as a function of the characteristics of the teacher, his environment and the tasks in which the teacher engages.

- Some of the characteristics of teaching behaviour are: (i) Teaching behaviour is an interactive process (ii) Teaching behaviour is a goal directed activity (in) Teaching behaviour includes several skills.

- The history of micro teaching goes back to the mid-1960s, when Dwight Allen and his colleagues from the Stanford University developed a training programme.

- There are several definitions of micro teaching. D.W.Allen (1966) has defined micro teaching as a scaled down teaching encounter in class size and time.

- Micro teaching is an experiment in the field of teacher education, which has been incorporated in the practice of teaching schedule.

- Micro teaching involves the following three phases as suggested by Cliff and others: (i) Knowledge acquisition phase (ii) Skill acquisition phase (iii) Transfer phase of micro teaching.

- The six steps generally involved in micro Reaching cycle are: (i) plan, (ii) teach, (iii) feedback, (iv)

re-plan, (v) re-teach and (vi) re-feedback.

- Some of the important skills of micro teaching are: (i) Skill of stimulus variation (ii) Skill of introducing the lesson (iii) Skill of explaining (iv) Skill of questioning (v) Skill of reinforcement.

- Micro teaching is very helpful for making the process of teaching more effective and successful.

- Micro teaching enables teachers to focus on certain areas of teaching and to view them from different perspectives.

- One major advantage of micro teaching is the provision of immediate feedback to bring improvement in the teacher's behaviour.

- Educational games, it is observed, usually stimulate social skills and help students to understand human behaviour. Games focus on human interaction within a social structure.

- Role playing enables learners to understand the attitudes, feelings or situations of those persons whose roles they assume. In role-play games, participants are assumed to play realistic social roles.

- It can be said that simulation can be made a powerful tool in solving some of the problems that hinder effective teaching and it can also impart training of certain skills which are necessary for teaching and its effectiveness.

- In simulation games, a teacher is expected to play a relatively non-directive role. His role is that of a consultant or a referee or both. He explains the main purpose of introducing the game and its procedure. He plays the role of a referee.

- In Flander's interaction analysis system, the entire classroom interaction is put into three main sections: (a) Teacher Talk (b) Student Talk and (c) Silence or confusion.

## 3.5 KEY TERMS

- **Micro teaching:** Is defined as a particular technique of teacher education, in which a teacher applies clearly defined teaching skills in carefully planned lessons within a stipulated period.

- **Social Skills Training (SST):** Is a form of behaviour therapy used by teachers and trainers to help persons who have difficulties relating to other people.

## 3.6 ANSWERS TO 'CHECK YOUR PROGRESS'

1. (a) Teaching behaviour (b) social interaction
2. (a) False (b) True
3. (a) (i) Teacher Talk (ii) Student Talk and (iii) Silence or contusion (b) interactive
4. (a) True (b) False

## 3.7 QUESTIONS & EXERCISES

**Short-Answer Questions**

1. Differentiate between teacher behaviour and teaching behaviour. What is micro teaching?

3. List some of the characteristics of micro teaching.

4. Differentiate between micro teaching and traditional teaching.

5. Write a short note on Flander's interaction analysis (FIACS).

**Long-Answer Questions**

1. Explain the chief characteristics of teaching behaviour.

2. Describe the micro teaching cycle.

3. Elaborate the Indian model of micro teaching.

4. Explain briefly the important skills of micro teaching.

5. What are the advantages and disadvantages of micro teaching?

# 3.8   FURTHER READING

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# UNIT 4  MODERN APPROACHES OF TEACHING

**Structure**

## 4.0  INTRODUCTION

In the global arena, teaching is no longer restricted to classrooms. Nowadays, several advanced technologies are facilitating in imparting education. The advent of computers and other technologically advanced equipments have made, it possible for students to get better education while being situated in distant locations. Distance education is now becoming a reality for students where students are learning at their own pace through the medium of study guides, learning material and audio-video mediums.

In this unit, you will learn about the use of advance technologies in teaching, computer-assisted instruction (CAI), personalized system of instruction (PSI), SAI, IGSI and modular approach.

## 4.1  UNIT OBJECTIVES

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

- Interpret the use of modern technology in teaching

- Analyse the usage of Computer-Assisted Instructions (CAI)

- Identify the Personalized System of Instruction (PSI)

- Describe SAI and IGSI

- Assess the modular approach

## 4.2  USE OF MODERN TECHNOLOGY IN TEACHING

Vikram Sarabhai, the father of Indian Space Programme, highlighted the significance of technology as, 'We are to play a meaningful role nationally, and in the community of nations; we must be second to none in the application of advanced technologies to

real problems of man and society.' In this context the use of technology in education assumes special importance.

Highlighting the importance of information and communication technologies, UNESCO (1996) observed:

> '...as tools for the education of children and adolescents, the new technologies offer an unprecedented opportunity to satisfy increasingly widespread and diversified demand, while maintaining quality. The possibilities they open up, along with their advantages for teaching, are vast. Computers and multimedia systems, for instance, make it possible to design individual learning paths along which each pupil can move at his or her own pace; they also make it easier for teachers to organise acquisition in mixed-ability classes.'

The role played by Information Communication Technology (ICT) in the paradigm shift of models of education is important here.

**Three Models** of **Education**

| Model | Focus | Student Role | Technology |
|-------|-------|--------------|------------|
| Traditional | Teacher | Passive | Blackboard/TV/Radio |
| Information | Student | Active | Personal Computer |
| Knowledge | Group | Adaptive | PC + Network |

***Table 8.1*** *Key Factors in the Paradigm Shift Development*

The time factor will no longer be a constraint. Asynchronous education frees the student from the demands of time.

The distance factor will no longer be a constraint The student can take part in education without being physically present at the teaching institution.

The pedagogical investment for modern distance education is certainly greater than that of the traditional model, whether in terms of initial outlay or the investment related to the delivery of education. There are two factors, however, which will reduce the overall cost in factors of scale:

1. The reduction of needs in terms of area and premises; and

2. The appreciable increase in the size of the virtual class.

The traditionally vertical teacher-student relationship will evolve towards a more **horizontal** model, in which the teacher becomes a facilitator, on expert or colleague and the learner becomes active. In this evolution of roles the group will gain importance as a source for consultation, dialogue and collaboration. Through this mechanism the education is 'received' by the individual in interaction with a group, of which the teacher constitutes only one element. Roles are thus completely redefined, and the dynamism of the new roles requires a new student.

Information/knowledge The transfer of knowledge is no longer the primary object of education. The student must learn to gather information as the need arises, to evaluate it, and to transform it into knowledge through the relational process.

| | |
|---|---|
| Market | By easing the constraints of space and time, education will open up to the **global market,** where language will become one of the main constraints on expansion. |
| Competition/collaboration | The internationalization of the education market and the emergence of new entities placed deliberately in the commercial area will intensify competition between educational establishments. Simultaneously, collaboration and **strategic alliances** on the part of universities will become imperative as the appropriate response to change. |
| Assessment | The traditional concepts of student assessment based on (examination) results will have to be adapted to new methods in which the assessment of the process will gain more importance so that the measuring of assimilated knowledge can be circumvented and factors more sensitive to the |

equation of the new **professional** can be integrated: ability to carry out research, to adapt, to communicate, to collaborate, etc.

| Type | The distinctions drawn between the various types of education (primary, secondary, technical, university, vocational) will becomes less important, and the emphasis will be placed on **continuing** education. |

(Didier Oilo, *From Traditional to Virtual: The New Information Technologies-Thematic Debate,* UNESCO, 1998.)

