

Computer Assisted Instruction (CAI): A New Approach in the Field of Education

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Abstract: *The main aim of the paper is to provide a brief outline of Computer Assisted Instruction (CAI) Which is being used widely in all sectors of life including educational sector. The paper also stated that how this new technology can be used for instructional purposes in teaching- learning process. Lastly the paper also mentioned some limitations of the CAI.*

Keywords: Computer Assisted Instruction (CAI), Programmed logic for Automatic Teaching Operation (PLATO). Time-shared Interactive Computer-Controlled Information Television (TICCIT),

1. Introduction

Computer-Aided Instruction (CAI) is a diverse and rapidly expanding spectrum of computer technologies that assist the teaching and learning process. CAI is also known as computer-assisted instruction. Examples of CAI applications include guided drill and practice exercises, computer visualization of complex objects, and computer facilitated communication between students and teachers. The number of computers in American schools has risen from one for every 125 students in 1981 to one for every nine students in 1996. While the United States leads the world in the number of computers per school student, Western European and Japanese schools are also highly computerized. Computer has contributed a lot in each and every sector of life especially in education sector.

CAI – Terminology

As with any field of learning, acronyms abound in the computer assisted instruction/learning domain. Terms vary in the breadth of their definition, or their specificity. It shows a brief list of some of the main terms that are used in CAI related field.

CBT - Computer Based Training
CAI - Computer Assisted Instruction
CAL - Computer Assisted Learning
CALL - Computer Assisted Language Learning
WBI - Web Based Instruction
WBT - Web Based Training

The term CAI, as the name suggests, is the use of a computer to provide instruction. The format can be form a simple program to teach typing to a complex system that uses the latest technology to teach new keyhole surgery techniques. CAI draws on knowledge from the fields of learning, cognition, Human Computer Interaction (HCI) amongst others.

2. Objectives

CAI is a natural outgrowth of the application of the principles of programmed instruction of learning. The main objective of the programmed instruction is to provided individualized instruction just to fulfill the special needs of

the individual pupil. In order to achieve this objective, some efficient device is required. This device should be flexible and it can store huge amounts of organized information. The device may enable a person to use some selected part of the stored information. A computer fulfils all these requirements. It can store the organized information, it can process the information suiting to the needs of individual learner. In short, CAI covers the entire educational system by proving itself in useful tool in teaching various subjects.

3. History

In the mid-1950s and early 1960s collaboration between educators at Stanford University in California and International Business Machines corporation (IBM) introduced CAI into select elementary schools. Initially, CAI programs were a linear presentation of information with drill and practice sessions. These early CAI systems were limited by the expense and the difficulty of obtaining, maintaining, and using the computers that were available at that time. Programmed Logic for Automatic Teaching Operations (PLATO) system, another early CAI system initiated at the University of Illinois in the higher learning. It consisted of a mainframe computer that supported up to 1000 terminals for use by individual students. By 1985 over 100 PLATO systems were operating in the united States. From 1978 to 1985 users logged 40 million hours on PLATO systems. PLATO also introduced a communication system between students that was a forerunner of modern electronic mail (messages electronically passed from computer to computer). The Time-shared Interactive Computer-Controlled Information Television (TICCIT) system was a CAI project developed by Mitre Corporation and Brigham Young University in Utah. Based on personal computer and television technology, TICCIT was used in the early 1970s to teach freshman-level mathematics and English courses. With the advent of cheaper and more powerful personal computers in the 1980s, use of CAI increased dramatically. In 1980 only 5 percent of elementary schools and 20 percent of secondary schools in the United States had computers for assisting instruction. Three years later, both numbers had roughly quadrupled, and by the end of the decade nearly all schools in the United States, and in most industrialized countries, were equipped with teaching computers. A recent development with far ranging implications for CAI is the vast expansion of the Internet, a consortium of interlinked

computers. By connecting millions of computers worldwide, these networks enable students to access huge stores of information, which greatly enhances their research capabilities. Computers are being used in almost all areas of life i.e., transportation, communication, national defense, scientific research and education.

