Chapter 4

Computer Aided Instruction – An Overview
CHAPTER-4

COMPUTER AIDED INSTRUCTION – AN OVERVIEW

4.1 INTRODUCTION

Computer is the finest and most important gift of science and technology to the mankind. It has done miracles in almost all walks of life. Today there is no aspect of our life which has remains untouched with the use and application of computers. In the field of education too, these are being used for managing its affairs including the actual teaching. With the introduction of New Educational Policy in 1986, our country also has taken initiative for making their use in the teaching learning activities.

Now-a-days computers are being used in almost every sphere of life including education. They are also used in research work in various areas of economics, population growth studies, family planning, psychology, history, geography and sociology. They are used for educational and managerial purposes. It is also used for drilling and practicing tutorials by the students. They are used for simulation and instructional games. Computers are rapidly being installed in Schools for teaching computer literacy, computer assisted instruction and for specific computer programming courses. The growth of computers in schools is based on a vision of improving pupil's school performance and altering the way of learning.

Computers are one of the powerful tools to facilitate learning and motivate the students. Computer has versatile use as a teaching aid. It can provide graphics along with texts and it also has got the facility for emitting sound. Thus, it provides stimulus variation. It can store questions for classroom use by the teacher. It can also enable the learners to evaluate their own answers in the absence of teachers. Though modern society is becoming more and more dependent on information technology in general,
there is need to develop self-study devices, which can supplement class room
teaching, so that the students can get more and more knowledge. No doubt,
computers have the potential to improve the class-room teaching and other
tasks related with education.

Computers in the classrooms are being used as powerful new
laboratories that permit faculty members to present information and instruction
in a way which was not previously possible. With computers in classrooms,
both the students as well as the instructors are involved and thus make the
educational process more effective and efficient. Their use can lead to
improve student's performance in thinking logically, formulating problem
solving procedures and understanding relationships. Computer programmes
allow students to improve those skills by participating in classroom exercises
that closely stimulate real world experiences. Such instructional stimulations
are particularly useful in situations where firsthand experiences are not
available and are not appropriate or are too expensive and risky.

Educators agree that the computers are powerful motivating learning
tools in schools and homes. Through animation and simulation facilities,
computers help the students in developing different mental abilities to process
with their lessons at their own pace through CAI. Computers can also be used
to perform difficult educational experiments to make them accurate and
harmless.

4.2 COMPUTERS AS A MEDIUM OF INSTRUCTION

With the advancement of modern technology in the world, it is more
urgent to use new pedagogy and also to develop efficiency in the way, the
students learn. There is a need to renovate our teaching methods to make
class room teaching effective. Most of the changes have been attributed to
the "information revolution". Many of the transformations taking place are
associated with the much rapid flow of information and greater capacity for its
storage. In the present information technology system computers have a pivotal role to play. Computer has a significant place in the teaching learning process. The following points will prove its utility in teaching learning process.

**Fig. 4.1 : Computer as a medium of Instruction**
4.2.1. Drill and Practice

The reliable presentation of the content matter again and again without restlessness helps the learner to practice. Computers have a large efficiency to provide the same content matter at any given time according to the interest of the learner. Computers provide maximum opportunities to drill and practice the matter up to the learner mastery level.

Computer programming is a much effective tool to improve skills of students not only in thinking but also in problem-solving, hypothesis formulation, and developing techniques for testing hypotheses. LOGO was developed in USA at Massachusetts Institute of Technology. Computers can be used effectively for drill and repeated practice on the concepts that have been taught by a teacher. A formula learnt in the classroom can be effectively drilled at the home with the help of a computer.

4.2.2 Simulation and Animation

Simulation mode of the computer is one in which the real world is represented as a model. The interaction may be either a straightforward simulation or a game. Interacting with a simulation/game, a student can get the real experience and insight.

Computer simulations are very much useful in education, especially in case of science, engineering and medical lessons. Topics such as gaseous diffusion, gravitation, interference and diffraction patterns of light waves, motion of satellites, etc., can be very well taught with the help of simulations. Animation tools provide sound and motion to individual graphic elements. Three-dimensional animations for instance computer aided design (CAD) are much helpful for students of architecture and engineering. Power point presentation with the help of a projector is more effective than the presentation with the help of transparencies and overhead projector. The
animation can take form such as flying of the text, flying of each character with or without sound, type writer text, reverse text etc., These help in making the presentation more colorful, especially in case of large audience consisting of students, peers and so on.

4.2.3 Problem Solving Skill

Besides teaching programming as an end in itself, the other widely held purpose for teaching elementary and secondary students is to improve their problem-solving and logical thinking skills. Programming is generally and popularly seen to have several intellectual and creative benefits. LOGO is a language which provides the children to think over the problem and to solve it. The critical thinking of the students helps to solve the problem. The children learn programming through the process of discovery. Therefore, what the child programmes at the beginning, need not necessarily be what the child actually desires to see on the screen. Through trial and error, the child eventually learns how to achieve what they want.