## Major technologies in education

Following are the important technologies in education that have combined to make the communication revolution and information age a challenging era for educators :-

1. Computer
2. Artificial Intelligence (AI)
3. Computer Assisted Instruction
4. CD-ROM (Compact Disc-Read Only Memory)
5. Dial Access
6. Educational Television (discussed in Chapter 17)
7. EDUSAT (Educational Satellite)
8. E-mail (Electronic Mail)
9. Teleconferencing
10. Telelecture
11. Teletutorial
12. Teleseminar
13. Video
14. Interactive Video
15. Videotex
16. Videoconferencing
17. Digital Resources
18. Virtual University
19. Internet

### Artificial intelligence (Al)

AI is a branch of computer science that deals with the task of making intelligent machines that can perform better than humans. Today, the best computerized learning programmes already include certain forms of artificial intelligence that can diagnose the student's learning deficiencies and tailor instruction to them. AI is a computational technology that involves the symbolic representation and processing of knowledge.

### CD-ROM (compact disc-read only memory)

ROM is a semi-conductor memory device which is used to store information of a permanent nature. It is non-volatile memory which retains the stored data even when the power to the device is shut off. It has become an important part of several digital systems on account of its low cost, high speed, system design flexibility and data non-volatility. The read-only memory has a variety of

applications in digital systems such as implementation of combinational logic and sequential logic, character generation, look-up table, microprocessor programme storage, etc.

## Dial access

Dial access is a round-the-clock delivery system through which callers can get access to a vast library of audio cassettes. It belongs to audio technology which uses the educational network (ETN).

The important merits of this system are:-

1. Students can dial up lessons from the library.
2. Instructors can call for audio-visual material from a distribution centre.
3. Paying for a number of instructors to teach repeated sections of basic courses can be associated.
4. Instead of trying to find room for classes to meet on campus, universities could enable students to watch videotapes of the lecture individually.

However, the use of dial access technology has become less popular with the advent of the easy-to-use audio and video tape players.

## E-mail (electronic mail)

It is natural to communicate with our friends and business associates based in distant locations, and this is the essence of networking. Human beings have always corresponded with each other in as rapid a fashion as possible for the era they lived in, when they could not meet personally, face to face. In today's electronics or information technology age, electronic mail (E-mail or email) allows us to communicate quickly and easily with friends and colleagues situated at distant places, and around the world. The use of e-mail is not only rapidly increasing but changing the way in which teaching, learning, research, healthcare, business, and administration are conducted. E-mail is the most widely used application. The speed with which it reaches its destination, and its low cost allows people to keep in touch with the day-to-day happenings in their businesses, professions and the happenings around the world. As e-mail becomes a common part of our day-to-day routine, we should understand its functioning in a proper manner.

### Internet addressing convention

Basically an internet e-mail address is made up of three parts. The first part identifies the username of the person to whom you wish to send mail. The second part identifies what host computer (or server) the person receives the mail on. Finally, the third part identifies what subdomain this host computer is located on. All three parts constitute a complete Internet e-mail address. Take a look at the example:

surekha@giasbmO 1 .vsnl.net.in

The username here is 'surekha'. The host computer is 'giasbmol'. The 'vsnl.net.in' is the subdomain of the national domain 'in'. The subdomain name 'net' identifies VSNL as a network service provider. If we are sending mail to someone on the same host computer, i.e., giasbmOl, we need not supply any other information beyond the username, for example:

vipul

If we are using PINE (Program for Internet News & E-mail) on giasbmol, this message will get delivered to Vipul, who has an account on the host 'giasbmol'. If we want to write to someone in Delhi who has an account on giaslol, we may address the mail as follows:

ram@giasl01

This will deliver the mail to Ram who has an account with VSNL's GIAS service in Delhi. We do not need to mention his full Internet address, which is 'ram@giasl01.vsnl.net.in. This is because the domain 'vsnl.net.in' is common to all the servers or host computers under VSNL in India. For all other addresses we need the full address as we discussed in the very first example.

## Teleconferencing or interactive television

Teleconferencing or interactive television is a two-way electronic communication between two or more groups or three or more individuals who are at separate locations.

Interactive television combines traditional TV viewing with interactivity of the Internet and personal computer.

In education, teleconferencing is used for the following purposes:
- It provides expert instructors to remote schools, colleges, uni-versities and offices.
- It offers quality instruction to learners scattered over several sites or over a large area.
- It allows learners to interact with the expert and with each other at multiple locations.

- It provides in-service training without leaving the work place.

### *Equipments needed in teleconferencing*

1. Satellite transponder.

2. Stubs.

3. A studio uplinked with the earth stations that can uplink the programme to the satellite and reception centres with direct reception facilities which can download the programmes uplinked from the studio of the stub.

4. Telephone.

5. STD.

6. Computer network.

### *Types of teleconferencing*

The three types of teleconferencing are:

1. Audioconferencing

2. Videoconferencing

3. Audiographic teleconferencing

Teleconferencing, a substitute for face to face meetings, is a new form of video-based communication via telephone lines or satellite broadcast. A teleconference is set up by making a network available for a group of participants to act freely in a discussion mode. It is one of the most important examples of how telecommunication is being adopted for the learning system.

In teleconferencing, people situated at distant locations can conduct a meeting by typing messages at their terminals.

The conference may be a videoconference or a computer-based conference or an audiographic one. The most important characteristic is that the participants may interact in a relatively unprepared or unstructured mode on the topic set up for discussion.

In teleconferencing, a participant may leave at will and catch up on what he has missed during his absence when he comes back. Summaries are instantly available. It is not even necessary for all

the participants to be present at the same time and attendance may by anonymous.

The area of applicability of teleconferencing is limited to certain categories of educational goals, for instance to tasks which require comparisons of viewpoints, group discussion, voting on an issue and so on.

### Classification of teleconferencing according to the media used

*Audioconferencing:* This is conducted by means of several telephones in different localities, often amplified for group listening, linked together into a network that allows all the stations to both transmit and receive spoken messages.

*Videoconferencing:* It is the system which may allow full audiovisual message transmission between all the linked stations, or may be limited to one-way video transmission from the first station supported by multi-way audio transmission between all the satellite stations.

**Audiographic conferencing.** It is a system that supports a basic audioconferencing system by some means of transmission and sharing of visual material—these may use any combinations of previously mailed printed material, fax transmission, networked personal computers or special purpose slow-scan television camera systems that capture and transmit still images from one station to another across the normal telephone system.

**Computer-conferencing:** This is a system that utilizes existing network of computers as a means of collaborative decision-making and discussion on the basis of shared (usually text-based) messages and files.

### Benefits of teleconferencing

*Meetings*

1. Teleconferencing enables the possibility of holding meeting that could not otherwise have taken place due to financial, time or other such constraints.
2. It reduces travel time and expense.
3. It provides the means to conduct meeting on a more regular basis, or at a moment's notice, thus accelerating decision-making and reducing time to arrive at conclusions.

*Distancs learning*

1. Teleconferencing connects educational faculties worldwide him parting distance learning and employee training.
2. It enables visual participation of remote students.

## Telelecture

Telelecture is primarily a one-way information transmission taken by its teacher with a very limited opportunity of questions or comments.

The preparation of telelecture has much in common with the preparation of a face-to-face lecture except that the structure of the message and its packaging in different forms of media and materials must take into account the constraints of the particular system that is going to be used.

A telelecture is usually followed by pre-telecast preparation and follow-up.

**Teletutorial**

It is a more focussed instructional session involving demonstration and explanation by a tutor, practice by the participants and evaluation and corrective feedback by the teacher.

A teletutorial may be initiated by an individual student or a small group, experiencing a particular learning difficulty by contacting the tutor at a distance with a request for help.

The mode of teletutor is very popular in Australia and New Zealand as well as in some of the remote areas of North America where transport has always been difficult.

**Teleseminar**

Teleseminar is characterized by an intensive involvement of participant owing to the small number of the group. It leads to a very focussed, in-depth discussion on a topic where previous experience is shared.

**Video**

Video is an important medium of learning which is being used on a large scale in modern times. Video technology allows playback of programmes.

A videotape recorder (VTR) has the following advantages:

  (i) Tape can be played back as soon it is made.
 (ii) Tape can be erased and re-used several times.
(iii) It is easily distributed and used.
(iv) Videotape recordings of teachers can indicate to them ways to improve their teaching-learning methods.
 (v) Specific programmes such as teaching skills, demonstrating and illustrating ideas are developed and used at all levels of education.
(vi) Instructional and professional resources from well-known experts could be brought directly to the learners.

