CHAPTER – I

Introduction
1.1 INTRODUCTION

Educators, in both private and public sectors, have demonstrated an increased interest during the past few years in the role of computer technology as applied to educational/training process. This interest has been, to a great extent, a function of the emerging technologies associated with low-cost personal computers, the recognition of the need for better means of individualizing education and an appreciation of the many ways computer support can improve the instructional and management responsibilities requisite within a total instructional system (Burns and Bozeman, 1981).

Only a short time ago, the use of computers in education would have been important to only a relatively few persons involved in research and development activities. Educational computing seemed far removed from the real world of practice. Now computer support is available to even the smallest of schools, Colleges and organizations.

The availability has raised a host of questions regarding applications of the technology. While many of these questions have been and continue to be of concern to researchers and scientists, they were of limited significance to practitioners. To-day, educators at all levels—from classroom personnel to executives charged with policy formulation—are voicing an expression beyond simple curiosity about education.
computing. They require and demand information related to the effectiveness and efficiency of computer-based education (CBE) systems.

Early advocates of computer support for the instructional process offered the promise of greater student achievement, more efficient use of human and material resources, improved attitudes towards the learning process, and an enhancement of education in general. Were these empty promises never to be realized, or have they been fulfilled? In order to seek answer to this question the effects of computer use on large number of outcomes, areas were examined to compare the achievement effects produced by all forms of computer based instruction (sometimes alone and sometimes as a supplement to traditional instruction) as compared with the effects of traditional instruction alone. While the research support is not as strong as that indicating the superiority of CAI, the evidence nevertheless indicates that CBE approaches as a whole produce higher achievement than traditional instruction by itself.

Bangert-Drowns 1985, Braun 1990, Kulik and Kulik 1987, Roblyer, et al. 1988 Swan, Guerrero, and Mitrani 1989 have concluded that “while both traditional and computer based delivery systems have valuable roles in supporting instruction, they are of greatest value complementing one another”.

-2
According to Batey 1986, Capper and Copple 1985, Kulik and Kulik 1987, Rupe 1986, Stannett 1985, researchers have also found that CAI enhances learning rate. Student learning rate is faster with CAI than with conventional instruction. In some research studies, the students learned the same amount of material in less time than the traditionally instructed students did; in others; they learned more material in the same time.

Capper and Copple 1985, Kulik 1985, and Bangert-Drown 1985; Rupe 1986, Stennett 1985; Woodward, Carnine and Gersten 1988 claims that if students receiving CAI learn better and faster than students receiving conventional instruction alone, they also retain their learning better. The research indicate that the retention of content learned using CAI is superior to retention following traditional instruction alone.

Much of the research that examines the effects of CAI develops to the conclusion than the use of CAI leads to more positive student attitudes that the use of conventional instruction. This general finding has emerged from studies of the effects of CAI on student attitudes toward:

• Quality of instruction (Kulik and Kulik 1987; Rupe 1986).

• School in general (Batey 1986; Bialo and Sivin 1990; Ehman and Glen 1987; Roblyer, et al. 1988).

• Self-as-learner (Bialo and Sivin 1990; Mevarech and Rich 1985; Robertson, et al. 1987; Rupe 1986).

Bangert-Drowns 1985, Bangert-Drowns, et al. 1985, Becker 1990, Bracey 1987, Ehman and Glen 1987, Kulik, Kulik and Bangert-Drowns 1985, Okey 1985, Stennett 1985, Swan, Guerrero and Mitrani 1989 found that CAI is more beneficial for younger students than for older ones. While research shows CAI to be beneficial to students in general, the degree of impact decreases from the elementary to secondary to post-secondary levels.

Bangert-Drowns 1985, Bangert-Drowns, et al. 1985, Kinnaman 1990, Kulik, Kulik and Bangert-Drowns 1985, Okey 1985, Roblyer 1988 compared low achieving and high achieving students in their research. These comparisons show that CAI is more effective with low achieving students than with high achieving ones.


According to Ehman and Glen 1987, Schmidt, et al. 1985-86, Lower – versus higher cognitive outcomes, Closely related to the above is the...
finding that CAI is more effective for teaching lower-cognitive material than high cognitive material.


