1 BED.SOCIAL SCIENCE UNIT 6

Dear students, Programmed Instruction or programmed Learning is one of the most innovative, highly individualized, systematic and very recent type of teachinglearning process. It is often referred as auto- instruction and is extremely useful for self learning and equally beneficial for class room instruction as well.

This type of Instruction actually started during the era of Aristotle and the process of Programmed Learning was for the first time practiced by Plato but this kind of Instruction could not progress due to lack of resources at that time. In 1954 James Howard and B F Skinner developed the Auto instruction Method which fashioned the base for Programmed Learning.

For the first time in 1963 NCERT started the preparation of Material for programmed Instruction / Learning and sincere attempts were made for the use of programmed instructions in the class room and in providing programmed study material to the students of distance education.

At present suitable self- instructional programmed materials have been prepared for different subjects and grades which are used by different students for self instructional Purpose. Programmed learning is extensively used in the teaching learning process of all those subjects which include practice and drill work and require logical and systematic study.

Objectives

Dear students, after reading this lesson, you should be able to:

a) Discuss the concept and meaning of Programmed Instruction / Learning;

b) Discuss the contribution of Skinner, Mager, Gilbert in Programmed Instruction;

c) What are the fundamental principles of programmed Instruction;

d) Understand different types of programmed Instruction

e) Discuss the Research trends in programmed learning;

Background Information

We cannot understand the present day status of instructional technology without examining its early beginnings and the origins of current practice. Programmed Instruction was an integral factor in the evolution of the instructional design process, and serves as the foundation for the procedures in which instructional technology professionals now engage for the development of effective learning environments. In fact, the use of the term programming was applied to the production of learning materials long before it was used to describe the design and creation of computerized outputs

. Romizowski (1986) states that while Programmed Instruction may not have fulfilled its early promise, "the influence of the Programmed Instruction movement has gone much further and deeper than many in education care to admit" (p. 131). At the very least, Programmed Instruction was the first empirically determined form of instruction and played a prominent role in the convergence of science and education. Equally important is its impact on the evolution of the instructional design and development.

Origin of Programmed Instruction

Although attempts at processes resembling programmed instruction date back to the 1920s (Pressey, 1926), the actual term is probably derived from B. F. Skinner's (1954) paper, "The Science of Learning and the Art of Teaching," presented at the University of Pittsburgh's conference of Current Trends in Psychology and the Behavioral Sciences on March 12, 1954.

Skinner's remarks reflected his reaction to a 1953 visit to his daughter's fourth-grade arithmetic class (Vargas and Vargas, 1992). Skinner (1954, pp. 90–91) argued that schools were unable to accomplish the type of teaching that eventually leads to original thinking because:

• Schools relied on aversive stimulation or control; as Skinner described it, childrenworked to "avoid or escape punishment."

• Schools did not pay attention to the contingencies of reinforcement.

• Schools lacked a systematic plan for learning skills, or, in Skinner's words, "a skillful program which moves forward through a series of progressive approximations to the final complex behavior desired."

• Schools too infrequently provided reinforcement.

Skinner suggested a systematic plan—or programmed instruction—as the vehicle to accomplish the changes that needed to occur in classrooms, and in his description of that plan he made two statements that illustrate the importance of instructional design and its relationship to technology. He stated that "education is perhaps the most important branch of scientific technology" (1954, p. 93), and "in the present state of our knowledge of educational practices, scheduling [of behaviors and consequences] appears to be most effectively arranged through the design of the material to be learned" (p. 94, emphasis added).

Skinner was at the forefront in articulating the need to accomplish this scheduling of behaviors and consequences and a program for effective and efficient learning through operant conditioning. Operant conditioning is a form of conditioning that reinforces desired behavior and it is this behaviorist theory that forms the basis for programmed instruction.

During the 1950s, educators and psychologists became concerned that the mass schooling precipitated by increasing demands on public education were not meeting an individual's needs for personal attention in the learning process, and they suggested that teaching machines could restore the "important features of personal instruction" (Skinner, 1986, p. 103).

Additional teaching machines were introduced in the 1960s, largely as a result of the success of programmed instruction. A variety of simple machines were introduced, including Skinner's teaching machine, the Porter device, the Bell device, the punchboard, the Subject Matter Trainer by Briggs, the Arithmetic Machine by Skinner and Zeaman, and the Polymath by Rothkopf (Ysewijn, 1993).