The VTR records images as well as sounds. It consists of (i) a camera, (ii) a microphone, (iii) a tape recorder, and (iv) a cassette or a specially recorded tape. Images and sounds are recorded as electronic signals on the tape. Thereafter signals are converted to pictures and sounds during playback.

**Interactive video**

This technology combines the attributes of sound, motion, colour, audio and tailored information via branching presentations.

Interactive video permits a viewer to participate in a simulated conversation on the TV screen.

On account of its heavy costs and complexity the' service of this medium has not expanded in the field of education as anticipated earlier.

**Videotex**

Videotex involves the transmission of display text and graphics and their reception on a television set. Videotex is of two types: (i) Broadcast Videotex (Telecast), and (ii) Interactive Videotex (View Data). Both are used for educational purposes.

In telecast type, the user can select information only from the limited amount being transmitted.

In view data type, a user can get access to thousands of pages of information stored in several computers.

Videotex is very useful in distance education in disseminating information regarding courses and programmes available.

**Videoconferencing**

Video-teleconference is a teleconference that includes video communications.

Video-teleconferencing system transmits voice, graphics and images of people. It has the advantage of being able to show the image of the speaker, three-dimensional objects, movements, and pre-produced video footage. On account of its ability to show the images of participants, video-teleconference can create a 'social presence' that closely approximates face-to-face interaction. This is a fully interactive system that either allows for a two-way video and audio, where the presenters and the audience can see and hear each other, or one-way video and two-way audio, where the audience sees and hears the presenter, and the presenter only hears the audience.

*Videoconferencing in education*

With the use of technology in the classroom, both teachers and students reap several benefits. Increased academic achievement, efficiency in the operation of schools, and the number of technically qualified students entering the workforce as well as the improved literacy in terms of technology, innovative teaching practices, and community relationships are some of the rewards of videoconferencing.

Videoconferencing, that allows individuals or groups at different locations to meet face-to-face in a real time setting, has found its niche in a world of new and emerging technologies. In the past, distance learning with two-way video and audio was way beyond the redch of many professional and academic organizations. Innovative telecommunication technologies such as ISDN (Integrated Services Digital Network), and IP (Internet Protocol) compressed videoconferencing systems have lowered costs, making videoconferencing feasible for many colleges, businesses and libraries, etc.

Several educators view videoconferencing as an extension of the classroom. Videoconferencing provides an effective teaching medium because it is geared toward the first truly digital generation.

Videoconferencing is advantageous because it enhances the learning process, increases student motivation and participation and encourages cultural diversity. It provides access to a vast array of information and resources to satisfy student's individual needs. Student's comprehension of difficult or abstract concepts is easily developed through the face-to-face interaction of videoconferencing. Positive relationships among different groups—educators, student, and community members— are cultivated through videoconferencing. Videoconferencing establishes a visual connection between experts (presenters) and participants (educators, students, and parents).

It allows the educators to meet and match the educational needs and abilities of their students. The technology supports the shift away from traditional lessons that are short, isolated, and educator-centred to a student-focussed interactive experience.

## Digital Resources

We are living in a digital world. Digital technology is used in a big way for producing, preserving and distributing information. Computers now outnumber office workers in several parts of the world. We do online or tele-banking and enjoy digitally mastered music.

In recent years academic and other institutions have started creating and distributing information in a plethora of digital formats at relatively low costs and without the need for complex programming skills that were once needed.

Digital sound recording and digital photography are also being widely used.

## Virtual university

Recently virtual university has come into existence. People are studying in virtual classrooms. One need not travel to other countries for educational purposes. One can pursue education staying at one's own place of residence. With the growing population, traditional colleges and universities are not in a position to give admission to all those who possess the required qualifications for eligibility and desire to pursue higher education. To cope with the problem, distance education institutions and open universities were established. However, these facilities also were considered insufficient. A large number of foreign universities have started opening their doors to students from other countries. Such universities make use of the Internet and thus have eliminated all limitations of traditional (real) universities. Such a university is called virtual university. It admits students belonging to any country.

The chief requirement of a virtual university is the availability of Internet facility with the prospective student. Students enrolling with the virtual university can take admission in any programme provided he possesses all the essential pre-requisites of the programme. When one has taken admission, he need not travel and can learn any topic anywhere at anytime. Formalities like filling a form, taking entrance examination, getting enrolled or registered payment of fees, etc., can be done online through the Internet from one's own place.

A virtual university provides a number of courses and programmes. A candidate can select any course. Once the selection of the course is done, a student can start learning any course through any method of teaching-learn-ing, viz., lecture method, discussion method, seminar method, self-learning method, etc.

A virtual university can have the potential to offer various courses and programmes ranging from undergraduate to Ph.D., D.Sc, D.Litt, etc.

A student can also download any portion of instructional material for future use. He can continue reading the same topic for any length of time and through as many methods as he wishes. Teaching-learning in a virtual university is individualized. A virtual university, by providing the element of flexibility, can nurture the talent of an individual. A student enrolled in a virtual university can take examination at any time he likes. Abrilliant student can complete a programme of three years' duration in two years or even in lesser period. There may not be any age criterion.

The only criteria for admission and completion of a course will be the competencies and potentialities of the candidate himself. A virtual university presents the possibility of globalization of education.

## Internet

Internet is the abbreviation of inter-network systems and is described as a network of the computer system. In a general sense, the Internet is defined as 'a global pool of information and services, accessible by means of locally executed interface software'.

When two or more computers or other devices are connected together in such a way that they communicate by sending message to each other, they form a network. It is the largest network over which two computers located in different parts of the world communicate. The estimated number of Internet users worldwide in the year 2000 exceeded 30 crores. This number is growing by about 50 per cent every year.

The Internet which began in 1968 in the United States Department of Defence Research is a new communication technology that is affecting our lives at a scale as significant as the telephone and the television.

## A brief history

Internet is the outcome of military needs and the product of a military undertaking. USA is the birthplace of the Internet. It was created as ARPANET in 1969 by the Pentagon's Advanced Research Projects Agency (ARPA) in 1969. (Pentagon is the military agency headquarters of the USA at Washington.) The initial was simple—to develop a geographically dispersed, reliable communication network for military use that would not be disrupted in case of partial destruction from a nuclear attack. That aim was accomplished by splitting the data being transmitted into small packets, which could take different routes to their destination. The 'packet switched' network can resist a nuclear attack in that the packets can take a different route if one route is knocked off. This main feature of Internet technology also makes it almost impossible to sneak into the confidential messages.

The procedure developed for interconnecting ARPANET computers and communicating the data was called TCP/IP, an acronym for Transmission Control Protocol/Internet Protocol. ARPANET allowed engi-neers and scientists working on military contracts all over America to share computers and computer resources. As a second thought, the computer scientists developed a way to exchange messages. This feature, 'e-mail' turned the network into a new communication link. The ARPANET was initially confined to organizations and individuals having US government security clearance and working on government contracts. But it soon merged with a nongovernment, parallel academic network called Usenet News, launched in 1979, which grew and eventually came to be known as the Internet.

## Usefulness of the Internet

Here are some of the ways in which the Internet can be useful:

- Exchange e-mails with millions of people through e-mail addresses.
- Search retrieve, and read millions of files stored on computers throughout the world.
- Search and bring to your computer shareware, freeware and commercial software.
- Search databases of governments, individuals and organizations for files on thousands of topics.
- Join specific topic-oriented discussion groups (known as newsgroups).
- Send and receive programme data files such as desktop publishing files, spreadsheet,

CAD files or word processor files, which you or the receiver can immediately start to work on. Send and receive sound, animation and picture files from far-off places.

- Set up temporary or permanent discussion or work-oriented groups.
- Browse through resources of private or public information services that are on the Internet.
- Communicate in real time with others connected to the Internet. Set up a site with information about your company's products and services.
- Browse and search 'catalogs' of goods and services, and purchase items online. Conduct test marketing. Distribute electronic publications. Read electronic publications. Sell products and services.