1.2 WHY STUDENTS LIKE CAI

Bialo and Sivin 1990, Braun 1990, Mokros and Tinker 1987, Robertson, et al. 1987, Rupe 1986, Schmidt, et al. 1985-86; Wepner 1990 have researched that, the following is a list of reasons given by students for liking CAI activities and / or favouring them over traditional learning. These student preferences also contribute to our understanding of why CAI enhances achievement.

Student say they like working with computers because computers:

- Are infinitely patient
- Never get tired
- Never get frustrated or angry
- Allow students to work privately
- Never forget to correct or praise
- Are fun and entertaining

5
• Individualize learning
• Are self-paced
• Do not embarrass students who make mistakes
• Make it possible to experiment with different options
• Give immediate feedback
• Are more objective than teachers
• Free teachers for more meaningful contact with students
• Are impartial to race or ethnicity
• Are great motivators
• Give a sense of control over learning
• Are excellent for drill and practice
• Call for using sight, hearing, and touch
• Teach in small increments
• Help students improve their spelling
• Build proficiency in computer use, which will be valuable later in life
• Eliminate the drudgery of doing certain learning activities by hand (e.g., drawing graphs)

1.3 COMPUTER MANAGED INSTRUCTION:
The basic rationale of Computer Managed Instruction (CMI) is an attempt to relieve the teacher or trainer of various tedious and time-consuming management tasks and so leave him with more time to devote to the essence of teaching. In an ideal CMI environment, there
would be a smooth partnership between the teacher, the student and the computer, in which each performed those tasks most suited to their (its) abilities. The teacher, freed of the administrative burden, would be able to devote his time to the task of helping students for which he was trained, and hopefully enjoys, the student would enjoy a course of study which was tailored to his individual needs and preferences, with ample feedback to guide his students; the computer, having no need of job satisfaction, but able to process information quickly and accurately, would take over the routine management of the courses.

The computer is therefore here cast in a background, supportive role in which it helps to manage, rather than to provide, learning opportunities.

1.4 COMPUTER MANAGED INSTRUCTION CYCLE:

There are four broad areas in which the computer may be used to provide management support. Firstly, it can construct, mark and analyse tests for diagnostic or assessment purpose. Second, it can keep records of the students performance and progress through their courses. Third, based on what is known about each student and the structure of the course, it can provide individual guidance for each student, directing or advising him on his choice of route through structured course materials. Finally, from its records, it can report on the performance and progress of the students and of the course to the individual students, the tutors and the managers of the education or training institution.
1.4.1 Assessment

The process of assessment is at the heart of most CMI systems and is the function which initially attracts most new users of the technology. The traditional process of assessment involves the teacher in a lengthy task of marking tests by hand. The student gains little from taking the test because the effort required to provide him with any more feedback than just a final score is too great.

FIGURE-I

ACTIVITIES OF STUDENT

- STUDENT STUDIES MODULE
- TAKES TEST
- STUDIES FEEDBACK
- DISCUSSES PROGRESS WITH TUTOR
- SELECT NEXT MODULE
- INFORMS COMPUTER OF CHOICE
1.4.2. Multiple Choice Tests

The introduction of new forms of assessment, particularly the use of multiple choice question (MCQ) tests, stimulated the development of techniques for making tests with the aid of a computer. In the simple form of a MCQ, the student is posed a question and is asked to select one from a list of alternative answers which follows the question. One of these is the 'correct' answer and the rest are used as distractors, devised to appear credible to students who can not determine the answer accurately. The MCQ can appear in a variety of forms such as:
- choice one response from several alternatives,
- choose two or more responses from the alternatives,
- determine whether a statement is true or false,
- match two lists of items.

FIGURE-II
ACTIVITIES OF COMPUTER

MARKS TEST

PROVIDES FEEDBACK

ADVICES ON NEXT MODULE
1.4.3. Feedback

The student's assessment may be used by the organisation to determine how well he is progressing in relation to the course, his peers or some set standard. It may be used for the benefit of the student himself, to give him feedback on his performance and help him to identify and rectify problems in his learning. This feedback, used to turn the test into a learning situation, can be provided at a number of levels. At the question level, the tutor may wish to provide a comment to each student who answers a question in a certain way. This might range from a simple message of encouragement for a correct response, to a detailed explanation of why a false answer was incorrect. Unless the tutor can devote a considerable amount of time to each student, it is usually impossible to carry out this sort of post-mortem analysis without some assistance from a CMI system. If the test is already being scored by a computer, then it is a simple matter to arrange for suitable comments to be associated with each response to each question in the test, and for the appropriate comments to be printed out for each student. The student's score on particular parts of the test or his overall score can similarly be used to select a suitable message on his performance, and at a higher level, his performance can be combined with other information stored about him, to give him feedback on his progress.
1.4.4 Routing