4.2.4. Networking

The term, networking, refers to several different concepts in educational computing. In one type of networking, hardware and software systems permit two or more central processors to share control of peripheral equipment, such as, storage disks or printers. The other type of networking includes the ways in which students and teachers use computers to communicate with each other, sometimes, across great physical distance. By using computer network it is possible to bring the educational institutes together. Local area network system of computer hardware can be hooked together in a single room or a building.

Computer as a medium of instruction is useful in developing the various activities of the individual.
4.2.5 Storing and Classifying Information

Students have access to large reference materials available on websites and prepare their notes, summaries for further use. They can also communicate their products and views to others. This storage and classification facility empowers the teaching learning-process to be more effective.

4.2.6 Improving Self-Learning

There are computer softwares that provide more student-centered teaching methods and more co-operative learning groups. These are much beneficial for special needs of students. A student using a computer cannot be a passive learner as it can happen in case of listening to classroom lectures. Computer can provide stimulus variations leading to individual-tailored learning. The principles of programmed learning i.e. active responding, student testing etc., can be utilized much better in CAI tailored to individual learner's learning need.

4.2.7 Developing Language Skills

Computer software can be so designed that it can correct students' mistakes in their expressions and provide feedback in language learning activities. Vocabularies can be taught and developed more efficiently on computers as an easy access to them and can be arranged using their pre-storage in the memory of the computer. Various functions like editing, correction work, teaching correct pronunciations and other aspects of effective language learning are possible in computer use.

4.2.8 Saving Labour and Time with Economy

Because of strong and easy storage facility, access can be efficiently achieved which saves time and cost of learners and this is a definite advantage that CAI and CAL provide to school learners. Its powerful
calculation facility which can save time of students in learning complex situations involving cumbersome calculations, etc.

4.2.9 Computer as a Teaching Aid

Computer has versatile use as a teaching aid in actual classrooms. On a connected large screen, it can provide graphics along with texts and it also has got facility for emitting sound. Thus, it provides stimulus variation. It can store and project questions for classroom use by the teacher. It can also enable the students to evaluate their own answers in the absence of the teachers. It can draw and compare maps. The teaching techniques have been modernized with the help of gadgets such as floppy diskettes, CD-ROMs, networking via ERNET and internet. Books and study notes are nowadays available in CD-ROMs.

4.2.10 Developing the Computer Packages

Evaluation methodologies include checklist, analytical (pen ended) review, observation and experimentation. The North West Regional Educational Laboratory of USA has developed certain guidelines for finding out the quality of a computer package which are to be used for instruction purposes. So while choosing the package the teacher / student/ any other user should take care of aspects such as the following:

(i) level of accuracy ,
(ii) level of difficulty ,
(iii) level of vocabulary used,
(iv) extent to which the packages are free from ethnic, sex and other stereotypes,
(v) level of clarity of operational instructions ,

(vi) extent to which purpose is defined,
(vii) level of clarity of presentation,
(viii) level of difficulty in relation to the concerned level of the student
(ix) extent of availability of graphical presentation, color and sound,
(x) level of ability to motivate students
(xi) level to which the creativity of the students can be stimulated
(xii) extent of facilities for providing feedback on student responses
(xiii) amount of provision for controlling the rate and sequence of presentation and revives
(xiv) extent to which the program is integrated with earlier experiences of students
(xv) extent to which learning can be generalized to an appropriate range of students.

4.3 DIFFERENT FORMS OF INSTRUCTION THROUGH COMPUTER

Fig. 4.2 : Different forms of Instruction through computer

![Diagram of Different forms of Instruction through Computer]

Computer Managed Instruction (CMI)  Computer Based Training (CBT)

Computer Enriched Instruction (CEI)  Computer Aided Instruction (CAI)

Computer Based Learning (CBL)
4.3.1 Computer Managed Instruction (CMI):

Computer managed instruction can best be defined at the use of computer programmes for the on-line management of the instructional process. This may include the planning, organizing, controlling and evaluation functions as they occur during the instructional process.

It can refer either to the use of computers by school staff to organize learner data and make instructional decisions or to activities, in which the computer evaluate the learner's test performance, guides them to the appropriate instructional resources, and keeps records of their progress.

According to Kearsley's, Computer Managed Instruction which includes all the routine data processing tasks that an instructor might wish to have performed to assess students, revise materials.

4.3.2 Computer Based Training (CBT):

A media design characteristic in which the computer is the method for disseminating the training material.

4.3.3 Computer Enriched Instruction (CEI):

It is defined as learning activities in which computers (1) generate data at the learners' request to illustrate relationships in models of social or physical reality, (2) execute programmes developed by the learners or (3) provide general enrichment in relatively unstructured exercises designed to stimulate and motivate learners.