Education through the Internet

1. Internet is highly educative as it provides access to information and contains enormous of data on numerous topics.
2. Internet has information on most of the advanced research topics in highly technical or scientific areas besides information on other petty topics as well.
3. The use of the Internet could provide wider access to good quality education at a low cost.
4. It provides information and education to the wider population located in every nook and corner of the globe.
5. It maybe considered as a tool to disseminate large quantities of information to propel the masses forward on a path of prosperity in the shortest possible time with minimum resources.
6. Internet technology can be very helpful in tackling adversities of nature like earthquakes, landslides, etc., and disparities of caste or creed of the society.
7. The learning process on Internet is interesting and interactive.
8. The students have a great opportunity to be creative.

   The Internet would also remove the limitations of:
   - classroom size
   - fixed period of imparting education
   - restrictions on the learner's pace of learning
   - the learner's ability to afford quality education in the best school, college or university anywhere in the world.

   The Internet can support the following types of education':
   - schooling
   - continuing education
   - re-skilling or re-education
   - task-specific immediate education.

   There is no doubt that the Internet offers the unique opportunity of providing education at a fast pace.

   The Internet has varied educational uses. Even a well-established traditional library can hardly match the resources available on the Internet. This is not to say that the Internet can replace the library. But the simple fact is that no library on earth has

the financial resources to buy the latest international books on everything under the sun. This is where the Internet comes handy for students, teachers, research-ers as well as for those preparing for several competitive examinations including the Civil Service Examination.

It frees one from the hassles of collecting reports from different sources for projects and research reports—wasting valuable hours travelling to various libraries all over the country to check their availability. The Internet makes all information available at the click of a mouse button.

Name any branch of study—the Internet provides the requisite information— whether it is to keep informed of the latest scientific discoveries or to enhance one's skills. The Internet helps in enriching classroom discussions.

## Universities, research laboratories and the internet

In the late 1980s, the American government, through its agency the National Science Foundation (NSF), set up five super-computer centres, which became the main nodes of the Internet, to which the university and research lab networks became connected.

The number of computers connected to the Internet has been growing exponentially. In 1983 there were less than 500 'host' computers in mostly mostly government laboratories and academic computer science departments. The rest of the academic community got a whiff of its information exchanging ability, and by 1987 there were about 30,000 host computers at different universities and research labs. By 1995 this number had increased to 5 million hosts. Since then expansion has been phenomenal,

## Documents and software libraries

In the early 1980s, using the Internet was still difficult. However, its power was obvious. There was no other method to connect universities and research labs around the world which was so fast, convenient and flexible. So, the Internet users at universities came up with a software to participate in discussions over the network. They created documents and software libraries on the network, which were accessible to all users. During this period, the Internet remained within the narrow confines of the academic and research lab world.

## Telenet service and BBS

With the prices of PCs coming down, more and more individuals also had computers. This led to an increasing demand by these people to connect their machines with other systems. In response to those demands, online services like Telenet came into existence. For a fee, individuals could connect with them and communicate with other users on the same service, as well as use their repository of information and software, which people could download. Further, along with online service came the concept of the Bulletin Boards Services (BBS), which allows users to connect with another computer in their vicinity and exchange information, share software, etc.

Initially these private networks, both corporate as well as commercial, had different hardware and software platforms and could not connect with each other, but in a brief span of time TCP/IP came to be used by them. Interconnection of these networks, BBS communities, and individual PCs in homes and offices by adoption of the Internet technology, TCP/IP, gave birth to the Internet as we know it today. All that is required to connect any network or computer with the Internet, is the capability to use TCP/IP for exchanging information. This is how the Internet became the leading network.

**Self-sustaining Internet**

During its evolution, the Internet was supported and controlled to a greater or lesser degree by American government agencies, first ARPA, and then the NSF, but now it has become a diversified, in some sense an uncontrollable global entity. Its nodes are supported by diverse sources. In the 1980s ARPA was recognized, its funding was cut and the American defense networks were mostly detached from the Internet. Its funding continued through the NSF, and until recently the NSF paid for connecting the computers of academic institutions and government agencies everywhere in the US A to the Internet. Slowly, the NSF permitted commercial networks to be connected to the Internet, initially for educational and research purposes, while forbidding primarily commercial use. This let to the rapid growth of the Internet.

**Internet and commerce**

Gradually, commercial use increased as the restrictions were eased. In 1995, companies overcame universities as the main users. In April, 1995 NSF moved out of the scene, and today the American government has no part in running and maintaining the Internet. It is now self-sustaining.

**From the laboratory to the mainstream of life**

Two other important developments underlie the present explosive growth of the Internet. The first important place at CERN, the European Organization for Nuclear Research. Here physicists developed a software for publishing, searching, and accessing information on the Internet, as a way for scientists to share documents with their colleagues at large. This came to be known as the World Wide Web (WWW).

The second occurred at the University of Illinois, where a young student named Marc Andreessen developed a graphical browser called Mosaic, to access information from the WWW. These two developments have catapulted the use of the Internet from the laboratory into 'o the mainstream of life.

**Facilities offered by the Internet**

- Transfer of files among computers and using file transfer protocol.
- Access to another remotely located computer through one's own computer.
- E-mail—every Internet user has an e-mail address which helps to transfer mains electonically.
- Network news, where new items are gathered into groups of related items depending upon the topic.
- Internet Relay Chat or just 'Chat' that allows users on the same or remote host to communicate directly from one terminal to another. Hence, the communication is instantaneous and character typed on one terminal appears on the second terminal.

**Working of the Internet**

Internet is not run by any single authority. All the computers and wires that make up the thousands of smaller networks connected through the 'Internet' work because they are broken up into small pockets and that the first part of each pocket contains the address where the pocket is meant to reach. How should it work, is not laid down in a master plan nor is there any central computer or authority for this purpose. Instead of having the e-mail route through a central computer and then to its destination, the mail has many ways to travel from one point to another through the Internet over the well-connected web of computers. For transmission hardware, the Internet is dependent on the existing infrastructure

developed by telephone companies, tele-communication companies and the national infrastructure resources available for tele-communication purposes.

Internet service providers lease data circuits from the telephone networks and have dedicated computers connected at the end points or modes. These rely on the distributed intelligence of networking equipment known as 'routers', thus bypassing the telephone company's expensive switching computers, while using their transmission lines.

All the content is held by computers known as 'servers', which are owned by organizations and companies, e.g., NIC, VSNL, Satyam, MTNL, and Microsoft, that are in the business of distribution of information.

When request is made to these servers for information, they bundle the requested information in small packets, with address as to where it is to be sent and subsequently send them down to the nearest node tq the Internet.

When they arrive at the Internet the packets are read by the router, which is nothing than a traffic cop which sends down in the same general direction as its address. A similar thing happens at the next junction on the Internet. This goes on till the packet is delivered to the right address where it is put together again with other packets to make up the complete original information.

In order to accomplish this task of sending messages across a network, computers use a network protocol. To understand the computer protocol, we can take the analogy of diplomacy rules, i.e., the set of rules of relations and interactions between the representatives of different protocol, m the same way, computers wanting to sendmessages to each other, have to conform to a standard set of rules defined in the networking protocols. This enables different types of computers run-ning different types of operating systems to communicate efficiently. The actual standard today is TCP/IP (Transmission Control Protocol/Internet Protocol). All this is accomplished by dedicated but fast computers that work as routers.

Every organization has its own network and every individual user has his own system and set-up; it does not matter as Jong as they communicate at the same protocol to the external world.

## Getting connected to the Internet

Basically there are four steps of getting connected to the Internet.

  (i) The first step is to get an account with the Internet Service Provider, say Satyam, VSNL, or MTNL.

 (ii) The second step is to get a modem for your computer to connect with the telephone lines.

A computer does not keltined of presenting drill experiences to learners. Also, a computer does not become frustrated and rude. For correct responses provided by students to programmed items, a smiling face appearing on the screen of the computer can indeed be a personalize learning.

