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COMPUTER ASSISTED LEARNING PROGRAMS

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There is a growing acceptance and use of computers by people from all walks of life. With the computer being so versatile and powerful, and the strong interest for its use, we should consider the use of the computer in our teaching process. Certainly, the computer cannot replace teachers but the quality of teaching and learning can be enhanced using the computer as a teaching resource. The use of the computer in teaching and learning is known as computer assisted learning (CAL).

In this article, the types of CAL programs and the ways they can be used will be discussed.

The Different Types of Programs

Most CAL programs can be loosely listed as one of the following:

- Drill and Practice
- Tutorial
- Experimental Data Analysis
- Simulation
- Modelling
- Information Storage and Retrieval

Drill and Practice

This is the question-answer type program where the computer generates large numbers of exercises, evaluates responses, gives immediate feedback as to the correctness of the responses, and sometimes hints on how to obtain the correct answers if the responses are incorrect.

An example of a drill and practice program is an exercise on the atomic number of elements. The atomic number is selected at random from a list by the program. If the student enters the correct element, the atomic number is removed from the list and another atomic number is presented by the computer. Atomic numbers which are not correctly named will not be removed from the list so that eventually the student is recycled through the atomic numbers requiring the most practice.

Properly written drill and practice programs help students commit to memory facts, rules and principles without which a deeper study of a subject is impossible.

Tutorial

In this type of program, information and explanatory material is presented in small segments followed by questions. If the student responds incorrectly, feedback according to the nature of his mistake is given. If the answer is correct, another segment of the explanatory material is generated. On the basis of responses made by the students, the program thus decides how rapidly material should be generated and how much should be covered.

CAL programs written incorporating good pedagogical principles and exploiting the unique qualities of the computer, for example, using animated graphics, sound and colour will be invaluable as a supplement to classroom instruction.

Experimental Data Analysis

This type of CAL allows experimental data to be analysed and the result is printed out either in numerical or graphical form. A more realistic approach to the study of certain topics is made possible with the appropriate program using either a built in set of data or, preferably, data collected and entered by the student. With one or more microcomputers in the laboratory, students can analyse and interpret their experimental data as they are obtained.

Simulation

In this type of program, the computer processing data through some mathematical model behaves like a piece of scientific apparatus, or an industrial plant, or a natural phenomenon or a microcosm of society, etc. The student can study the effect of changing various parameters by observing the outcome of each case so as to develop an appreciation of orders of magnitude and the scope and limitations of a system. One well-known program is the Contact Process for the manufacture of sulphuric acid, published by Longman for the Computers in the Curriculum project. In this simulation, the pupil first investigates the chemical principles and then 'discovers' the optimum conditions for an industrial process by modifying the parameters to allow for social and economic considerations.

No other media can simulate as easily or as well as the computer. Simulation programs are suitable for mathematically complicated and difficult topics and for experiments which are too costly or dangerous or too time consuming to investigate.

Modelling

Modelling involves creating, adapting or choosing a theoretical model to correspond with a natural phenomenon or a man-made system. This type of program is encountered more often at the higher levels of education. An example of this type of program involves finding the relationship between variables (in the form of an equation) for data obtained from an experiment. Students are thus able to gain some insight into the concept of modelling and some training in inductive thinking.

Information Storage and Retrieval

Information in various forms can be readily stored and retrieved with a computer. With a large data bank, the computer holds great potential for providing a rich information environment

(data base) which can be accessed or interrogated easily compared to books or microfiche. Information stored in the computer can be easily updated, expanded and enlarged upon.

This type of program, which is not widely used in schools at the moment, may be commonplace later on. Even now, very crude devices appear, for example, some cash dispensing machines allow bank clients to make account enquiries. In education, we are inundated with information especially at the higher levels. This type of CAL program allows students to study topics which require access to large data bases which cannot be easily handled manually. Teachers may need to teach their students to interrogate an information retrieval system efficiently in the future.

The Different Uses of the Programs

There are various ways in which the different CAL programs can be used. They can be used individually by the student, in small tutorial groups, for laboratory use and for demonstration purposes.

Drill and practice and tutorial programs are very suitable for individual use after students have received instruction in class so that the concepts taught can be reinforced. Programs appropriate for small tutorial groups will be drill and practice, tutorial programs with a gaming element, or simulation and modelling programs which provoke and stimulate discussions.

In the laboratory, drill and practice and tutorial programs can be used to teach or to consolidate concepts necessary for the performing of an experiment in advance of the experiment. For complicated and dangerous experiments at higher levels of education, a simulation where students are required to assemble apparatus, take readings, compute and interpret results may adequately prepare students to benefit from the laboratory session. Data retrieval programs to check for data essential for the experiment or to compare results obtained can be used alongside other laboratory equipment. Experimental data analysis and

modelling programs can be used to analyse experimental data after the results have been obtained from experiments.

It is envisaged that the use for demonstration will be popular among teachers as it resembles traditional teaching and is less demanding on hardware requirements and organisational skills. Programs suitable for demonstration are that which capitalise on colour, sound and the ability of the computer to produce moving pictures that can be controlled by the teacher.

Conclusion

Some critical remarks have been made regarding CAL programs which are pedagogically unsound and the lack of organisational skills in handling them. However, one cannot expect perfection in any innovative approach to teaching in the beginning. For CAL programs to enhance our teaching, relevant and high quality CAL programs are essential and teachers should be equipped with the organisational skills of using them.

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