During the 1970s and 1980s, as the first computers were being placed in the classrooms of many schools, behavioral theories became quite popular. Advances in programming and computer technology also spurred the popularity of

programmed instruction by making it possible to teach a wide range of topics and skills.

During this period programs for nearly every topic covered in a traditional school curriculum (i.e., math, science, language arts, social studies) were written for a variety of teaching machines (which eventually gave way to the personal computer) (Chen, 2006). Programmed instruction is now generally considered to be one appropriate instructional approach among many, and most appropriately utilized in conjunction with a variety of other instructional methods.

Meaning of Programmed Instruction

Programmed instruction / learning simply means learning performed or instruction provided by a teaching Machine or programmed textbooks. In order to understand the meaning of programmed instruction we will through light on some definitions of programmed instruction put forward by different scholars:

Smith and Moore (1962): Programmed instruction is the process of arranging the material to be learned into a series of sequential steps, usually it moves the students from a familiar background into a complex and new set of concepts, principles and understanding.

Leith (1966): Programmed 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 queuing is applied and each response is verified by the provision of immediate knowledge of result. Such a sequence is intended to be worked at the learners own pace as individualized self instruction.

Jacobs and et al (1966): Self-instructional programmes are educational materials from which the students learn. These programmes 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.

Espich and Williams (1967): Programmed instruction is a planned sequence of experiences, leading to proficiency in terms of stimulus responses relationship, that have proven to be effective. Susan Markle (1969): It is a method of designing a reproducible sequence of instrumental events to produce a

measurable and consistent effect on the behaviour of each and every acceptable student.

Gulati and Gulati (1976): Programmed learning, as popularly understood, is a method of giving individualized 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 fallow the laws of behaviour and validate his strategy in terms of student learning.

Owing the above definitions we came to the conclusion that Programmed instruction / learning is a systematically planned, empirically established and effectively controlled self-instructional technique for providing individualized instruction to the learner through logically sequenced small segments of the subject matter by using the principles of operant conditioning and schedules of reinforcement.

6.1 Principles of Programmed Instruction

The fundamental principles of a good programmed learning strategy are as under:

1. Principle of Small Steps: It is a well known fact that a learner learns better it the content matter is presented to him in suitable small steps. Therefore, in programmed instruction the subject matter is divided into sequenced and meaningful very small steps called frames, which are presented to the learner one at a time for responding.

2. Principle of Active Responding: In Programmed Instruction a learner is provided information in frames and he is supposed to be very active in responding to the individual frames as the learner is provided only one frame at a time and is allowed to proceed further only on completing the previous frame, thereby keeping him active and meaningfully busy throughout the programme.

3. Principal of Immediate Reinforcement: The learner understands better when he is motivated to learn by receiving the information of the result just immediately after responding, which is also in accordance with the psychological phenomenon of reinforcement in learning. In programmed instruction it is important to provide

immediate results of individual frames so that the learner will get appropriate reinforcement in time.

4. Principle of Self-pacing: The concept of programmed Instruction has actually emerged on the concept of providing learners an opportunity to learn at their own pace. The programme should be prepared keeping in view the principle of self-pacing, so that the learner can respond and move from one frame to another according to his own speed of learning.

5. Principal of Student –testing: In programmed learning as the learner gets the results of his learning while the process of learning which provides him continuous evaluation of his own learning. In this process the learner has to leave the record of his own response because he is required to write a response for each frame on a response sheet. This detailed record helps in revising the programme and acts as a source for studying and improving the complex phenomenon of human learning

6. 1 Types of Programmed Instruction

Programmed Learning / instruction can be broadly divided into following types on the basis of researches and experimental studies in the field of programmed instruction:

1. Linear or Extrinsic Programming

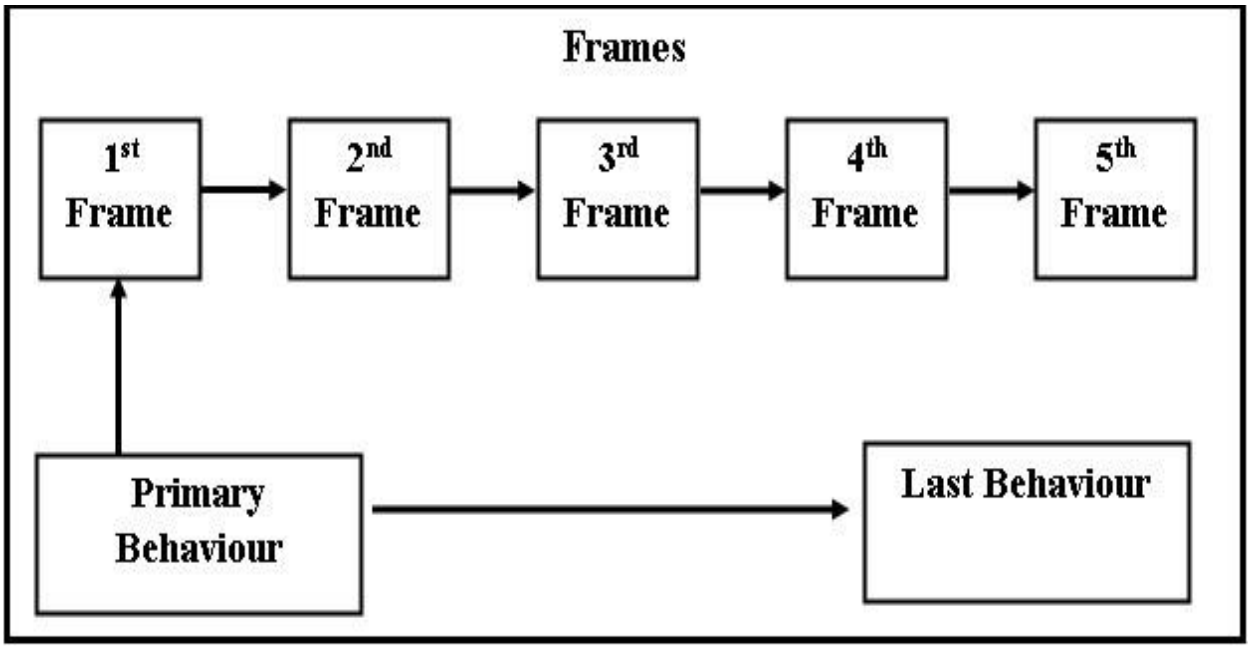
2. Branching or intrinsic Programming

The first two types, Linear or Extrinsic Programming, Branching or intrinsic

Programming programming represent the actual Programmed Instruction;

6. LINEAR AND BRANCH PROGRAMMING IN PROGRAMMED LEARNING

The credit of linear programming style goes to B. F. Skinner. Linear programming style is related to “operant conditioning”. Operant conditioning states that human behavior is shaped through suitable reinforcement to the responses. It tells that “A Certain direction can be given to human behavior”, for this purpose activities is needed to divide in small parts and make their analysis. It is a gradual process and the responses are conditioned in a step by step manner.



In a linear programme, learner's responses are controlled externally by the programmer sitting at a distant place. A linear programme is called a straight line programme as the learner starts from his initial behaviour to the terminal behaviour following a straight line. The student proceeds from one frame to the next until he completes the programme. linear programme immediately reinforces student responses that approach the learning goal. Responses that do not lead toward the goal go unreinforced. Each bit of learning is presented in a "frame," and a student who has made a correct response proceeds to the next frame. All students work through the same sequence, and a low rate of error is necessary to ensure continued positive reinforcement of correct responses.

Fundamental Principles of Linear Programming

Linear programming is based on five fundamental principles-

1. Principles of small step.
2. Principle of Active responding.
3. Principle of immediate confirmation.
4. Principle of self-pacing.
5. Principle of student testing.

In this type of sequencing all students read and respond to the same frames.

The sequence is linear in that there is a single line or path for all students to follow.

Characteristics of linear programme

1. Linear are exposed to small amount of information and proceed from one frame to one item of information, to the next in an orderly fashion.

2. Linear responds overtly that their correct responses can be rewarded and heir incorrect responses can be corrected.

3. Linear are informed immediately about whether or not their response is correct (feedback).

4. Linear proceed at their own pace (self-pacing). Others characteristic of Linear programme

1) Linear means proceeding in a straight line. In linear programme generally, information is broken into small steps of 40-50 words in length which is called a frame. The learner must respond to each frame in succession by filling in word or phrase in a blank.