**IV.** *Use of CM in new learning.* The fourth factor in emphasizing CAI might well be new learning to be acquired by students. Each student using a computer terminal may experience a programmed instruction. With programmed learning, a learner may read a few statements or see a demonstration on the screen of the computer. A student in return responds to a multiple-choice or a completed item based on what was comprehended from the sentences read or demonstration experienced. After responding, the computer screen may show a smiling face if the response given was correct. If incorrect, the involved student may try again to respond correctly. If a second wrong response was given, the correct answer is provided on the screen. The successful learner in each response given is ready to progress to the next linear item. The student responding incorrectly also is ready for the next sequential item, after seeing the correct response on the screen. Read, respond and check are concepts emphasized again and again in sequential programmed items. New leanings, not drill and practice, are

being emphasized.

**V.** *Computer learning based on individual needs.* Each student can achieve one's own unique optimal level of achievement. No student needs to wait to have other learners progress at a similar level of achievement. Learners individually may progress as rapidly as personal capabilities permit using computer terminals.

**VI.** *Computer learning and problem solving.* CAI may also provide problem solving experiences for students. Thus, a problem is presented on the screen of the micro computer. The student using keys on the micro computer types a related decision. Feedback on the screen is provided to the learner relating to the typed decision. Anew problem is then presented directly related to feedback to the involved learner regarding the previously made decision. Again, the student types a choice to be made involving, perhaps, four alternatives in a multiple choice item. Feedback is again provided to the student on the quality of decision made, as well as new sequential problem presented on the screen.

**VII.** *Microcomputers in the reading curriculum.* Marlow Edger thinks that there are numerous means of utilizing personal computers in teaching students in the area of reading. Tutorial programmes provide pupils with new learning. Thus, a programme might emphasize each of the following uses in terms of developing word attack skills:

1. Phonics in assisting learners to associate sound with symbols.

2. Syllabication in guiding pupils to divide words into syllables and thus unlock unknown words.

3. Structural analysis in which students learn to divide words into prefixes, suffixes and root words.

4. Configuration clues whereby learners perceive shape or form of specific words for identification purposes.

5. Picture clues whereby a picture provides the identification of unknown words.

6. Context clues in helping students to identify a word within the confines of a sentence. The unknown word must make sense with other words contained in the sentence.

Additional uses for microcomputers include drill and practice, as well as simulations and games. Wright and Forcier listed the following criteria for software selection for drill and practice as well as simulations and games:

| *Criteria for Drill and Practice Programmes* | *Criteria for Simulations and Games* |
|---|---|
| 1. Format is interactive | 1. Clear direction |
| 2. User can establish the pace | 2. Simple keyboard paddle use |
| 3. Provision made for progression in levels of difficulty | 3. Varying levels of difficulty |
| 4. Items at the same level of difficulty can be selected at random | 4. Realistic situation for role-playing |
| 5. Employs motivational techniques | 5. High level of interest maintained throughout |
| 6. Rewards for correct responses | 6. Results predicated on user input |
| 7. Incorrect responses handled appropriately | |
| 8. Teacher can modify content | |

**VIII.** *Use of computers in methodology of educational administration am management:*

1. Keeping records of finances, fees and donations, etc.
2. Compiling results.
3. Preparing graphs, drawings and lists from the data whenever required.
4. Scheduling daily activities.
5. Reminding about specific times and dates when certain things must be done.
6. Providing information about professional questions (when hooked to a national databank).
7. Helping in word processing and several other personnel tasks.
8. Maintaining record of school staff.

**IX.** *Computer and improvement in the effectiveness of instruction:*

1. The computer assisted instruction is individualized.
2. The computer can be programmed to interact meaningfully with the student to enable him to overcome his learning difficulties.
3. The revelatory form of CAI assists the student to learn through a process of gradual recovery.
4. CAI enables the student to make models of real life situations, formulate and test ideas and hypotheses.
5. A student learns to use the computer in solving difficult problems.
6. The computer data bank helps the student to obtain data and process it quickly and meaningfully.
7. A student can take a test with the computer and can obtain immediate feedback so that he can rectify his mistakes and improve his learning.
8. A computer can be used in several innovative ways to improve learning.

## Limitations of CAI

1. Speech or analysis written by the computer seems to be possible only outer several years.
2. The computer fails to appreciate the emotions of the students. The warmth and the emotions exuded by the teacher in direct classroom interaction with the students is missed by the students in CAI.
3. The peripheral equipment put constraints on the ways in which a student can interact with the computer.
4. Commenting upon the limitations of the computer, Longuit— Higgins have opined, 'The human student is a rather rich information source. Reducing him to a short of morse code consisting of a string of multiple choice answers we lose a lot of this information and so reduce the possibility of understanding his difficulties.'
5. CAI fails to develop essential features of language competency.
6. Some students get more tired in CAI than conventional study.
7. CAI is a sort of mechanical approach to education.

**Functions of the school administration and the teacher in relation to the use of computer in education**

1. New functions of the teacher will depend upon the specific purpose for which the computer is used.

2. A technical expert should be consulted in the selection and purchase of hardware.

3. An agreement should be made with the suppliers for the supply and installation of the computer.

4. One or two persons of the school should be trained in operation and servicing of the computer.

5. A small centrally located room should be selected for the installation of the computer.

6. Storage space should be provided for software programmes.

7. A teacher called as 'computer manager' or 'computer resources person' shall be the overall incharge of the computer. He will coordinate the entire work in this regard.

8. In CAI the teacher has the chance to use new tools which will enhance his individual satisfaction and increase his efficiency.

9. The teacher will be liberated from his routine duty.

10. The teacher will be in a position to produce elaborate graphs and tables.

11. The teacher can compute accurately and rapidly huge data. Computers can never be a threat to teachers. The computer is after all a tool itself incapable of action. It has no inborn wisdom. It carries out with incredible speed the instructions given to it. One can store and retrious data swiltly from a computer. The instructions nevertheless have to be given to it by the teacher. The computer therefore is a medium or tool in the teaching/learning process. It is the teacher who is to decide which part of the curriculum the computer can handle. It can be the flashing of a piece of text with blanks for teaching or a multiple choice question with alternatives on the display screen for testing and recording the student's score.

**Developing competence of teachers and administrators in using microcomputers**

For achieving proficiency in computer usage, the following means may be utilized:

1. Organizing workshops stressing the relevant objectives.

2. Conducting faculty meetings containing vital agenda items.

3. Arranging video remove tape presentations on model procedures in computer usage.

4. Showing slides, filmstrips, and films presenting sequential significant content.

5. Planning talks by qualified resource personnel to participants on curriculum and uses of the computer.

6. Visiting classrooms in which effective computer usage is being stressed.

In-service education for teachers and administrators in micro-computer use in the curriculum should:

1. provide sequential new learning.

2. emphasize utilitarian values in teaching and learning situations

3. stress meaningful and understandable content

4. inculcate the goals or reasons for learning

## Type of CAI programmes

*1. Logo:* This system developed by Feurzeing and Papart pro-vides instruction which can be used to produce pictures on an oscilloscope or make a little mechanical robot. Often the students suggest their own tasks and then write appropriate programmes.

*2. Simulation and gaining:* This system enables the student to mount an experiment in a symbolic form. For instance, experiments involving the breeding of fruit flies are often used in teaching genetics.

*3. Controlled learning:* Controlled learning involves the use of interesting adaptive strategies. It includes both drill and practice. Drill and practice programmes are supplementary to the regular curriculum followed by the classroom teacher.

*Devices used in CAI:* Ronald Gentile mentions the following devices used in CAI:

1. Students can ask a question by typing a question on the keyboard attached to the computer.

2. Film projection devices, on the basis of student responses, select films, present auditory and visual material and automatically score students responses.

3. Displays super imposed on 'films' highlight certain concepts of the films. '

4. With Cathode-ray tubes a pen can be used for drawing curves or indicating on a screen. These answers can then be evaluated by a computer.

5. Random-access slides and films. These are two devices developed for auditory communication. They are:

   (i) *Complied Speech*—Here the computer has random access to pre-recorded phrases which can be arranged on the basis of the student's response. For example, the computer can tell the student a chemical formula.