4.3.4 Computer Aided Instruction (CAI):

A computerized programme that presents instructional information and requires interaction from the learner. Usually consists of text and still graphics.
CAI software can be categorized under a variety of modes, which include drill and practice, tutorial, games, simulations and teacher utilities.

4.3.5 Computer based learning (CBL):

Computer Based Learning refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes. The concept is generally seen as being distinct from the use of computers in ways where learning is at least a peripheral element of the experience.\(^{12}\)

Computer Aided Learning, which is taken to include simulations and games, database search/inquiry methods and programming of computers.

Computer aided learning (CAL) is the need of the day. It should be kept in mind that it is one of the various methods of modes of delivery of education. It is not only the mode. It has certain advantages.

Among the different forms of instructions through computers, the researcher is very particular in stating about the significance of application of Computer Aided Instruction (CAI) in Commerce teaching. An overview about the Computer Aided Instruction is given below:

4.4 COMPUTER AIDED INSTRUCTION (CAI):

4.4.1 Origin of CAI

In 1961, in the University of Illinois, the first attempt was made to Produce Logic for Automatic Teaching Operation (PLATO). The second landmark in CAI was the development of computerized tutorials in arithmetic.

and reading for elementary school children by Patrick Suppes of Stanford University in the year 1966. At present, most of the universities and public firms are producing the CAI packages for teaching different subjects at different levels. Different experiments have been done in the field of Computer Aided Instruction. The recent concept of CAI has followed the principles of programmed learning materials. It is the natural outgrowth of Programmed Learning Material (PLM).

4.5 DEFINITION OF CAI

Computer Aided Instruction (CAI) is a set of programming instructions which are used to develop certain predicted skills among the students. The programme presents the subject matter on a CRT screen and tests the student's mastery over it. In this way, CAI provides drills, practice, exercise and tutorial sequences to the students and sometimes engages the student in a dialogue about the substance of the instruction. It means computer is used as a teaching aid and proxy for a teacher. So, CAI is a type of instruction which is used to achieve the objectives of the instruction.

CAI is the software package which is used to (i) assist the delivery of information (ii) CAI is often described as the use of a computer to argument classroom instruction by providing instruction and course content in the form of drill and practice, tutorials and simulations (Chambers and Sprecher, 1983; Wright and Forcier, 1985)

Barke (1982) defined "CAI refers to the use of the computer for the facilitation and certification of learning".

Wright and Forcier (1985) "CAI refers to the use of the computer and software programmes to assist the delivery of information to the student".  

4.6 IMPORTANCE OF COMPUTER AIDED INSTRUCTION (CAI)

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. It is just one step ahead to the use of teaching machine and probably two to the use of programmed text books in making the instructional process as self-directed and individualized as possible. The computer is said to be ahead of the teaching machine on account of its unlimited number of individual learners than the teaching machine.

Computer aided instruction (CAI) for this reason is relatively a new and developed concept than the teaching machine and programmed learning oriented instructional technology. As observed by Hilgard and Bower (1977) "Computer aided instruction has not taken as so many dimensions that it can no longer be considered as simple derivative of the teaching machine or the kind of programmed learning that Skinner introduced". Use of computer has not almost revolutionized the field of instruction in all its dimensions. It can't be defined now as a teaching machine for presenting programmed instructional material and consequently it will not be proper to define computer
assisted instruction as the type of instruction which makes use of computers, as advanced form of teaching machine, for presenting the programmed instructional material.

A Computer is an electronic device that processes raw data to generate meaningful information. A computer network can be used for social interactions, feedback and for educational betterment. The computer is now regarded as a super teaching machine. Its use in education has been tried as an innovation and it has proved its teaching effectively in many developed countries.

Computer Aided Instruction (CAI) is an interesting innovation in educational technology. It seems to revolutionize the whole spectrum of education. It has better flexibility and more versatility than any of the teaching machine. It can cater to the individual needs of many students at a time and record all the responses of all the pupils with reliability. Computer Assisted Instruction produces learning experience effectively and efficiently.

Through Computer Aided Instruction, evaluation of students' performance and classification of students according to their abilities are possible since every student is unique in his capacity to learn as a result of his variation in interest, intelligence, abilities, attitudes, aptitudes. In computer assisted instruction there is an interaction between an individual student and the computer just as happens in tutorial system between teacher and an individual student. Computer is able to display the instructional material to the individual student. 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. The interaction between the individual learner and the computer device helps in the realization of the set instructional objectives. 14

Computer aided instruction may be defined as a method of instruction in which there is a purpose interaction between a learner and computer device for helping the individual learner to achieve the desired instructional objectives with his own pace and abilities at his command.