The concept of using the computer to guide students through structured course materials is based on the assumption that the majority of students should follow one of a small number of paths. The rules governing the optimal path that should be followed by a particular student can then be pre-specified by the tutor and subsequently interpreted by the CMI system. At this point, the discourse may be interrupted by the educational psychologist who points out, quite correctly, that since we do not fully understand how students learn, it is impossible to lay down rules as to which is the best route through any course. This is a valid criticism of a system which attempts to prescribe and enforce a best route through the materials for all students. However, it can be argued that it is possible to provide useful guidance for most of the students, for most of the time. This can then cater for most of the routing decisions that would otherwise be taken by the tutor and allow him more time to concentrate on the minority of students who are in need of intelligent, as opposed to routine, help. The CMI system is used to support the tutor, not to replace him.
1.4.5. Record Keeping

In order to guide students effectively and to provide useful information to tutors and students, the CMI system must maintain records, about the students' performance and progress, about the performance of the course and the tests involved – and perhaps about the teachers as well. The information stored relates to the students' scores on each test, to the modules they are currently studying, and to those they have completed. It may also include background information about their learning preferences, aspirations and problems, and comments made about them by the tutor. For each of the test within the computer
managed course, the system may store statistics on overall performance and on each question.

1.4.6. Reporting
To manage his teaching or training effectively, the tutor needs information about his students' performance and progress. The student also needs feedback to manage his own learning. Thus the CMI system must provide reports, based on the stored records, to all those involved in the teaching and learning process. These reports must be accurate, up to date, and most important, provide the appropriate information in the appropriate format. The student's report will include detailed feedback which is needed by his tutor who is interested in broader indications of progress.

1.5 THE ROLE OF CMI IN PROMOTING INDIVIDUALIZED INSTRUCTION
Computer managed instruction is a highly specialized application of the computer to assist in the process of managing an individualized instructional plan for students. It consists of two required functions. First, the computer tests the student to identify his/her strengths and weaknesses. The result is a diagnosis which indicates which objectives the student has and has not mastered. A unique dimension added by CMI is that the diagnosis is individually tailored for each student's pattern of performance. Based on the diagnosis, each student receives
a computer-generated prescription, that is an individual course of study designed to help the student meet the specific unmastered objectives. The second function of CMI is, therefore, perspective. CMI is not simply computerized testing or item-banking as these do not provide individually-tailored diagnostic and perspective functions.

Hansen (1970) listed five major functions of CMI: (a) providing diagnostic evaluations with learning prescriptions, (b) counseling students about adaptive learning strategies and career development, (c) developing an optimal scheduling system to match students and learning resources, (d) maintaining an appropriate student instructional record system, and (e) limited use of CAI for drill and practice.

Most of the specific conditions (alterable variables) identified by Bloom (1984) can be enhanced with the use of CMI. Individualized reinforcement can be provided for each student, item, and objective through CMI. Similarly, CMI can provide corrective feedback precisely where and when it is needed, to the individual student. Cues and explanations can be built into the CMI application and presented only to those whose performance indicates additional help is needed. Student classroom participation is interpreted to mean the active cognitive processing of information by each individual student, irrespective of level of participation. In a CMI exercise, the student must be actively processing information at a significantly more intense rate than during conventional instruction. During conventional instruction, there are
many distractions which often cause the student to miss what is going on. During CMI, the student's attention is directed to the task at hand (assuming the ability level of the student is reasonably matched with the difficulty level of the CMI items. Research conducted by Flanagan (1969), Cooley and Glaser (1969), Silberman (1968) and Anderson et al (1975) supports the above explanation.