   (ii) *Synthetic Speech*—Here the computer uses a set of rules to convert stored speech and sounds into meaningful patterns.

## Origin of computer-aided assisted instruction

Computer-aided instruction (CAI) dates back to the early 1960s. Introduction of micro computers in 1980s generated a new enthusiam to use it for instructional purposes. The first major pioneering attempt in CAI was made in the USA in 1961 when the University of Illinois produced Programmed Logic for Automatic Training Operations (PLATO). The second landmark in CAI was in the year 1966 when computerized tutorials in arithmetic and reading for elementary school children were developed by Patrick Suppes of Stanford University.

Tbndow (1966) used a computer to teach fifth graders the elements of binary system, some computer vocabulary and the know-how of computer operations. Schurdak (1966) used computer to teach a FORTRAN course and found it more effective than other conventional methods. Atkinson (1968) developed programmes for the computer-based instruction in reading using IBM-1500 instructional system in which each student terminal consists of a picture projector, a cathode ray tube (CRT), a light pen, a typewriter keyboard and an audio system playing pre-recorded messages.

These days, microcomputers are being used on a regular basis widely at all levels of

education from primary level to university level.

Computer-Assisted Instruction (CAI) has become an integral part of the learning process in the advanced and developed countries of the world. For instance, a survey of instructional technology in schools of the United Kingdom in 1989 revealed the following.

### A. Primary schools

1. There were on an average 2.5 micro-computers (micros) per school.

2. The average number of pupils per computer was 67.

3. Nearly 60 per cent of information technology resources were met from public funds and the rest were met from other sources such as Parent-Teacher Association.

4. Half the teaching staff were making a significant use of micro-computers on a regular basis.

5. Nearly all pupils have 'hand on' experience of micro-computers.

### B. Secondary schools

1. There were on an average 23.2 micro computer in every school.

2. The average number of pupils per computer was 32.

3. 80 per cent information technology resources weramet from public funds and the rest from other sources such as Parent-Teacher Association.

4. Nearly three-quarters of pupils have 'hands on' experience of mini-computers.

### Working of a computer

A computer is a power-driven machine equipped with keyboards, electronic circuits, storage, compartments and recording devices for the high speed performance of mathematical operations. In simple terms, a computer is a 'glorified computer', however, with a differ-ence. The computer is a box loaded with information. The processes and formulae necessary to process information are also fed in the computer. When related information is given to it, it interacts and manipulates the information, translates the answer and types it out on a type writer.

A computer has five basic parts:

1. Input equipment to feed information to the system.

2. Output equipment to indicate the results of processing usually on a visual display unit (TV screen) and/or print out.

3. A memory store to hold information.

4. A processing unit to perform the required information.

5. A control unit, for processing controlling in such a way that all elements operate in harmony.

*Memory:* The computer can store information fed into its memory. Memory is of two types—main memory in the form of silicon chips and backing store in the form of magnetic tapes. The main memory is used to hold programmes and information needed to carry out a particular processing task.

*Computer hardware and software:* The physical components of the computer are called hardware. The programmes which contain instructions to the computer in a language that it can understand are called software.

*Software programmes:* The programmes used by the user to play a game, to learn from a

computer-assisted course, to solve a numerical problem to classify a large mass of data etc. are examples of applications of software.

**Significant facts and statements regarding computers and their use in education**

**A. General facts and statements regarding computer**

1. The computer was developed out of man's search for a machine which could do long and laborious calculations easily and with great speed.

2. The design of Analytical Engine developed by Charles Babbage in 1883 laid the foundation of modern computer.

3. In 1943, the first computing machine was constructed by International Business Machines Corporation in USA.

4. From 1970 onwards, the size of the computers as well as their cost was drastically reduced.

5. After 1970 computers began to be used increasingly in education—schools, colleges and universities.

6. After 1974, micro-computers also known as personal computers were available.

7. Depending on the size, processing power and cost, computers are divided into three categories, namely mainframe computer, minicomputer and microcomputer.

8. Computers can be used for (i) Creative music (ii) Data base (iii) Education (iv) Graphic design (v) Mathematical work (vi) Simulated work (vii) Word processing.

9. Fortan was the high level language suited to scientific applications that emerged in 1957.

10. COBOL (Common Business Oriented Language) developed in the late 1950's to meet the requirements of commercial applications.

11. BASIC (Beginners All-purpose Symbolic Instruction Code) was developed in the early 1960s.

**Statements and facts regarding computer-aided instruction (CAI)**

1. Providing programmed instruction through the computer is called CAI.

2. In the 1960s, some universities used computers for presenting programmed instructional material.

3. In 1961 CAI was used in the University of Illinois in USA.

4. In 1966 Tondow used a computer to teach fifth graders.

5. In 1966, Schurdak used computer to teach a FORTAN course.

6. Again 1966, Patrick Suppes of Stanford University computerized tutorials in arithmetic and reading for elementary school children.

7. In generative CAI, the computer generates questions within a basic framework of a topic.

8. Computer Managed Learning (CML) is concerned with the use of computer to perform the tedious and time-consuming management tasks of learning.

9. For facilitating computer scoring, objective type questions preferably of multiple-choice and alternate responses are given.

10. The computer can be used as a test-item bank and for obtaining several different tests using the

item-bank.

11. By quickly reviewing the performance of the student in the previous courses, the computer can be used to suggest future courses for the student.

12. CML system is used to maintain records of students which is made available to them and their tutor.

13. The CML system can issue timely reports to students, teachers and administrators.

14. Based on student records, the CML system can give to the student vocational guidance.

15. Four administrative uses of the computer in education are: (i) Student administration (ii) Financial administration (iii) Resources administration and (iv) Library administration.

16. Some of the advantages of using CML are: (i) Saving in cost and resources (ii) Saving in time and effort (iii) Improving effec-tiveness of learning.

## Computer Education Programme in Schools in India

A Pilot Project on Computer Literacy and Studies in Schools (CLASS) was initiated in 1984-85 in 248 selected Secondary/Higher Secondary schools. The objective is to acquaint students and teachers with the wide range of computer applications and its potential as a learning medium. By the end of 1988-89, about 2600 schools had been covered. Sixty resource centres had been set up to train school teachers and provide support to the participating schools. Efforts have been made to start generation of indigenous software through NCERT, New Delhi. The Project is jointly co-ordinated and supported by the Department of Electronics, the Department of Education, Computer Maintenance Corporation (CMC) and the NCERT.

Under the existing arrangements, CMC Ltd., is responsible for procurement, installation and maintenance of hardware in schools, while NCERT is responsible for academic inputs including teacher training and monitoring through 61 Resource Centres, Engineering colleges and Universities throughout the country. The schools are selected by the government in consultation with the concerned state government.

In a review undertaken by the Ministry of Human Resource Development, a number of shortcomings, in its implementation were noticed. Chief of these shortcomings were:
* multiplicity of agencies involved
* instructions outside school hours
* inadequate training of teachers and inadequacy of instruc-tional material
* no set curriculum

Attempts are being made to remove these shortcomings.

## Concluding Remarks

hispite of the unprecedented impact of CAI on education in advanced countries, it has not made much headway in India. On account of several reasons, India has not been able to introduce CAI on a substantial scale. In fact, computers in education are hardly used by the teachers as a as their classroom instructional work is concerned. CAI must be tried out in selected areas of instruction in the first instance. It appears the in that near future, as the situation is, there are remote possibilities of the use of this new medium of classroom communication on an appreciable scale, ill our educational institutions. Resource crunch seems to be the greatest hurdle in this context. Classes are overcrowded and educational institutions in general lack suitable accommodation and basic equipment.

The introduction of computers in education is not a quick and easy path to follow. But to be at par with the developed countries we can hardly afford to ignore its importance in education. If we want successful introduction of this technology in education, a more comprehensive plan is needed to be developed to give the practical knowledge of basic skills to operate the equipment, understanding of basic principles and awareness of main applications, ability to design and prepare a software, etc., to the maximum number of teachers.