4. Types of CAI

Information that helps teach or encourages interaction can be presented on computers in the form of text or in multimedia formats, which include photographs, videos, animation, speech, and music. The guided drill is a computer program that poses questions to students, returns feedback, and selects additional questions based on the students' responses. Recent guided drill systems incorporate the principles of education in addition to subject matter knowledge into the computer program. Computers also can help students visualize objects that are difficult or impossible to view. For example, computers can be used to display human anatomy, molecular structures, or complex geometrical objects. Exploration and manipulation of simulated environments can be accomplished with CAI-ranging from virtual laboratory experiments that may be too difficult, expensive, or dangerous to perform in a school environment to complex virtual worlds like those used in airplane flight simulators. CAI tools, such as word processors, spreadsheets, and databases, collect, organize, analyze, and transmit information. They also facilitate communication among students, between students and instructors, and beyond the classroom to distant students, instructors, and experts. CAI systems can be categorized based on who controls the progression of the lesson. Early systems were linear presentations of information and guided drill, and control was directed by the author of the software. In modern systems, and especially with visualization systems and simulated environments, control often rests with the student or with the instructor. This permits information to be reviewed or examined out of sequence. Related material also may be explored. In some group instructional activities, the lesson can progress according to the dynamics of the group.

5. Basic Assumptions of CAI

- 1) CAI can be arranged for 4000 students simultaneously. It can cope with the problem of quality and quantity in education.
- 2) One can learn at his own pace, receives immediate and personalized feedback, i.e., completely individualized instruction.
- 3) In CAI, each learner's performance during the course and on the test is automatically recorded and can be feedback to the teacher so that he may promptly evaluate the learner's performance and use the data in designing the best teaching strategy for the learners in future.
- 4) It can be used in all types of teaching learning programmes. Any lesson in any subject can be programmed for CAI provided that the lesson material can be represented in words, picture and experiments to be presented to the students.

CAI system has been used at all levels of education ranging from elementary school to post graduate study and on job training in almost all subjects. Atkinson (1968) designed a

programmer for teaching reading to infants. The child first must learn to identify letters. This task of identifying letters is done in three stages of the program—

- 1) **First Stage** – A model letter appears on the projector connected with a computer, while three letters are presented on the screen. Then the recorded voice instructs the child to look at the letter on the projector. Different letters are shown on the projector. Training is imparted to the child in identifying the letters.
- 2) **Second Stage** - At this stage, the child masters the identification of single letter. During this phase the child learns to discriminate Pairs of letters.
- 3) **Third Stage** – During this stage, two, three letters combination are presented on the screen. The child is asked to touch one symbol out of the two combinations which are identical.

6. Various Instructional Modes

In the field of instructions, a computer plays a major role. In these computer assisted instructions, it interacts directly with the learners while presenting lessons. The computer delivers instructions directly to students and permits them to interact with the computer through the lessons programmed in the system. There are various instructional modes which can be facilitated by computer assisted instruction (CAI).

- 1) **Tutorial Mode** - In tutorial information, is presented in small units followed by a questions. The pupils' response is analyzed by the computer and appropriate feedback is given. A network of branches or pathways can be programmed to each. The pupils are allowed to work on their own pace. The more alternative programs available to the computers, the more adaptive the tutorials can be to individual differences.
- 2) **Drill of practice** - In this mode, the program leads the learner through a series of examples to develop dexterity and fluency in using the skill. All correct responses are reinforced. Only on achieving the mastery by the learner, the computer will proceed further.
- 3) **Discovery Mode** – Here, inductive approach is followed. The problems are presented and the pupil solves problems through trial and error. It is just like laboratory learning. It aims at the deeper understanding of the results obtained from discovery. Hence, complex problems can be solved.
- 4) **Gaming Mode** – This mode may or may not be instructional but it is recreational. Sometimes learning takes place through games. This mode is especially meant for young children.
- 5) **Simulation Mode** – Here the pupil faces scaled down approximation of a real life situations. Hence, realistic practice takes place without involving any risk.
- 6) **Problem Solving Mode** - problem solving can be readily achieved provided the typical computational capability of the computer is available and there is a typewriter and display response device with remote control of two-way communication. The students need to know how to communicate with computer and how to solve his problem. Hence, the computer assisted or aided instruction may be defined as the use of a computer as an integral part of an instructional system, the learner generally engaging in two-way interaction with the computer via programming. In computer, linear and

branching programmed learning is used. It meets and meets many student functions like a super machine. It interacts with the pupils. The computer keeps the record of each pupil's responses. On the basis of these responses it is further decided which information's are to be provided to the students. In case of incurrent response, the computer also hints at correct response. In this way, each pupil is cared and feedback to each and every pupil is provided.

- 7) **Inquiry Mode** – Inquiry is mode of third type of CAI application. In this CAI system responds to student inquiry with answers it has stored. In this mode instructional staff must learn how the system operates.
- 8) **Author Mode** - CAI is used to support instruction by generating sets of materials for a student's use. In generating concept learning materials, these might be sentence forms which have blanks in them each of which is to be filled by a word or a set of word, i.e., inserted into the blanks by computer according to the set or instructions.
- 9) **Logo** – This system was developed by Farseeing and Paper at MIT. Logo is simple programming language which can be taught to children. This programme provides instructions which can be used to produce picture on screen. The children who learn LOGO, make up their own programs to draw flowers of faces or generate designs on the screen. .