2) Linear Arrangement: In such type of programme, the learner advances in a single series of shorts steps which are designed to ensure high rate of correct responding to the questions (frames). Same path is followed by each learner. The

learner starts from initial behaviour to the terminal behaviour following straight-line sequence. All learners pass through the same path.

3) Responses are controlled. In a linear programme, responses are controlled by the programmer. The responses and their order are fixed. The learner has no choice to respond in his own way.

4) Response is emphasized. In linear programme, the emphasis is laid on response. The learner must respond to each and every in order the learning to occur.

5) Feedback is quick. As soon a s the learner responds to the frame he can immediately compare his response with the response f the programme. Learners are informed immediately about whether or not their response is correct

6) Provision for prompt. In the beginning, prompt or cue can be supplied to facilitate learning too occur.

7) Cheating is discouraged by not revealing the answer to the learner.

8) Learners proceed at their own pace. Learner can skip certain frames.

9) Responses are self-constructed. Learners respond overtly so that their correct responses can be rewarded and their incorrect responses can be corrected Advantage of Linear Programming

➢ The assumption behind the linear programming is students learns better if content is presented in small units, students response if immediately confirmed, results in better learning, Student's error create hindrance in learning, Student learns better in Laissez fairy environment.

➢ Frame size in small steps; include only one element of topic at a time. Each step is complete in itself. It can be taught independently and can be measured independently. Frame structure is based on stimulus-Response- reinforcement. There are four types of frames. Introductory frames, Teaching frame, practice frames and testing frames.

➢ Responses in linear programming are structured responses and these are controlled by programmer and not by learners. Immediate confirmation of correct responses provide reinforcement, wrong responses are ignored.

➢ It is used for secondary level students, used for achieving lower objectives of learning especially for recall and recognition, useful for student of average and below average intelligence can be used in Distance education program.

Limitations of Linear programming-

1) Lack of motivation: It is alleged that learning becomes dull and learner experiences monotony and boredom. It takes too much time to teach a few points.

2) Freedom of choice is curtailed: The learner has no choice of his own to respond, thus it s alleged that creative imagination of learner is inhibited.

3) Costly: It has been found that preparation of programmed material requires too much paper and time.

4) Blanks and key terms are guessed: Rothkopf is of the opinion that in many programmes, the learners find out the cues as to what is to be filled in blanks and key terms are guessed

5) It can be used in limited areas: Where the behaviour is measurable and observable such as Maths and science.

6) Searching of material is not permitted: as in a textbook. Judgmental learning is not practiced. c) Does not permit differentiation among responses: No freedom for student to response.

7) Students follow a rigid line prescribed by the programmers: Every learner has to follow the same path; therefore, student may cheat from one another.

8) It is very difficult to find out exactly the background of each learner : Programmes are generally designed with a view that learner has no previous background of the subject matter..

9) In book form presentation: learners are expected to be honest but from all learners we cannot expect honesty. They can see the correct response without reading the frames.

10. Based on learning theories which were formulated by experience conducted on animals. A human being is more intelligent, than animals, he has got an intelligent brain.

11. Wrong responses are avoided in the program: No remedy is provided for them. Branching Programming

Branching Programming

The founder of Branching programming is Norman A Crowder, hence it is also known as Crowderian Model. It is based on configuration theory of learning. It is a problem solving approach. It is stimulus centered approach of learning. As the word “branching” means the subdivision the stem or trunk. The same concept is applied in the branched programming instruction style.

The main concept (the trunk of the tree) is sub divided into smaller concepts (the stems of the tree) and further again to other minute details of the topic. Norman A Crowder has given its definition as ―It is a programme which adapts to the needs of the students without the medium of extrinsic device as a computer.‖

It is called intrinsic because the learner within himself makes the decision, to adapt the Learning to his/her needs. The rationale of intrinsic programming postulates that the basic learning takes place during the student‘s exposure to the new material on each page. In branching programme, the learning material is divided into ‘‘units‘ of material called ‘‘frames‘.