### 4.3.1 Personalized System of Instruction (PSI)

Personalized System of Instruction (PSI) or the Keller Plan was developed by Fred S. Keller in 1965. It is a plan of individualized instruction. Still it retains the merits of collective instruction to a great extent. It is felt that Keller plan is definitely a better approach to learning than the conventional spoon-feeding method of lecturing in the classroom. The plan is better suited for college level instruction.

*Chief characteristics:* The Keller plan is a sequence of three-step cycles of learning process with presentation, response and consequence arranged in such a way as to optimize learning. The course policy is explained to the students in the beginning and he is given the study guide. The flow chart in figure 8.3 explains the various processes involved in the Keller Plan.

The course content is roughly divided into (12-20) units which can be mastered by a student in about a week. The student is expected to master every unit at his own pace. The student first gets unit-1 along with the study guide. The study guide is prepared by the teacher. It gives explicit objectives which the student has to achieve. When the student has achieved the objectives, he will take the unit test.

The duration of the unit test is usually from 20 to 25 minutes and its scores are prepared in 5 minutes. Textbooks and study guides comprise the learning material. The structure and organization of a study guide includes instruction for each unit, behavioural objectives, procedure, text supplement and test questions. The procedure consists of what is to be read, where to look for, where rote learning is necessary and where comprehension is necessary For each unit, four equivalent but different forms of readiness tests are provided. The instructor goes from student to student and solves the problems of every individual. The student takes the readiness test provided he thinks that he has fulfilled the behavioural objectives. The test is scored in the presence of the student with his verbal clarifications. If he clears the test without any conceptual mistake, he is provided with the study guide for the next unit. Otherwise he has to attend to the areas requiring further study and appear for the test again. He is given the re-test, which may be old or new or on-the-spot constructed test depending upon the need. After completion, he goes for the next unit. After a little progress, some high pacers are selected from the students to act as proctors (internal as against external wherever possible). The proctors help the instructor in the one-to-one contact with the students when they are studying, and administering and scoring of the tests. Proctors are issued with proctors' guide sheets wherein their duties and the extra material they have to study is mentioned. Proctors are rewarded for their additional labour, interest and regularity. Each proctor is incharge of a certain number of peers (classmates).

There will be some review tests also to assess the of the students. Enrichment activities are also provided, which carry credit or motivational value. These enrichment activities include extension lectures, work visits or experimental work.

**Advantages of PSI**

Same of the advantages of PSI are:

1. Every student with all his intellectual, psychological, socio-economic status, interest and aptitude, is considered as a class in himself.
2. Students learn at their own pace rather than at the instructor's pace.
3. Maximum use is made of the tested concepts of educational technological methods, viz., feedback to the instructor and continuous formative tests.
4. It does not require costly sophisticated media of educational technology.
5. Environment of cooperation is built due to the taken cave of proctor's guidance.
6. Readiness of the students is taken care of.
7. Negative reinforcement, i.e., punishment is avoided.
8. Importance is given to the written word in the study guides and readiness test.
9. The students learn through self-learning.
10. Learning in the students is visible and the teacher acts as a learning facilitator.

Following points may be kept in view while making use of PSI:

1. In the very beginning, students may be explained the efficacy and usefulness of this system.
2. A handout on the scheme should be prepared and given to each student in the very beginning of the course.
3. Behavioural objectives should be specified.
4. A suitable textbook which satisfies most of the behavioural objectives should be selected and each student should be asked to possess this book.
5. The whole curriculum should be broken into units which can be mastered in about a week. The number of units will approximately be equal to the number of weeks available. Units need not be sequenced as in the curriculum or in the textbook.
6. Study guides for each unit should be prepared. Study guides will be structured in the following ways:
   (i) Introduction—Need and importance of the unit. Teacher's comments— summary or synopsis prerequisites.
   (ii) Behavioural objectives.
   (iii) Procedures—objective reference to the page or article numbers in the textbook. There may be portions marked for an individual for comprehension or rote learning, or for study only or for experimentation.
   (iv) Study questions for self-test by the learners.
7. Readiness tests—3 or 4 equivalent forms for each task, covering all objectives in that task should be written. Readiness tests should contain test items which are objective or subjective, descriptive or problem-solving type and/or performing an experiment or doing a job. The size of a test should normally be such that it takes 15-20 minutes for a student to attempt and 5-8 minutes for the instructor to check.
8. Proctors should be selected from any of the following, in order of priority— colleagues, research assistants who have passed the course, senior students, high pacer classmates called

as internal 'profits'. rfpossible* the proctors should be rewarded in some form. There should be one proctor for every 10 students.

9. Manuals for proctors, giving the page numbers of textbook or other references or supplementary text which the proctors can use in guiding the student, should be prepared. If the proctors are not from the students of the same class then the key to the readiness tests may also be included. A structured interview by the proctors with his peers may also be included.

10. Aprogress report indicating the desirable dates for assessing the different tasks should be prepared.

11. Marking policy, if any, should be decided.

12. PSI classroom should be arranged into four functional areas: (i) Quiet study, (ii) tutoring, (iii) test taking (iv) evaluation.

13. Some enrichment activity in the form of extension lectures, field trips, etc., may be planned.

14. The instructor should have weekly meetings with the proctors to discuss about any problem encountered, progress of the students and briefing of the proctors.

15. Feedback may be obtained from the students and the proctors, regarding their attitudes about PSI: one at the mid session to make any changes in the process and another at the end of the course.

16. The instructor should maintain a student-wise progress record and an anecdotal record for his future reference.

*Follow up:* The instructor should go through the anecdotal record to identify the bottlenecks. He may have to revise the study guides, readiness tests, proctors manuals, the procedure, the progress chart and records keeping.

It will be desirable that the teacher shares his experience with the faculty members and others outside his Institute through reports.

**Limitations and points of criticism**

1. Teachers may not have the necessary enthusiasm to try new ideas.

2. Teachers may feel that they are not rewarded for their work. *

3. Teachers may find it difficult to write specific behavioural objectives.

4. Teachers may feel satisfied with their existing teaching techniques.

5. Mastery of learning is ignored.

6. Adequate test or notes are not readily available.

7. The subject matter changes quickly.

8. There are large number of students in every classes.

9. Teachers are bound to give lectures for long hours.

PSI course is an interesting and rewarding job. At the same time it is not difficult to use. It does not require elaborate physical plant. It utilizes conventional classroom facilities. It easily adapts to the time provision in traditional courses-3 hours per week and proportionately for semester and trimester courses. It relies on traditional texts. Other hardwares and softwares of educational technology can be used in it.

**Learner-Controlled Instruction (LCI)**

This method of individualized instruction was developed by Robert Mager in 1951. It j is based on the belief that a student should be a source of significant input to the \ sequencing decision. It follows this approach, 'Let the students know that they could ask any question they wished about a topic, they wished to study, for example, electronics and let then get on with it using the instructor as a resource person.'

The most important feature of LCI is that it is a kind of Socratic dialogue in the reverse sense. In Socratic dialogue, the teacher leads the learner gradually to the desired goal but in learning controlled instruction, the learner leads the teacher to the . desired goal by asking questions.

Pointing out the importance of the learner in the instructional process, Mager observed, 'Although we pay verbal tribute to the business of taking the learner from where he is to some other place, we generally, fail to consult the learner in the matter except to ask him to help us to maximize the effectiveness of whatever sequences we have already decided upon.'

**Merits of learner-controlled instruction**

1. In learner-controlled instruction, the learner himself organizes the learning sequences according to his own mental abilities and this creates confidence in him.
2. It encourages reciprocal respect and a friendly emotional environment between the learner and the teacher.
3. Since the goals are set by the learners themselves, they become meaningful, realistic, satisfying and helpful in guiding their learning activities.
4. There is high motivation to learn because the need to learn emerges from the curiosity of the learner.
5. The teacher carefully studies the interests and needs of the learners in order to help them to realize their goal.
6. The activities and experiences of the learners are enriched and supplemented by the use of related materials.
7. The learner engages in active and real life experiences which are related to one another.
8. There is continuous evaluation of the learner and the programme.

