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Computer Assisted Learning – A Study

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Abstract
Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. CAL uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum.CAL refers to the use of the computer as a tool to facilitate and improve instruction. CAL programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding. Computer Assisted Learning (CAL) describes an educational environment where a computer program, or an application as they are commonly known, is used to assist the user in learning a particular subject. Technology assisted learning refers to an overall integrative approach of instructional methods and is actually part of the bigger picture. With the paradigm shift in technology with internet, smart phone, iPad, book reader devices CAL has evolved from just computer aided learning to Technology aided learning. This is Technology Aided Learning - in that the software application and hardware device is an aid to an overall learning strategy – which in itself is a conglomeration of other methods of instruction, (e.g. the lecture, tutorial sheets, text books etc.). With the personalization features of the computer programme now it is possible to define the learning path, pace and milestone for each student as per their need and current readiness.

Keywords
Technology Assisted Learning, Cognitive characteristics, Personalization, Assessment

I. Introduction

Computer assisted learning has often been used to describe the development and application of educational technology for a variety of circumstances. From the mid-1980s until the early 1990s the term CAL was often used to refer to the development of either a single computer program or a series of programs which replaced the more traditional methods of instruction, in particular the lecture. ϖ "Technology Assisted Learning or Technology Aided Learning is defined as learning through computers with subject wise learning packages/materials" ....Mifflin. A Computer Aided Learning (CAL) or Technology Assisted learning can be defined as learning or teaching subjects like mathematics, Science, Geography, and etc., through software programs or e-books with subject wise learning packages/materials. • It may include all types of Technology-Enhanced Learning (TEL), where technology is used to support the learning process. • It is said to be: "Pedagogy empowered by digital technology". • In broader sense, it may be considered as a part of E-Learning. Computer Assisted Learning can be defined as a computer program or file developed specifically for educational purposes. The technique used throughout the world in a variety of contexts, from Primary school to University. Role of the CAL is to optimize the learner's route through a content field on the basis of his personality, cognitive characteristics, and diagnosed state of readiness

1. Types of Software used in CAL

Different types of Software used for Computer Assisted Learning are

(i). Drill and Practice

- Drill and practice software is generally used the same way that worksheets or flash cards are used in classrooms. It provides repeated exposure to facts or information, often in a question or game-type format. Ex: Math Munchers, Reader Rabbit, Accelerated Reader
- Drill and practice software was the most prevalent type of computer application for many years, since teachers were not quite sure how else computers could be used. Drill and practice software also fit nicely into a behavioural approach to teaching and learning since it measured student performance.
- Drill and practice software deals primarily with lower-order thinking skills.
- Drill and practice applications do not utilize the full power of computers. However, many drill and practice software titles are very good at what they do. The computer does not get tired of providing students with the practice and feedback they need.
- Most drill and practice programs also have a tracking device so that students (and teachers) are aware of their progress. In addition, many of the drill and practice programs have sounds and other motivating characteristics that encourage students and the students can progress at their own rate while using the software.

(ii). Tutorial

- Tutorial software presents concepts or skills and then gives students the opportunity to practice them as compared to Drill and practice software which does not include a teaching component.
- Tutorials may be linear (students must go from p. 1 to p. 2 and so on) or non-linear (where they can branch off in one of several directions based on interest or need). Older software is more likely to be linear in nature.
- Tutorials are often very interactive. Students do not just passively sit and read computer screens, some tutorials capitalize on individualized instruction and adjust the pace and feedback based on the students' progress.
- Students who are absent or who need remediation can often benefit from using a computerized tutorial; provided one is available that covers what was missed.

(iii). Problem Solving

- Problem solving software allows learners to see the results of their reactions to various events. Learners manipulate variables, and feedback is provided based on these

manipulations. Problem solving software does not necessarily utilize realistic scenarios. For example, in the Carmen San Diego series, the student flies around the world getting clues to try to track down a criminal. The process is contrived, although students develop problem solving skills and learn geography at the same time.

- There is a lot of power to using problem solving applications in the classroom, provided they match the curriculum. It is sometimes otherwise difficult to provide feedback based on individual choices students without the computer.