1.6 COMPUTER ASSISTED INSTRUCTION AND SOME ALLIED TERMS
It will be helpful, to offer some definitions of CAI and other kinds of learning activities involving computers. As Kulik, Kulik, and Bangert-Drowns point out in their 1985 research summary, "the terminology in the area is open to dispute". This is putting it mildly. Those seeking to make sense of the array of terms used by educators and researchers—computer-assisted instruction, computer-based education, computer-based instruction, computer-enriched instruction, computer managed instruction—can easily become confused. The following definitions are a synthesis of those offered by Bangert-Drowns, et al. (1985), Batey (1987), Grimes (1977), Samson et al. (1986), and Stennett (1985), and represent commonly accepted (though certainly not the only) definitions of these terms:

-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, including drill and practice, tutorials, simulations, instructional management, supplementary
exercises, programming, database development, writing using word processors and other applications. These terms may refer either to stand-alone computer learning activities or to computer activities that reinforce material introduced and taught by teachers.

- **Computer-assisted instruction (CAI)** is a narrower term and most often refers to drill-and-practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher directed instruction.

- **Computer-managed instruction (CMI)** can refer either to the use of computers by school staff to organize student data and make instructional decisions or to activities in which the computer evaluates students' test performance, guides them to appropriate instructional resources, and keeps records of their progress.

**Computer-enriched instruction (CEI)** is defined as learning activities in which computers (1) generate data at the students' request to illustrate relationships in models of social or physical reality, (2) execute programs developed by the students, or (3) provide general enrichment in relatively unstructured exercises designed to stimulate and motivate students.

### 1.7 JUSTIFICATION OF THE PRESENT STUDY

The greatly changing conditions of life and new technological advancements are demanding a new perspective of teaching Science. Science education is spreading its roots deeper and deeper and
encroaching the entire educational system touching all disciplines.

Inspite of tremendous advancement in all fields, science teaching in the Indian schools generally conform to traditional methods and continues to be dull, boring and uninspiring as ever. There is need of conducting in-depth analysis, synthesize research in relation to teaching of discipline in order to evolve effective modes of teaching. A review of a research literature in Computer Assisted Instruction and Computer Managed Instruction suggests that it had not attracted the attention of researchers so far to investigate their effectiveness; in enhancing Self Concept, Study Involvement and Achievements of Student. In Indian conditions, Sood (1994) Panda and Chaudhary (2000), Suresh (2000), Mahapatra (1991), Das (1999), Adhikari (1992), Girdhari (1996), Mahajan (1993) have studied the effectiveness of the Computer Assisted Instruction and found it effective in enhancing pupils achievement.

It is apparent from the researches conducted in India on CAI and CMI that very little work has been done in this field. The use of CAI and CMI in teaching Science their integration in the classrooms and in the teaching training institutes has remained almost completely unexplored. Only negligible number of studies have been conducted in this direction that too in limited disciplines. Many linked question and issues have remained unanswered. Thus a lot of research-studies need to be attempted in this direction to answer such problems and .it is due to this
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reason that the investigator has selected Computer Assisted Instruction and Computer Managed Instruction to find out their relative effectiveness on Achievement, Self Concept and Study Involvement.

TITLE OF THE PROBLEM

" A COMPARATIVE STUDY OF THE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION (CAI) AND COMPUTER MANAGED INSTRUCTION (CMI) ON PUPIL'S ACHIEVEMENT IN SCIENCE, THEIR SELF CONCEPT AND STUDY INVOLVEMENT ".

1.8 EXPLANATION OF THE TERMS USED IN THIS RESEARCH

Computer Assisted Instruction (CAI) -

The use of the computer to assist in the delivery of information is called Computer Assisted Instruction (Poppen ,1988) . Educators differ in their definition of CAI i.e. CAI is often described as the use of a computer to augment classroom instruction by providing instruction and course content in the form of Drill and Practice, tutorials and simulations (Coburn.et al, 1982). Decorate (1988) prefers the term Computer Guided Learning (CGL) because it places more emphasis on the activity of the learner. CAI is a form of individualized instruction where a student works at his or her own pace through written material displayed visually on the computer terminal. Written material used in the computer is sequenced logically according to the structure of the subject.
In the present research the following definition has been used as an operational definition of the term Computer Assisted Instruction which states "The use of computers to assist in the delivery of information, which is in the form of individualized instructions, where a student works at his /her own pace through written material displayed visually on the computer terminal".

Computer Managed Instruction (CMI) -
In this research Computer Managed Instruction refers to either use of computers by school staff to organize student data and make instructional decisions or to activities in which the computer evaluates students' test performance, guides them to appropriate instructional resources, and keeps records of their progress.