Computer Aided Instruction refers to a system of educational instruction performed almost entirely by computer. Such systems typically incorporate functions such as:

- Assessing student capabilities with a pre-test
- Presenting educational materials in a navigable form
- Providing repetitive drills to improve the student's command of knowledge
- Providing game-based drills to increase learning enjoyment
- Assessing student progress with a post-test
- Routing students through a series of courseware instructional programs.
- Recording student scores and progress for later inspection by a courseware instructor.

4.7 ACTIVITIES IN COMPUTER AIDED INSTRUCTION (CAI):

There are three activities of instructional activities currently being performed through CAI system in advanced countries. These are (i) Logo (ii) Gaming and simulation and (iii) Controlled learning.

4.7.1 Logo

This type of system was developed by Farseeing and Papart. LOGO is a simple programming language which can be taught to the children. The programme provides instructions which can be used to produce pictures,
etc. The children who learn Logo make up their own programmes to draw, flowers, faces or generate design on the screen. Often, children suggest their own tasks and then write appropriate programmes. The supposed values of the programming activity are that logo problems can be described in terms of procedures; a procedure being a set of instructions like a cooking recipe.

4.7.2 Gaming and Simulation

Plato III and Plato IV exemplify the use of computers in programming which enable the students to perform an experiment in a symbolic form. For example in teaching genetics, experiments involving the breeding of fruit flies are often used. The breeding process takes about three weeks or much longer if your flies die or fail to breed. The Plato programme generates a population of fruit flies with known characteristics which can be selectively cross bred. The computer, in fact, constructs the new population according to the known rules of genetics and does it very fast, indeed. Similar work is in progress in other subjects in science. It means learning with entertainment and by playing is the principle behind it.

4.7.3 Controlled Learning

It includes both drill and practice. Drill and practice program is supplementary to the regular curriculum contents taught by the classroom teacher. The classroom teacher may specify the sequence of topics in advance and may also introduce the basic concepts. The students, later on, review and practice the fundamental skills on individualized basis at instructional terminals. The computer provides immediate feedback to individual learners simultaneously as they work through a set of exercises. The records of individual students performance is furnished to the teacher for evaluation. It also includes interactive tutorial types of instructions. It is no more than a branching programme but can involve the use of interesting adaptive strategies. Actually controlled learning packages are based upon psychological concepts.
4.8 PRINCIPLES OF COMPUTER AIDED INSTRUCTION (CAI):

The computer aided instruction relied on the following psychological and pedagogical principles:

i) The quality of computer instruction depends not only on the technical possibility of computers but also on a learner's clear understanding of the goals and content of training, as well as on the psychological and pedagogical validation of computer-implemented tutorials.

ii) A computer programme must enable the learner to display his intellectual initiative and get him to comprehend the conditions of instruction; it must open avenues for collective interaction in the solution of a tutorial problem.

iii) The programming strategy always depends on a teaching process and the concept on the authors.

iv) Regular renewal and modification of education with due account of scientific and technological progress are a must.

v) Computer aided instruction ought to be considered as a process of joint creative activity of the teachers and the learners.

vi) Personality development in the course of instruction is an individualized process of work.

vii) The efficiency of computer-aided instruction depends on the role and place that the teacher assigns to it in a teaching process and on the availability of special didactic programmes.

viii) Mastering the potential of computer technology pre-supposes a proper training scheme in keeping with the following provisions:

a) Learning to handle a computer is only a part of instruction;

b) A computer is no more than an instrument of problem-solving
c) The use of computer must broaden the human minds’ possibilities in problem solving.

d) Teaching one to work with computer is a method to develop thinking.

ix) While learning to communicate with their mates and computers, learners ought to develop independent creative thinking.

4.9 NEED FOR COMPUTER AIDED INSTRUCTION (CAI):

Learning and teaching are essential components of any educational process. Education helps ones to develop within it aims at developing one’s cognitive, affective and psychomotor aspects to the fullest. Under the contexts of subject matter the learning- teaching processes are geared to the achievement of well-defined objectives. The learning and instructional experiences and activities are so designed that the learner interacts with materials and the tutor to achieve subject mastery, conceptual clarity and develop his own expression and communication skills over that subject matter. He learns text lessons and answers questions related to them.

The purpose of CAI program is to improve the learning performance of students and increase the teaching productivity and effectiveness of teachers by the developments and evaluation of advanced computer based technology. The students can learn factual information effectively by using Computer aided instruction in academic subject areas. Across subject areas, computerized instruction is associated with greater or equal gains in learning when compared with traditional instruction. Furthermore, this achievement is obtained in equal or less time than is needed for regular classroom learning. Further, the use of CAI curricula helped students to improve standardized test scores significantly.