(iv). Simulation

- A simulation is a representation or model of a real event, object, or phenomenon where learners can see the results of their actions. Sometimes it is not practical or feasible to do the real thing, so a simulation is used to provide experiences that otherwise would be denied. The difference between simulation software and problem solving software is that simulation software deals with realistic situations.
- This is a very powerful application of computers and the educational community can capitalize on this type of software. Students are given the power to manipulate aspects of models or situations. They see the results of their decisions immediately.
- Simulation and problem solving software address higher-order thinking skills.
- One element to be aware of when using simulation and problem solving software is that sometimes tests do not reflect what students learn through their involvement with these packages. As we start to use software that addresses higher-order thinking skills, we also need to consider alternative forms of assessment that can help us to better evaluate what students know and understand.

(v). Games Software

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

(vi). Discovery

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

II. Features of CAL

Computer programmers have been able to create computer-assisted-learning programs that have served to increase student learning by affecting cognitive processes and increasing motivation. Current research shows the mechanisms by which computer programs facilitate this learning are:

(i). Personalization Information

Personalizing information allows computer-assisted-instruction to increase learner interest in the given tasks (Padma and Ross, 1987) and increase the internal logic and organization of the material (Anderson, 1984; Ausubel, 1968; Mayer, 1975). (2) animating objects on the screen The animation of objects involved in the explanation of a particular concept, for example, Newton's First Law of Motion, increases learning by decreasing the cognitive load on the learner's memory thereby allowing the learner to perform search and recognition processes and to make more informational relationships (Reiber, 1991).

(ii). Practice Activities

Providing practice activities that incorporate challenges and curiosity Computer-assisted-instruction increases motivation by providing a context for the learner that is challenging and stimulates curiosity (Malone, 1982). Activities that are intrinsically motivating also carry other significant advantages such as personal satisfaction, challenge, relevance, and promotion of a positive perspective on lifelong leaning (Keller and Suzuki, 1988; Kinzie, 1990).

(iii). Creative Context

Providing a creative context. A creative context increases learning by facilitating engagement (Parker and Lepper, 1992; Malone, 1982). Fein (1981) and Signer (1987) have also found, apart from using computer programs, the involvement in fantasy is often highly intrinsically motivating. (5) Providing a learner with choice over his/her own learning providing students with choice over their own learning provides leaner-controlled instruction which contributes to motivation. Increased motivation in turn increases student learning (Kinzie, Sullivan and Berdel, 1988).

III. Types of Student Interactions in CAL

(i). Recognition

In the case of recognition-type interactions, the student is merely required to indicate whether or not the information presented by the machine, in the form of a question or incomplete statement, has been presented previously, 13 Multiple choice or binary choice (yes/no) items occurring in CAL interactions are sometimes of this type

(ii). Recall

Recall-type interactions require the student to do more than recognise information presented, but they do not call for understanding. They require the student to reproduce textual information in either verbatim or transformed verbatim (rearranged syntactically or logically, but not in terms of meaning) forms, Recitation, sentence completion and cloze-type test items exemplify verbatim recall interactions; some kinds of sentence completion, free recall, matching, and some kinds of low-level logical inference questions, exemplify transformed verbatim interactions.

(iii). Reconstructive

Reconstructive Understanding or Comprehension this kind of interaction is by far the most pervasive in the CAL ranging from some, quite elementary types of comprehension to some fairly subtle ones. These types of interaction do not depend on the superficial features of the information presented as with (i) and (ii); rather, they engage the student in meaningful operations on the content presented. He may be * Note that this interaction takes place via a VDU terminal. The text disappears from the screen before the question appears; question and answer are displayed together. Called upon to reconstruct statements, concepts, or principles, but this will generally be within the limits of what has been presented; the boundaries of what is learned will always be more or less clearly determined by the semantic content of the information given in the interaction.

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(iv). Intuitive Understanding

Global Reconstructive or Intuitive Understanding These interactions are much more difficult to describe. They often involve prolonged activity and are directed at 'getting a feel' for an idea, developing sophisticated pattern-recognition skills, or developing a sense of strategy. The emphasis is on experiential learning which might develop an awareness by the student of his actions in the context of a constellation of problems or ideas recognised by experts as critical to understanding a field of knowledge. Here, more than in types (i), (ii) and (iii), understanding must be demonstrated in what the student does, and it will be judged accordingly by teachers, (It cannot be judged by explicit criteria stored in the machine.) These interactions involve such activities as discovering principles behind simulations, developing a 'feel' for diagnostic strategies, problem-solving using classical techniques, and the like. Learning the diagnostic strategies of the expert physician takes place this type of interactions, where the student tries out courses of action in the form of alternative tests and treatments. The aspiration is to develop the clinician's sense of the appropriateness of different courses of action in different contexts

