# COMPUTER AIDED LEARNING

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With the advent and rapid expansion in Information and Communication Technology, the access to higher education is being expanded enormously and fundamentally changing the models of education. Today, with the use of technology, education has become more learner-centric, individualised, interactive and relevant to learner's needs, thus making it truly a life long learning. Higher education can no longer be considered as a campus-based education for students. The arrival of computer and later internet has opened a much wider horizon for education. Computers have taken over every conceivable field of operation today.

Computer Aided Learning (CAL) is based on the integrative approach whereby a lecture or an instruction is not replaced by the computer programme but it is introduced during the course as a learning resource. It refers to the use of computers to aid and support the education and training of the students. It is pedagogy empowered by digital technology. Computers are being increasingly employed for classroom instruction as also for individualised and distance education. Computer-Based Instruction (CBI) is variously known as Computer Aided Learning (CAL) in the U.K. and Computer Assisted Learning (CAI) in the USA. They both refer to on-line direct interactive learning experience through the computer. The synonyms for CAL are Internet Based Training (IBT) or web based Training (WBT), Multimedia Learning, Networked Learning and Virtual Education.

CAL is to convey vast amount information in a very short period of time. It is a powerful method of reinforcing concepts and topics first introduced through the text book and discussion in the classroom. CAL empowers us with a powerful tool to comprehend complex concepts. The use of computers in education is basically a vision as a teaching and learning aid, besides it helps to develop computer literacy amongst children. CAL helps to make the teaching-learning process joyful, interesting and easy to understand through audio-visual media. It has potential to improve students' performance by promoting active participation, maintaining attention to tasks and enhancing problem-solving skills.

The psychological bases of using CAL are that learning could take place through hands on activities and by providing opportunity to the learner to construct her/his own knowledge based on one's experiences. The students become an equal partner in the development of the knowledge. It reflects the true spirit of the age old saying, "Tell me and I will forget; Show me and I might remember; But involve me and I will understand.

## Instructional Applications of Computers

CAL perhaps provides the best opportunity to the students for self-guided learning. It is self-paced and self-planned, with the students themselves choosing their own paths through the web of information encompassed by the package. It can be done in one of the many different modes of instruction, some of which are:

**Tutorial Mode-** In this mode, information is presented in small units followed by a question. The student's response is analysed by the computer and an appropriate feedback is provided.

**Drill and Practice Mode-** In this mode, the learner is provided with a number of graded examples on the concepts and principles learnt earlier. The idea is to develop proficiency and fluency through doing. All the correct responses are reinforced and the incorrect responses are diagnosed and corrected. The computer continues the drill until mastery is achieved by the learner.

In the **Simulation mode**, the learner is presented with scaled-down simulated situations bearing correspondence with the real situations, e.g. simulation of an oscillating pendulum, propagation of waves, flight of an aeroplane, occurrence of a nuclear reaction, etc.

• In the Discovery Mode, the inductive approach to teaching and learning is followed. The learner is encouraged to proceed through trial and error approach, i.e. by solving a given problem, realising, where and how the things went wrong, trying again and finally solving the problem.

In the Gaming Mode, the learner is engaged in playing opposite the computer or a fellow learner. The extent of learning depends on the type of the game. Games on spellings, names of places or general knowledge games are some examples.

## Advantages of Computer Aided Learning

The basic tenets of CAL offer the following advantages over other systems of instruction.

• Scalability

Many aspects of CAL are scalable, particularly when Internet derived technologies are utilised to produce a CAL package. Unlike other educational media, a CAL package is digitally stored. Thus, it may be reproduced without error as many times as required. By providing access to a CAL package over a network many students may use a single resource. Further, if the CAL package is made accessible via an Internet browser then it becomes potentially available to a very wide population of learners using a large number of computers.

- Interactivity

  The importance of interaction to learning was eloquently summarised by Confuscius: "*What I hear I forget. What I see I remember. What I do I remember always*". The nature of CAL lends itself to involving the student with the learning processes with tasks requiring actions as also those dependent on feedback on the action that the student may receive leading to further appropriate tasks. This goal-action-feedback cycle may be followed in a simple series of interactive questions, a complex case study or even a computer simulation of a clinical situation.

- Automation of Assessment

  As a student interacts with a CAL exercise it is possible to keep a record of each interaction on an identifiable log file. This provides a convenient option to check on student performance by checking on the correctness of response to the CAL exercise. Further, by building-up a profile of how a number of users interact with the system it is possible to identify weaknesses in the CAL exercise itself. The automatic logs can thus help decrease both the burdens on assessing students and validating CAL exercises.