The CAI program will provide enhanced educational capabilities by expanding and customizing intelligent access and integration of digital
educational resources, supporting individualized learning and supporting learning that is learner-centered, collaborative, authentic, and interactive regardless of a student's location. The CAI will develop and demonstrate affordable and effective learning technologies that will significantly improve learning productivity.

Under the computer-aided settings, the textual materials are presented in frames with various purposes and these frames are stored in the computer memory so that easy access to them can be made whenever required. These computer-stored interactive learning and instructional sessions provide learning experiences to the learners.

Thus, under computer-aided instructional settings, the teacher will not waste time in writing unnecessary details on the blackboard but rather will quickly retrieve the required materials from memory over the large screen connected to the computer. All students in the class will be able to see this projected subject matter and start interacting with so that learning will be more effective in the classrooms. Because of its large storage capacity of information, a computer may be potentially used for drill and practice sessions, for teaching through simulation and animation on the screen, for developing problem-solving skills. In a computer class, the students can actually experiment with what is being taught and thus, they learnt in a creative way.

4.10 NEED FOR WIDER APPLICABILITY OF CAI

Computer-aided instruction is the need of the day. It should be kept in mind that it is one of the various modes of delivery of education. It is not the only mode. It may not suit to all teachers and all students. It has certain advantages and limitations. It is not necessary that frequency of computer use will be linked to commitment to teaching. Rather certain students might find it distracting. Hence, teachers, parents and guardians need to be careful regarding giving computer to students for use. As computers promote self-directed learning all students may not be successful in effective utilization of
computer as a learning tool. Similarly, all teachers may not find it convenient to use computer in general and to use computer softwares for teaching in particular. No doubt, use of computer in teaching-learning situation is a facility that can be effectively used by rich students. CAI is a comparatively new area in India on which adequate amounts of researchers are yet to be undertaken. In order to promote CAI, computers have been provided to schools and also to teacher educational institutions. There are not many Indian software that can be used for CAI. Prof. Yash Pal, (2001) while delivering talk on the 14th annual conference of AIAER on information technology pointed out necessity of developing indigenous softwares to make CAI effective in the Indian Scenario.

4.11 ADVANTAGES OF COMPUTER AIDED INSTRUCTION (CAI):

Psychological based learning; self-pacing, individualized instructions are the requirements of the present educational system. Computers are the means and have potentials to do so.

4.11.1 Psychological Based Learning

In the general classroom there are heterogeneous group of students coming from different areas. They differ from each other on the basis of age, mental abilities, socio-economic status etc. Different studies conducted in these areas have shown that a single method of learning is not suitable for all the students. So the learning principles and methods should be followed by considering their individual differences. By following different psychological principles a learner’s motivation interest can be developed. Organization of instructional material in a suitable fashion helps to develop the motivation among the learners. So the instructional material should be in a suitable form and follow psychological principles.

4.11.2 Active Involvement of the learner

The pioneer of Programmed Instruction (PI), Prof. B.F. Skinner of Harvard University has given five steps which are based on operate conditioning. Out of these five steps, one is active responding. He has defined
that the learners learn well when they remain active in the process. The active involvement of the learners helps them to think about the problem in depth because their head and heart are involved in the instructional process. The power of critical thinking is developed, which establishes proper relation between the different attributes of the problem. Intermittent slabs of human active interaction in any instructional situation are likely to maximize its effectiveness. CAI is the instructional material which has full scope for interaction and can be designed in such a way.

4.11.3 Development of Cognitive Domain

Every function of the human body is being controlled by the brain. Grasping problems, adjustment with situations, and solving problems are done by the mental processes. So, development of mental abilities of the learner should be the main goal in our learning process. The instruction should be designed in such a way that there is full scope for developing critical thinking and cognitive functions. Generally, it is observed that the day to day activities of the classroom aim at the development of knowledge and comprehension to a large extent. In other wards, higher level of cognition remains undeveloped.

4.11.4 Self Pacing as an Essential Feature of Instruction

In self pacing, learners get the opportunity to learn themselves according to their own time and pace. They can move according to their own capabilities. Researches have proved the effectiveness of self-pacing. Modular form of instruction, programmed learning material, computer assisted instruction, and other self-study materials are examples of self-learning material.