Much information, one or two paragraphs or even a page, is provided in a frame. Thus each frame is quite larger than that employed in linear programme. The learner goes through the frame. After that he is required to respond to multiple choice questions associate with the learning material of the frame.

The learner moves forward if he answers correctly but is diverted (branched) to one or more remedial frames if he does not. These frames explain the matter afresh, ask him questions to elicit the right answer and reveal his previous mistakes, and then return him to original frame. This cycle goes on till the learner passes through the whole instructional material at his own pace.

Each Content frame includes the following:

a) Repeating student response

b) Positive confirmation

c) New information‘

d) Question

e) Alternatives followed by page numbers, where the student should go next. Each Remedial frame includes the following :

a) Repeating student response

b) Negative confirmation

c) Reasons why he is wrong

d) Further explanation in simple language

e) Directions as to where the student should go next.

Features of Branching programme

1) Material in a frame is larger; much information is presented at each step. A step may consist of two or more paragraphs and sometimes a full page.

2) The method of student response is different than that of linear model; student has to make choice out of several choices. Multiple-choice question are asked. Each response to the question is keyed to different pages.

If the learner selects correct response, his response is confirmed and in case he selects wrong response, then he routed to material which explains as to why he is wrong.

3) Crowder holds that teaching is communication and so he concentrates his attention upon the improvement of communication.

4) Learner has freedom to choose his own path of action according to the background of subject matter. The learner controls the exact sequence that he will follow.

5) The programmer has ample opportunity to exploit the literary style.

6) Student is more alert and concentrates on the subject matter more carefully.

7) Detection and concentration of errors is important. Crowder holds that making error is basic to learning. He permits 20 percent errors in his model. In such a model first the errors are detected and then corrected.

The learner knows why he is wrong. Crowder says that it is impractical to eliminate errors in the process of learning

8) The crucial and identifying feature of branching model is the fact that the material presented to each student is continuously and directly controlled by the learner‘s performance in answering questions.

9) Intrinsic programmed material when presented in a book form, the book is called scrambled book because the pages do not follow in a normal sequence.

10) It is very useful to concept learning or where the material is given I larger steps.

11) The role of active response is not central in intrinsic theory. Intrinsic programme offer less guidance to learner as to what material in the frame is important.

The best known branching technique is called intrinsic programming. Its major characteristics are:

▪ Frame size is large.

▪ There may be a Para or page in the frame.

▪ It consists of rather long frames which often appear as pages in an ordinary textbook.

▪ The student reads the page (or frame) and then responds by selecting the correct alternative in a three-alternative multiple-choice item.

▪ Each alternative is associated with a page number which directs the students to another frame.

▪ Frame structure is Exposition.

Fundamental Principles of Branching Programming

1. Principle of Exposition,

2. Principle of Diagnosis,

3. Principle of remediation.

The advantages of branched programming instructions are as follows –

1. In this format the student proceeds to the next frame until he makes an error. The errors branch him to supplementary material designed to give him remedial instruction

2. The center of the teaching – learning process is the learner and not the facilitator or the instructor.

3. The learner learns with his or her own speed and pace.

4. Much of the learning takes place when freedom is give to the learners. In branched programming style freedom is given to the learners so that they can learn at their own pace.

5.Learning is done when the new concepts are revised. The learner gets an opportunity to travel to and fro in the newly learnt content. If the responses given by the learner are not up to the mark, the learner can start learning the content from which he or she has not understood. The correct responses are appreciated there by internally motivating the learner to grasp the content till the end.

Limitations of Branching programming

1) The learner may guess the correct response without understanding the subject matter of the frame.

2) Infinite branching cannot be provided. It cannot cater to the needs of the individuals. It is very difficult to find out the total number of branches for each individual.

3) Cost of preparation is high, audio-visual equipment is costly.

4) The programme needs revision after every two years which is a very costly affair.

5) Programmes are the product of programmer‘s imagination and it is he who decides diagnostic questions and level of content.

6) Branching model can be used after sixth grade the grade because small children do not follow its mechanism.

7) It is very difficult to ask questions on the whole matter of the frames because the frames are too large and sometimes important subject matter is left.

8) It does not consider learning process whether learning is taking place or not. Main emphasis is on diagnosing the weakness of learners and providing remedy to them.