(v). Constructive Understanding

Constructive Understanding Type (ii) interactions are extremely open-ended and involve the student in 'creating' knowledge. Because the creation of new knowledge almost always takes place against a context of old knowledge, In Type (v) interactions, the student engages in 'open' enquiry: he is not working towards solutions which are necessarily within the known structure of the discipline. From his point of view he is going beyond what is known. He may be testing his own hypotheses, developing his own methodologies and drawing conclusions based on his own work. This interactions look like genuine research, not just exercises on the content and methods of fields already known.

IV. Advantages of CAL

- CAL is individualized, that is each student is free to work at his own place, totally unaffected by the performance of any other students.
- Information is presented in a structured form. It proves useful in the study of a subject where there is hierarchy of facts and rules.
- CAL forces active participation on the part of the student, which contrasts with the more passive role in reading a book or attending a lecture.
- CAL utilizes a reporting system that provides the student with a clear picture of his progress. Thus students can identify the subject areas in which they have improved and in which they need improvement.
- By enabling students to manipulate concepts directly and explore the results of such manipulation, it reduces the time taken to comprehend difficult concepts.
- CAL offers a wide range of experiences that are otherwise not available to the student. It works as multimedia providing audio as well as visual inputs. It enables the student to understand concepts clearly with the use of stimulating techniques such as animation, blinking, graphical displays etc.
- CAL provides a lot of drilling which can prove useful for low aptitude students.
- CAL can enhance reasoning and decision-making abilities.

V. Limitations of CAL

- A CAL package may be regarded simply as a novelty, rather than an integral part of the educational process.
- Though simulation permits execution of chemical and biological experiments, hands-on experience is missing. Moreover, CAL packages cannot develop manual skills such as handling an apparatus, working with a machine etc.
- There are real costs associated with the development of CAL systems. It is expensive in terms of staff time to devise and programme effective CAL.
- Content covered by a certain CAL package may become outdated. A very high cost is involved in the development of these packages. If the course is outdated, the resources involved in its development will be a waste.
- CAL packages may not fulfil expectations of teachers. Objectives and methods decided by the CAL author and of a teacher may differ
- Motivating and training teachers to make use of computers in education is a challenging task. They may have fear of this new device. They may be unwilling to spend extra time for preparation, selection and use of CAL packages. It may also be perceived as a threat to their job.
- There are administrative problems associated with computer installation. The problems particularly related to the physical location of the computer resources, the cost of hardware maintenance and insurance and time- tabling.
- The rapid development of hardware makes it difficult to select a system before it becomes obsolete. If a new system is installed by a maximum number of institutions, they may not get courseware required for the system and courseware developed so far may become useless.

VI. Conclusion

The detailed analysis of CAL and its various feature, usage suggest that Computer assisted learning has the potential to totally transform the education process and remarkably improve the efficiency of learning by providing great motivation to kids. Not its practically impossible to ask kids not to use smart phone or laptops but CAL presents a way where we can use this technological access which today's students have to their own good .CAL gives them freedom to experiment with different options , instant feedback and answer to queries. Self-pacing is yet another great feature where adaptive software's can change the graphics and study material as per student need of beginner and advanced levels. This assistance from technology can help provide more bandwidth to teachers to work with students who need more of their time. Privacy feature helps the shy students to try out new things with no fear of rest of the class knowing how many times they have attempted a problem or even their answer is wrong or right, they and teacher will only get the feedback and then design the learning strategy accordingly. It is a proven concept now that multimedia and animation helps to learn the difficult concepts easily. With all the great features CAL has to offer, we would like to add a word of caution here, overuse of multimedia may divert the attention from the content and learning becomes too mechanical. So the balance used of technology under the guidance and supervision of teacher has a great potential to transform the learning process. In USA and other countries such software applications are being used from the 1st grade itself and student choose the topic from the recommended list of topics from the teacher to pick any and work on sample worksheets in their free time. They get points,

virtual medals and trophies, such software's are so fun with kids. In coming years we see more such trends being followed in Indian schools as well.

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