4.11.5 Individualized Instruction

Our classes are heterogeneous in nature i.e. each and every individual of the class has special characteristics. All the students possess different kinds of abilities. Therefore, the general way of teaching cannot satisfy the needs of all the learners. So there is a basic need to provide individualized instruction. Computer is one of the best media that has the potential to do so.
There are certain criticisms as regards the use of CAI by the school learners. Some of them are as follows:

i) CAI does not provide mobility during interaction but computer only provides eye, hand co-ordination.

ii) Too much use of computer can be harmful to the eyes.

iii) Though simulation permits execution of chemical and biological experiments, hands-on experience is missing. Moreover, Computer assisted learning packages cannot develop manual skills such as handling an apparatus, working with a machine, dissecting an animal, etc.

iv) The introduction of CAI in classrooms proves quite expensive and uneconomical in terms of educational returns.

v) CAI is basically a learner's controlled instruction. Here the learner is the master of the whole instructional process and thus there is a little scope for keeping restraint and checks on the learners. It may lead to indiscipline, truancy, carelessness and unnecessary wasting of time on the part of students.

vi) CAI how good and effective it may prove as an instructional device cannot be accommodated properly in the present set-up of our schools or colleges comprising set time-table schedules, uniform curricula and group oriented instruction, examination system, etc.

vii) In case of individual's self work, it restricts social interaction with others.

viii) Pre-school children develop vocabulary through social interaction. Computers cannot be much effective for this
purpose. The computer programmes dealing with voice synchronization capabilities are very much costly.

ix) There is not much scope for development of creativity and imaginative thinking.

x) In the classroom, the learners not only learn from interaction with teachers but also from their peers. This is not possible in the case of computer-assisted learning.

xi) It limits the learner's activity to a two dimensional object.

xii) Computers cannot replace human teacher managed classroom that can have non-verbal reinforcement, use of humour, and exchange of personal feelings between the teachers and the taught, etc.

xiii) Computer assisted learning takes the learners away from the habit of learning from books and other printed or hand written materials, which affects the development of language skills.

xiv) Computer assisted evaluation is not possible in the case of short answer and long answer tests.

xv) It also fails to evaluate essay, precise, abstracts, etc. effectively.

4.13 PROBLEMS FACED IN USE OF THE COMPUTERS IN CLASSROOMS

On one side, computer classrooms offer a great potential as a tool to improve the teaching, on the other hand there are many barriers that may impede its widespread use. Some of them with specific solutions are given below:

4.13.1 Lack of Good Institutional software

Development of good software is a technical job and needs expertise in educational technology, along with the knowledge of psychology and
computers. Generally, the software developed is based on animation and simulation. It is necessary that the package should be based on psychological principles.

4.13.2 Campus Administrators have not been responsive

Computer classrooms are expensive. In general, campus administrators whose budgets are limited do not allow specialized needs for hardware and software supports to fund. To avoid the problems administrators neglect the demand of computers in their department.

4.13.3 Lack of Good Researches

Very little research work has been conducted in India to determine the extent to which they are of value from either teaching cost or benefit point of view. Controlled research experiments should be conducted to determine the merits.

4.13.4 Attitude of Teacher

Teacher attitudes are generally neutral. They are not at all interested in using the computers. Majority of the teachers do not known the use of computers. Some of the teachers think that the computer packages are not suitable for all the types of subject matter and learning situations. This is however, not the case.

4.13.5 Availability of machines

India is a developing country. Majority of the schools do not have computers. Most of the schools do not have adequate facilities to computerize the classes. Teachers are also fearful due to its rapid change in technology.

4.13.6 Lack of Planning

If the computers are being introduced in the schools there is a need to modify the curriculum, to train the teachers, and plan the policies for solving problems related to schools. Besides the above stated barriers there are many other problems, namely,
i) Lack of clearly presented goals for computer activity;
ii) Lack of implementation plans;
iii) The assurance of access; and
iv) Funds for initial purchase, etc.

4.14 ESSENTIALS OF COMPUTER AIDED INSTRUCTION (CAI)

Recent developments in microprocessor technology have led to the production of several types of interactive teaching tools, such as microcomputer aided instruction and simulation, interactive video tapes and video-disk, etc. These tools allow the learner to interact with the tutor, and have a dialogue with television monitor in which a combination of computer based instructions, computer animation, and video-still framer present the lesson.

4.14.1 By increasing interactivity

In general, interactivity enables the learners to adjust the instruction to confirm to their needs and capabilities. The learners become active participants rather than passive observers by making significant decisions. More specifically, interactive lessons are those in which the learner actively or overtly responds to the information presented.

Cohers (1984) defined that, “interactivity is defined as the quantity of interactions per unit time during a programme”. Learners necessarily process information actively in order to comprehend and remember it (Ausubal, 1960). Therefore, the more mentally active the learners process the information from the computer based programme, better will be the learning.

Interactivity can be increased by:

(i) Provision of user controls
(ii) Providing active responses
(iii) Non-linear path
4.14.2 Provision of user controls

Kearsley and Frosts (1985) list several factors which are helpful in producing a high level of students' participation. One of them is more controls for the learners more will they be involved in the process.

4.14.3 Active Responses

Evaluation of learners responses and consequent feedback, increase the interactivity. Learners' immediate evaluation about their responses also increases the quality of interactivity.

4.14.4 Non-linear path

An important feature of computer based material is that the learners may select a nonlinear path throughout the process according to the individual's ability and need. The path of learning should be decided by their responses.