Conventional Method of Teaching-
In Conventional method of teaching the teacher is the only active participant in the teaching learning process and the pupils are the passive listeners. The mode of the instruction is lecture, which is often supplemented by home assignments.

Achievement in Science -
It is the level of learning and attainment in a particular area of the subject in terms of knowledge, understanding, skills and applications. In the present investigation, Achievement in science refers to the marks obtained on achievement test in
science developed by investigator related to units taught to experimental groups and control group.

**Self Concept -**
The definition given by Sherry and Verma (1993) has been adapted as an operational definition of the term Self Concept. Self Concept means- "those perceptions, beliefs, attributes and feelings which the individual views as part of characteristics of himself ". It is his own conception of his health and physique, intellectual abilities, academic status, behavior, temperament qualities, mental health, emotional tensions and socio-economics status.

**Study Involvement -**
The definition given by Bhatnagar (1982) has been adapted as an operational definition of the term Study Involvement, which states, "The degree of involvement is determined by the (i) number of needs satisfied and (ii) the extent of their satisfaction through the performance of task. Study involvement as conceptualized in this context, therefore, may be classified as intrinsic motivation for study.

1.9 **OBJECTIVES**
The present study purports to realize the following objectives:

1. To design and develop instructional plans for teaching selected units in science from amongst the prescribed course of study at class VIIth stage based on

   i) **Computer Assisted Instruction**
2. H2, "There will be no significant difference in the mean Study Involvement pre-test : post-test scores of the students taught through Computer Assisted Instruction."

3. H3, "There will be no significant difference in the mean Achievement pre-test : post-test scores of the students exposed to Computer Assisted Instruction."

4. H4, "There will be no significant difference in the mean Self Concept pre-test : post-test scores of the students taught through Computer Managed Instruction."

5. H5, "There will be no significant difference in the mean Study Involvement pre-test : post-test scores of the students exposed to Computer Managed Instruction."

6. H6, "There will be no significant difference in the mean Achievement pre-test : post-test scores of the students taught through Computer Managed Instruction."

7. H7, "At the post test stage there will be no significant difference in the mean Self Concept scores of students taught through
   (i) Computer Assisted Instruction and Computer Managed Instruction.
   (ii) Computer Assisted Instruction and Traditional method.
   (iii) Computer Managed Instruction and Traditional method."

8. H8, "At the post test stage there will be no significant difference in the mean gain Self Concept scores of students taught through
9. H9, "At the post test stage there will be no significant difference in the mean study involvement scores of students taught through

(i) Computer Assisted Instruction and Computer Managed Instruction.

(ii) Computer Assisted Instruction and Traditional method.

(iii) Computer Managed Instruction and Traditional method."

10. H10, "At the post test stage there will be no significant difference in the mean gain scores of study involvement of students taught through

(i) Computer Assisted Instruction and Computer Managed Instruction.

(ii) Computer Assisted Instruction and Traditional method.

(iii) Computer Managed Instruction and Traditional method."

11. H11, "At the post-test stage, there will be no significant difference in the mean achievement scores of students taught through
12. H12, "At the post test stage there will be no significant difference in the mean gain achievement scores of students taught through
(i) Computer Assisted Instruction and Computer Managed Instruction.
(ii) Computer Assisted Instruction and Traditional method.
(iii) Computer Managed Instruction and Traditional method."

1.11 DELIMITATIONS

Keeping in view the constraints of time and limited resources available to the researcher the study has been delimited as under:

1. The study was delimited to the 7th class in a single school of Delhi.

The sample was taken from a single school because of non-availability of schools having computer facilities, feasibility of treatment and controlling of school environment.

2. No randomization has been exercised while selecting the sample.

3. The study was delimited to the Computer Managed Instruction and Computer Assisted Instruction modes of teaching.

4. The effectiveness of Computer Assisted Instruction and Computer Management Instruction was studied in the subject of science only.
5. Due to the constraint of time and non-availability of school for longer period, only four units of the Science course of class V11 were taken up for treatment and that constituted contents of the treatment.

6. The sample constituted of only male subjects and sex control was not exercised on groups.

8. The study could have been conducted on a variety of other educational /psychological outcomes, but it was conducted only on Self Concept, Study Involvement and Achievement in Science.