7. Advantages and Disadvantages

CAI can dramatically increase a student's access to information. The program can adapt to the abilities and preference of the individual student and increase the amount of personalized instruction a student receives. Many students benefit from the immediate responsiveness of computer interactions and appreciate the self-paced and private learning environment. Moreover, computer-learning experiences often engage the interest of students, motivating them to learn and increasing independence and personal responsibility for education. Although it is difficult to assess the effectiveness of any educational system, numerous studies have reported that. CAI is successful in raising examination scores, improving student attitudes, and lowering the amount of time required to master certain material. While study vary greatly, there is substantial evidence that CAI can enhance learning at all educational levels. In some applications, especially those involving abstract reasoning and problem-solving processes, CAI has not been very effective. Critics claim that poorly designed CAI systems can dehumanize or regiment the educational experience and thereby diminish student interest and motivation. Other disadvantages of CAI stem from the difficulty and expense of implementing and maintaining the necessary computer systems. Some student failures can be traced to inadequate teacher training in CAI systems. Student training in the computer technology may be required as well, and this process can distract from the core educational process. Although much effort has been directed at developing CAI systems that are easy to use and incorporate expert knowledge of teaching and learning, such systems are still far from achieving their full potential. The main advantage of a CAI system are related to the degree to which it permits the individualization of education, particularly instructions –

1. The capability of individualizing both the means and ends of instruction.
2. The capability of doing research -
 - i) On teaching under controlled conditions.
 - ii) Under conditions which individualize instructions in a particular way.
 - iii) On various modes of teaching.
 - iv) Ability to collect detailed records of student performance.
3. Permits evaluation of effectiveness of the teaching procedures as well as teaching materials.
4. The capability of developing ways of assisting teachers and authors in the development of instructional materials.
5. The capability of evaluating alternative media used to implement and support instruction.
6. Computer aided instruction (CAI) mean using computers to teach people, it does not mean teaching people to use computer or teaching people about computer technology. Computer can be used in education –
 - i) To reinforce present educational system.
 - ii) To revolutionize the present educational system.
 - iii) To lay the foundations for future system of education to come.

8. Role of Teacher

CAI has proved powerful tool for the teacher in the instructional process. Of course, there is some change in teacher's role as. CAI directly interacts with the students individually and with the teacher. Teachers are to play their role in CAI. Human teachers cannot be eliminated from teaching-learning process. We can highlight the role of a teacher in CAI in the following manner

- **Use of New Tools** : CAI provides the teacher some chance to use new tools. This use will enhance the person's satisfaction. Also it will increase the individual's efficiency. The CAI can compute accurately and rapidly amounts of data. It can produce elaborate graphs and drawings.
- **Compatible with Line Teaching** : CAI is compatible with line teaching. It can be used side by side. CAI is flexible system of instructions. It can very promptly evaluate the performance of individual student. The teacher can devote his time for more creative activities.

9. Limitations of CAI

1. **Experts Needed in CAI** - Compute aided instructions need the help of the following experts -
 - i) **Computer Engineer** – A computer engineer is a technical person and knows about basic principles and techniques of programming.
 - ii) **Lesson Writer** - The lesson writer is an expert who is familiar with lesson writing. Lesson writers may be experienced teachers or an experienced teacher may be a lesson writer. He knows theories of learning.
 - iii) **System Operator** – He knows the system thoroughly and can cope with all commonly thoroughly and can cope with all commonly occurring failures of software and hardware in the system.
2. The computer fails to appreciate the emotions of students. The emotional climate created by teacher in

direct class room interaction with the students is absent in CAI.

3. CAI programs do not in themselves solve psychological or educational problems. Computer programmes of conventional type do not work like human beings at all.
4. CAI fails to develop essential features of language competency where the ability to generate or construct meaningful sentences is essential.
5. It was pointed out that some students got more tired than conventional study or felt like quitting the study.
6. CAI cannot appreciate the student's artistic endeavor and cannot strengthen his friendship and deepen his perception of those around him.
7. The peripheral equipment puts constraints in the ways on which a student can interact with the computer.

10. Conclusion

Computer assisted instruction (CAI) has emerged as an effective and efficient media of instruction in the advanced countries of the world. In fact, CAI is being used in formal and non-formal education at all the levels. In India too, computer has been introduced in most of the areas such as data processing decision making. It has also impact on the working methods of research and development in the fields of education.

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