4.14.5 Quality of software

Hagen (1985) in his “easy to read scheme” quoted the following characteristics:

i) Well phrased material;
ii) Structured in a natural eye movement sequence, from top to bottom and left to right;
iii) Consistently placed functional screen areas;
iv) Message clarity, i.e. designing of message in a clear way;
v) Text should be spelled correctly, and also grammatically correct;
vi) Screen formatting and graphics should be used for readability and educational purposes not just for decoration or effect; and
vii) Readability is improved by using different boxes and windows, etc.

4.14.6 Evaluation of Academic Effectiveness

If we can measure the academic effectiveness of one, educational software programme, then we can begin to discover specific factors that
contribute significantly in maintaining the quality of software. Once successful software factors are identified a developer can focus on building these factors into all the educational software thus improving the quality of the software.

4.15 DEVELOPMENT OF COMPUTER AIDED INSTRUCTIONAL MATERIAL

Development of CAI involves generating of prescriptions based on needs of learners and the nature of contents. CAI is not only the delivery of instructions but a means of individualizing instructions which involve testing also.

For developing Computer Aided Instructional material certain steps are to be followed. CAI is the natural outgrowth of the application of the principles of Programmed Learning Material (PLM), which was basically developed by Skinner (1950). The steps involved in developing CAI were similar to those of PLM. These steps are as follows:

Fig. 4.4 : Steps in development of CAI material
4.15.1 Selection of Topic

The foremost step which is very important for developing CAI material is the selection of a topic. Selection of content depends upon the following points.

i. Mastery over content;

ii. Sufficient knowledge of programming

iii. The knowledge of computer languages; and

iv. The topic must have sufficient scope for graphics and animation and the topics should be conceptual in nature. These types of topics are more appropriate and suitable for CAI.

4.15.2 Objective specification

Software packages here refer to organize instructional components for achieving some predetermined objectives. The objectives to be achieved depend upon the pre-requisites possessed by the students. The pre-requisites for learning different objectives are stated as the entering behaviour of the learner. Learning based on the entering behaviours of the learner help to fulfill new objectives. Objective specification helps in sequencing the contents and evaluating the software package.

4.15.3 Preparation of Criterion Test

In order to measure the achievement of the terminal behaviours through the developed software package, a criterion test has to be prepared. Advantages of the criterion test are: i) it helps to evaluate the instructional process, and ii) it provides feedback to the programmer so that modifications can be done.

4.15.4 Content Analysis

Content analysis means breaking down of content in small steps and arranging these steps in a systematic, logical order. For developing software
package, the content related to the suitable topic should be analyzed. Content analysis helps the programmer to establish the link between the different concepts.

4.15.5 Writing Frames of CAI

Frame is the place where the students practice the fraction or unit of behaviour which is to be developed. The content which is to be taught is presented through frames.

4.15.6 Frame Components

In a frame there are four components. These are stimulus, response, prompt and reinforcement. When writing a frame the programmer should give priority to incorporate the given components in a frame.

4.15.7 Types of Frames

Generally, frames are categorized into two major types:

i. Home Page

ii. Remedial frames

Further, both the types are divided into five types, namely, Introductory frames, Teaching frames, Practice frames, Review frames and Testing frames. Teaching frames are used to provide teaching points related to the different terminal behaviours. Introductory frames are used to establish a link between previous knowledge and new knowledge. For the purpose of drilling and practice, practice frames are used. In review frames all the teaching points are consolidated together to give a complete picture of previous knowledge. Lastly, the criterion or testing frames are used to measure the achievement of terminal behaviour.

4.15.8 Frame Size

Frame size is decided on the basis of the nature of content and type of frame, whether the frame is home page, or remedial. Home page contains
almost a single teaching point. However, the size of the frame varies according to the style of programming which is described further. It mostly depends upon the nature of content, style of presentation and type of frame.

4.15.9 Prompts in the Frames

To elicit the correct response, prompts are provided. The main functions of prompts are: (i) reduction of errors; and (ii) to enrich the students learning by helping them. The home page frames are mostly the diagnostic frames and hence, do not contain prompts, whereas, remedial frames generally contain prompts. The natures of prompts are changed according to the type of frames. Practice and Review frames must have high level prompts while in teaching frames low level prompts are used.

4.15.10 Response Mode

Response mode is always in overt form. Generally, the questions included in home page or remedial frames are of multiple choice. It means that more than three options are provided and the students are asked to choose one out of them. This is because the computer does not allow constructive type of responses. It is very difficult to establish chaining in computers with constructive type responses. Providing more options for answers make the software effective.

4.15.11 Tryout and Modification Stage

For empirical validation the following techniques should be employed. These techniques are given under different captions.

