

Chapter 4

Computer Aided Learning and Multimedia

DEFINITION OF CAL

In general, Computer Aided Learning (CAL) is the term given to software applications in which a computer is used to partially replace the function of a human instructor in the education or training of a learner/student. CAL is not limited to a particular field in education or constraint to a specific subject matter. The primary goal of CAL is to convey pre-defined theory/concepts to student so as to allow him/her to understand and apply gained knowledge at work place.

A CAL application offers the student a structured method of obtaining information as well as using the computer as navigational and information retrieval medium. CAL can therefore be thought of as a front end to a large information database. Early CAL packages offered the user information in the form of pages of text only. As technology evolved, applications started to present information using a wide range of media formats, including high-resolution graphics, narration, and even interactive video (Marshall, 1988). Hence the combination of one or more electronic media is subsequently known as multimedia.

Present CAL applications offer numerous advantages. Most importantly, CAL facilitates the implementation of effective training packages that can be made available to anyone who requires it without imposing any time constrain in learning. In addition, the CAL tutoring packages do not rely on the

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availability of skilled human instructor and is not influenced by the number of students requiring training (Dean and Whitlock, 1983). There are many benefits of employing CAL in the education sector as discussed in Section 4.

Although there are numerous benefits inherent in CAL, a major disadvantage with it is the way in which information is presented to the student. Conventional CAL packages present information at a pre-determined tutoring level and follow a set of structure. These packages do not take the student's basic knowledge or learning style into account and therefore lack the ability to adapt intelligently to the student's specific learning requirements (Vasandani *et al.*, 1989). The only form of student adaptation that is occasionally implemented is the pace at which the course material is presented (Sclechter, 1991).

Over the past few years, CAL packages have been designed to incorporate multimedia to allow learners to perform multi task simultaneously during a tutoring session. For example a learner can read text and be narrated by displaying a video clip to explain certain concepts of the subject matter. CAL in its simplest form does not cater for the individual student. Information is presented in a predetermined sequence, regardless of how knowledgeable the student is at the beginning of the learning activity, or how quickly or slowly the learner absorbs and understands the course material (Rickel, 1989). The incorporation of multimedia in CAL, on the other hand, provides the learner with the opportunity of exploring information in various media formats in addition to conventional text and graphics which focus on presenting information in a way that maximizes the student's learning process. In addition multimedia can be programmable i.e. gives the possibility of engaging the learner in activities, i.e. reacting, or responding, to selections made by learners (Cairncross, 2002).

IMPLEMENTATIONS OF INTERACTIVE MULTIMEDIA IN CAL

In general, the production of an effective interactive multimedia CAL package requires subject expertise, computing, authoring and modeling, and teaching skills. In the early days, developers had limited computing/programming skills and hence the resulting packages were often useful for teaching and testing factual knowledge but not good enough to promote learning and understanding. Attempts to overcome these shortcomings have been resource intensive and there is a need for a cost effective way of developing interactive multimedia CAL packages. Although there are a wide variety of interactive multimedia CAL packages in the market, there is considerable discussion and concern on the suitability of these packages in various education settings (Cairncross, 2002).

Gardner (1990) argued that the most routine and simple tutorial (question and answer) or multiple choice style learning package can be effective in motivating students to study. The author inferred that it is going to be difficult to design a good piece of simulation or modeling package that challenges students to think and learn. Some researchers have developed learning packages and revealed its effectiveness; for example McAteer (1996) conducted a study on integrating two simulation packages on animal physiology in the University of Glasgow's Institute of Biomedical Sciences. The laboratory exercises aimed to complement the lectures by giving practical experience of scientific principles, to illustrate the techniques and procedures involved in practical aspects of physiology, to give hands on experience of investigative experimental work and to provide real data for handling, analysis and interpretation. From the observation of students engaged in their tasks across the laboratory room, McAteer noted that the simulation station was very much "one of the labs" rather than specifically "a computer assisted learning exercise". The author also realized that emphasis on learning and understanding the subject

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