9)There is no sequencing of pages. Student finds it difficult to follow the steps. He does not find it exciting or motivating, therefore he does not want to go through these pages.

10) More emphasis on remediation rather than teaching. Hence, it is only a tutorial approach.

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Computer Aided Instruction:

CAI as the name suggests, stands for the type of instruction aided or carried out with the help of a computer as a machine or CAI is the type of instruction which make use of computers. CAI is the method of instruction in which there is a purposeful interaction between a learner and the computer device (having useful instructional material as software) for helping the individual learner achieve the desired instructional objectives with his own pace and abilities at his command. It is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place.

Definitions:

Bhatt and Sharma (1992):-"CAI is an interaction between a students, a computer controlled display and a response entry device for the purpose of achieving educational outcomes." Hilgard and Bower (1977):-"computer-assisted instruction has now taken as so many dimensions that it can no longer be considered as a simple derivative of the teaching machine or the kind programmed learning that skinner introduced."

Characteristics Of CAI:

1. In CAI there are two way interactions between an individual student and the computer just as happens in the tutorial system between the teacher and an individual student.

2. The computer is able to display the instructional material to the individual student.

3. The individual student takes benefit of the displayed material and responds to it. These responses are attended by the computer for deciding the future course of instruction displayed to the learner.

4. The interaction between the individual learner and the computer device helps in the realization of the set instructional objectives.

Computer Assisted Instruction (CAI)

Computer Assisted Instruction

Terminology

Use of computer in education is referred by many names such as

• Computer Assisted Instruction (CAI)

• Computer Aided Instruction (CAI)

• Computer Assisted Learning (CAL)

• Computer Based Education (CBE)

• Computer Based Instruction (CBI)

• Computer Enriched Instruction (CEI)

• Computer Managed Instruction (CMI)

New Terminology

Web Based Training

• Web Based Learning

• Web Based Instruction

Computer-based education (CBE) and computer-based instruction (CBI) are the broadest terms and can refer to virtually any kind of computer use in educational settings. Computer-assisted instruction (CAI) Computer Aided Instruction (CAI) is a narrower term and most often refers to drill-and-practice, tutorial, or simulation activities. Computer-managed instruction (CMI) Computer-managed instruction is

an instructional strategy whereby the computer is used to provide learning objectives, learning resources, record keeping, progress tracking, and assessment of learner performance. Computer based tools and applications are used to assist the teacher or school administrator in the management of the learner and instructional process.

Computer Assisted Instruction (CAI)

A self-learning technique, usually offline/online, involving interaction of the student with programmed instructional materials.

Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place.

CAI uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum.

CAI refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.

Typical CAI provides

1. text or multimedia content

2. multiple-choice questions

3. problems

4. immediate feedback

5. notes on incorrect responses

6. summarizes students' performance

7. exercises for practice

8. Worksheets and tests.

Types of Computer Assisted Instruction

1. **Drill-and-practice** Drill and practice provide opportunities or students to repeatedly practice the skills that have previously been presented and that further practice is necessary for mastery.

2. **Tutorial** Tutorial activity includes both the presentation of information and its extension into different forms of work, including drill and practice, games and simulation.

3. **Games** Game software often creates a contest to achieve the highest score and either beat others or beat the computer.

4. **Simulation** Simulation software can provide an approximation of reality that does not require the expense of real life or its risks.

5. **Discovery** Discovery approach provides a large database of information specific to a course or content area and challenges the learner to analyze, compare, infer and evaluate based on their explorations of the data.

6. **Problem Solving** This approach helps children develop specific problem solving skills and strategies.

Advantages of CAI

• one-to-one interaction

• great motivator

• freedom to experiment with different options

• instantaneous response/immediate feedback to the answers elicited

• Self pacing - allow students to proceed at their own pace

• Helps teacher can devote more time to individual students

• Privacy helps the shy and slow learner to learns

• Individual attention

• learn more and more rapidly

• multimedia helps to understand difficult concepts through multi sensory approach

• self directed learning – students can decide when, where, and what to learn

Limitations of CAI

• may feel overwhelmed by the information and resources available

• over use of multimedia may divert the attention from the content

• learning becomes too mechanical

• non availability of good CAI packages

• lack of infrastructure