4.15.12 Experts Concerns

First draft of CAI with the above mentioned specifications should be given to the experts for editing and corrections. Suggestions given by the experts to make it more feasible and comprehensible should be included in the package. Experts also scrutinized criterion tests and terminal behaviours with respect to CAI. All the difficulties regarding language, concepts, and
clarification, especially the presentation of contents are incorporated so that the developing CAI facilitates the learning process.

4.15.13 Individual Tryout

Individual tryout should be done on the limited students. First of all information regarding the package should be given to the learners. Technical difficulties or difficulties regarding language, responses, structure etc. were noted and modified on the basis of individual responses.

4.15.14 Small Group Tryout

After modifications, the tryout should be on a small group. The performance of the students on criterion tests determined the extent to which the terminal behaviours have been attained by the students for each concept. So, on the basis of error rate on each item of criterion test CAI can be modified.

4.16 DESIGNING PACKAGES FOR CAI DEVELOPMENT

There are many designing packages such as Photoshop, Illustrator, 3-D Max, Dreamweaver, Macromedia Flash MX, etc. to develop the computer aided instructional material. All the designing packages have their own potentialities, advantages and limitations. While selecting the designing packages, some points should be kept in mind, which are cited here. Designing packages should create the programme so that it:

- is friendly i.e. people oriented;
- is flexible, allowing the programmer to develop new programmes and alter the existing programme with relatively little effort;
- is well suited for interactive environment;
- can be executed on each type of computer;
- is with all the facilities viz. graphic, text, music and mathematical operations; and
- generates the screen with different resolution power.
4.17 COMMANDS GENERALLY USED FOR DEVELOPING CAI

Many commands are at one's disposal on developing CAI. They are available in all languages of the computer. Now-a-days they can be integrated with windows as well. The commands are AND, BEEP, CHAIN, CHR, CLS, COLOR, CIRCLE, DELETE, DIM, DRAW, END, FOR-TO, GET, GOTO, GOSUB, IF-THEN, IF-THEN ELSE, LET, LINE LOCATE, PLAY, PRINT, RANDOMISE, SCREEN, SOUND, STOP etc., Any CAI design should be economical, user-friendly, providing reinforcement and feedback facility and menu-based etc.,

4.18 JUSTIFICATION FOR CAI

4.18.1 Philosophical justification

CAI is on the basis of the principles of Naturalism. This philosophy is learner-oriented as much freedom is given to the learner. The learner should learn the concepts on his own and with the guidance of the teacher. Here the teacher is just like a director in a film and the student plays the role of an actor.

The teacher's role is to facilitate the environment in such a way that the student learns by doing and by playway method. In CAI, the learner learns with fun unlike the formal classroom which is teacher-dominated.

4.18.2 Psychological Justification

Psychological principles imply that motivation and interest are essential factors in the learning process. Without self interest even an effective teaching is likely to fall into the deaf ears of the learners in the formal classroom settings.

The learner gets frequent feedback of his learning through his self-testing technique available with the learning material. Hence he gets satisfaction in his learning tasks. This satisfaction maximizes his learning.
4.18.3 Sociological Justification

Education technology and information technology help to solve the two vital social problems like knowledge and information explosion and population explosion.

Knowledge grows thick and fast everyday and the population increases by geometric progression having reached one billion in India. At this critical juncture, it may not be possible for the Government to go on establishing formal educational institutions and printing books on every new subject. Since it may cost a lot on the exchequer of the Government which is nothing but the tax payer's money.

Hence the Computer aided instruction has come as a great boon to the educationalist, teachers and educational planners and policy makers in general and learners in particular.

4.19 CONCLUSION

Computer education has assumed immense significance in the education system of the country. Computers can be used effectively for providing good quality education and for removing disparities between slow and bright learners as far as possible. Besides teaching various subjects, there can be versatile use of computers in research experiments and innovations of enriching curricula and improving the standard of education. Computers are effective in preparing timetables and keeping data of students including maintenance of cumulative record card. They are useful in referring to books available in the library. They are also useful for keeping various types of administrative data such as preparing pay bills, keeping personal history of employees etc. Therefore, a good use of computers in any level of education would been a powerful store house of information, so it is absolutely necessary that computer education is to be imparted at all levels of education from primary to higher or even specialized education. Many colleges and institutions are now offering courses in computer programming.
at the undergraduates as well as postgraduate levels. The future of computers in education is fully assured because they have the ability to bring into the educational processes such attributes as untiring patience, availability at round the clock in the individualized and student-paced instruction programs. Anyhow, a time will certainly come when the use of computers in every walk of life will be necessity as they help in learning and mastering a multitude of professional skills by providing continuous feedback to the learners. Thus, this chapter discusses about learning through computer, computer aided teaching and learning, advantages and limitations of Computer Aided Instruction. The next chapter deals with the description of designing Computer Aided Instructional material for illustrated commerce curriculum.