- Information interconnectivity

  The information may be interconnected on computers, which allow users to click on highlighted text to jump in a non-sequential manner to related information including pictures, audio and video clips.

- Multimedia

  The incorporation of multimedia elements such as images, audio and video clips in CAL packages provide more than simply enhancing the interest of the learner. Cognitive psychologists suggest that learning is facilitated if the student has to undertake active processing of presented information, "mental roughage". Different individuals learn better in response to different media, and it has been suggested that learning may be improved by providing information in more than one form simultaneously such as animation with sound.

- Students' convenience

  The convenience of the student is taken care of in learning through CAT exercises. Each student receives instruction at his own pace.

- Continuity

  Each student responds continuously as she/he receives instructions.

- Rapid Feedback

  Each student receives rapid feedback. The student gets has/his feedback for the previous content before reaching the next level.

- Division of Content

  All units of learning are broken down into subunits and small elements of learning. The student gains mastery over the first subunit before moving to the next subunit.

- Standardisation of the Content

  The same material is available to a large number of learners over a wide geographical area, which standardises the learning experience whenever the learner logs on.

- Serves a large population

  A single programme can help thousands of students to learn the content practically located anywhere on the globe.

- Nonverbal and Auditory

  It is possible to present the content in nonverbal and auditory form other than the text form.

## Physical Obstacles to use of Computer Assisted Learning

- The development of high-tech computer-assisted learning programs is labour intensive, requiring appropriate hardware, backup and frequent upgrading.

- A dedicated information technology staff is necessary to provide practical advice and maintenance of the software and hardware.

- Some people may be less inclined to use electronic resources because of perceived lack of computer literacy.

- There is a lack of adequate basic infrastructure in schools.

- Lack of funds for operations and maintenance makes it difficult to maintain high standards of Computer Assisted Learning.

- Lack of evaluation techniques and results of tools, makes it difficult to know the effectiveness of the instruction.

- There are few learning resources for teachers in rural areas.

## Teachers related issues

Many a time even if teachers had been trained in the use of computer aided teaching, the integration of ICT in the teaching/learning process is not sustainable. Some common reasons could be:

- teacher overload as they have to prepare the programs for Computer Assisted Learning,

- lack of incentives and motivation for the teachers,

- shortage of trained teachers,

- non-availability of latest Technology Hardware and basic Infrastructure and

- non-availability of proper technical assistance.

## Findings of the Research

The researches regarding use of CAL support the following:

- The use of CAL as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone.

- Research is inconclusive regarding the comparative effectiveness of conventional instruction vis a vis CAL.

- Computer-based education (CAL and other computer applications) produce higher achievement than conventional instruction alone.

- Use of word processors by the students facilitates development of writing skills leading

**67**

to higher-quality written work as compared to other methods employed for improving writing skills (paper and pencil, conventional typewriters).

- Students learn material faster with CAL than with conventional instruction alone.

- Students retain what they have learned better with CAL than with conventional instruction alone.

- The use of CAL leads to more positive attitudes toward computers, course content, quality of instruction, school in general, and self-as-learner than the use of conventional instruction alone.

- The use of CAL is associated with other beneficial outcomes, including greater internal locus of control, school attendance, motivation/time-on-task, and student-student cooperation and collaboration than the use of conventional instruction alone.

- CAL is more beneficial for younger students than older ones.

- CAL is more beneficial with lower-achieving students than with higher-achieving ones.

- Economically disadvantaged students benefit more from CAL than students from higher socio-economic backgrounds.

- CAL is more effective for teaching lower-cognitive material than higher-cognitive material.

- Most handicapped students, including learning disabled, mentally retarded, hearing impaired, emotionally disturbed, and language disordered, achieve a higher levels with CAL than with conventional instruction alone.

- There are no significant differences in the effectiveness of CAL as far as gender of learners is concerned.

- Students' fondness for CAL activities centres on the immediate, objective, and positive feedback provided by these activities.

- CAL activities appear to be at least as cost-effective as — and sometimes more cost-effective than— other instructional methods, such as teacher-directed instruction and tutoring.

Most programmes of computer-based instruction evaluated in the past have produced positive effects on student learning and attitudes. Further programmes for developing and implementing computer-based instruction should therefore be encouraged.