**Demerits**

1. Developing a programme in learner-controlled instruction is very costly and time consuming.
2. No two individual learners are alike and this would necessitate the writing of the programme for the learner every year.
3. The learner may not be able to sequence his learning task.

## 4.3.2 Security Awareness Instructor (SAI)

The SAI is a modern, professional certification which assures applicable knowledge, skills, ethics, approach, and responsibility for teaching security. The SAI focus is on the method for assuring a quality training.

### 4.3.3 Modular Teaching Approach

Modular teaching is one of the most popular teaching-learning techniques in the West as well as in Asia. The approach is used in almost all subjects such as natural science, education, social science and computers. It is a recent development based on programmed learning. It takes into account the learning capability of a learner, which necessitates the planning for adoption of the most appropriate teaching techniques to help the individual grow and develop at one's own space.

Characteristics of a modular approach are: (i) Should be independent (ii) Self-contained
(iii) Self-instructional
(iv) Well defined
(v) Clear in objectives
(vi) Concerns individual differences
(vii) Have systematically organized learning opportunities (viii) Utilizing all types of media
(ix) Active participation by learners
(x) Immediate reinforcement of responses
(xi) Mastery of evaluation strategy
(xii) Evaluation of work

The approach should have some basic components, such as:

(a) **Rationale:** A complete and clear picture of the module and clarity of the need for the study.
(b) **Objectives:** The probable outcome of the module, which should be stated in terms of behaviour and performance.
(c) **Entry test:** To evaluate whether the learner has prerequisite skills to enter the module.
(d) **Multi-media material:** Utilization of the available variety of media to actively involve learners.
(e) **Learning activities:** A variety of learning activities can be used to catch the attention of the learners, such as, presentation, demonstration, drill, stimulation and problem solving.
(f) **Self-test:** A process to review and assess one's progress.
(g) **Post test:** To check whether the objectives have been attained.

Analysing the modular approach to teaching, it becomes clear that it is a more effective, updated and technology-based method. It provides flexibility to distance teaching mode as well as to learners.

## 4.4   SUMMARY

In this unit, you have learnt that:

- Some of the important technologies in education that have combined to make the communication revolution and information age a challenging era for educators are: (i) Computers (ii) Video (iii) Telelecture (iv) Teleconferencing (v) Videotex (vi) Internet (vi) Artificial Intelligence.

- AI is a branch of computer science that deals with the task of making intelligent machines that can perform better than humans.

- ROM is a semi-conductor memory device which is used to store information of a permanent

nature. It is non-volatile memory which means that retains the stored data even when the power to the device is shut off.

- Dial access is a round-the-clock delivery system through which callers can get access to a vast library of audio cassettes.
- Teleconferencing or interactive television is a two-way electronic communication between two or more groups or three or more individuals who are at separate locations.

- The three types of teleconferencing are: (i) Audioconferencing (ii) Videoconferencing (iii) Audiographic teleconferencing.

- Telelecture is primarily a one-way information transmission taken by its teacher with a very limited opportunity of questions or comments.

- Video is an important medium of learning which is being used on a large scale in modern times. Video technology allows playback of programmes.

- Videotex involves the transmission of display text and graphics and their reception on a television set. Videotex is of two types: (i) Broadcast Videotex (Telecast), and (ii) Interactive Videotex (View Data).

- Video-teleconference is a teleconference that includes video communications.

- Recently virtual university has come into existence. People are studying in virtual classrooms. One need not travel to other countries for educational purposes.

- Internet is the abbreviation of inter-network systems and is described as a network of the computer system.

- The Internet which began in 1968 in the United States Depart-ment of Defence Research is a new communication technology that is affecting bur lives in a scale as significant as the telephone and the television.

- Some of the abilities and skills needed for the Internet are: (i) Basic knowledge of computer, (ii) Familiarity with multimedia software (iii) Familiarity with Internet software (iv) Communication with the resource person.

- Computer Assisted Instructions (CAI) aid the learning process in the following ways: (i) By asking questions (ii) By stimulating processes, (iii) By doing difficult calculations, (iv) By providing information from a large store.

- A computer is a power-driven machine equipped with keyboards, electronic circuits, storage, compartments and recording devices for the high speed performance of mathematical operations.

- A Pilot Project on Computer Literacy and Studies in Schools (CLASS) was initiated in 1984-85 in 248 selected Second-ary/Higher Secondary schools. The objective is to acquaint students and teachers with the wide range of computer applications and its potential as a learning medium.

- Personalized System of Instruction (PSI) or the Keller Plan developed by Fred S. Keller in 1965 is a plan of individualized instruction. It is felt that Keller plan is definitely a better approach to learning than the conventional spoonfeeding method of lecturing in the classroom.

- Learner Controlled Instruction is an individualized instruction which' was developed by Robert Mager in 1951. It is based on the belief that a student should be a source of significant input to the sequencing decision.

- Modular teaching is one of the most popular teaching-learning techniques in the West as well as in Asia. The approach is used in almost all subjects such as natural science, education, social science and computers.

## 4.5  KEY TERMS

- **Artificial Intelligence (AI):** AI is a branch of computer science that deals with the task of making intelligent machines that can perform better than humans
- **Dial access:** Is a round-the-clock delivery system through which callers can get access to a vast library of audio cassettes.
- **Teleconferencing:** Is a new form of video-based communication via telephone lines or satellite broadcast.
- **Videotex:** Is an information service in which data is transmitted over television cables or telephone lines and displayed on a television or computer screen.

# 4.6 ANSWERS TO 'CHECK YOUR PROGRESS'

1. Some of the equipments needed in teleconferencing are:
    (i) Satellite transponder
    (ii) Stubs
    (iii) A studio uplinked with the earth stations that can uplink the programme to the satellite and reception centres with direct reception facilities which can download the programmes uplinked from the studio of the stub.
    (iv) Telephone
    (v) STD
    (vi) Computer network

2. Some of the benefits of teleconferencing are:
    (i) Teleconferencing enables the possibility of holding meeting that could not otherwise have taken place due to financial, time or other such constraints.
    (ii) It enables visual participation of remote students.
    (iii) Teleconferencing connects educational facilities worldwide by imparting distance learning and employee training.

3. Some of the merits of a videotape recorder are:
    (i) Tape can be played back as soon it is made, (ii) Tape can be erased
    and re-used several times, (iii) It is easily distributed and used.

4. Some of the facilities offered by the Internet are:
    (i) Transfer of files among computers and using file transfer protocol.
    (ii) Access to another remotely located computer through one's own computer.
    (iii) E-mail

5. Some of the abilities and skills that are needed for the Internet are:
    (i) Basic knowledge of computer.
    (ii) Familiarity with multimedia software.
    (iii) Familiarity with Internet software.
    (iv) Storing and retrieving information from the Internet and multimedia.
    (v) Communication with the resource person.

6. Fred S. Keller developed the Personalized System of Instruction (PSI) or the Keller Plan.

7. Some of the merits of learner-controlled instruction are:

    (i) In learner-controlled instruction, the learner himself organizes the learning sequences according to his own mental abilities and this creates confidence inhim. (ii) It encourages reciprocal respect and a friendly emotional environment between the learner and the teacher, (iii) The activities and experiences of the learners are enriched and supplemented by the use of related materials. (iv) There is continuous evaluation of the learner and the programme.

## 4.7    QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is artificial intelligence?
2. List the merits of dial access.
3. Write short notes on (a) teleconferencing (ii) interactive video (iii) videotex.
4. List the merits of using the Internet.
5. What are the limitations of computer-assisted instruction (CAT)?
6. Write a short note on computer education programme in schools in India.

Long-Answer Questions

1. Explain the classification of teleconferencing according to the media used.
2. What is a virtual university?
3. Describe the working of the Internet.
4. Explain briefly the use of computers in imparting education.
5. What are the merits and demerits of the personalized system of instruction (PSI)?
6. What is a learner-controlled instruction?

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# Institute of Distance Education

## Rajiv Gandhi University

*A Central University*

Rono Hills, Arunachal Pradesh