
Computers in Family Practice

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Computer-Assisted Instruction and the Use of PILOT

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Professor Richards was the first general practitioner appointed to the faculty of New Zealand's new second medical school in Auckland. He is interested in microcomputers for teaching, in both the undergraduate and the continuing medical education areas. One of his projects involves preparing for practicing physicians computerized educational programs that are distributed by the representatives of pharmaceutical firms, who also lend computers to the physicians for a week or two at a time. This paper describes PILOT, a computer language particularly suitable to the preparation of educational programs in the medical school milieu.

—Roger A. Rosenblatt—Editor

The ready availability of microcomputers and the computer literacy of most medical students today present the medical educator with a powerful educational tool.

Probably the greatest value of the computer in

computer-assisted instruction lies in its capacity to provide a stimulating, interactive, and realistic learning opportunity. A particular advantage of this format is its flexibility; depending on objectives and levels of attainment, the student may choose many paths through the material, using the program to review or consolidate knowledge or, alternatively, to skip rapidly through material that is already well understood.

Another advantage is that the students have an opportunity to work at their own speed so that more facile students need not be held back by a lack of understanding on the part of their fellows. This nonthreatening form of education prevents students from being shown up if their learning is slower paced than that of their peers. One thus avoids the common classroom situation in which many students will claim that they understand new lesson material to avoid appearing inferior to other students. The computer makes no protest at submitting to an infinite number of repetitions; thus understanding may be well tested, reinforced, and absorbed. Properly programmed, a lesson may give the student cues when an incorrect answer is obtained and can move on from one section of a lesson to another at the speed best suited to the learner.

The computer is also capable of providing

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graphic material quickly and accurately to illuminate a lesson. Should students require a permanent record of their performance and of the lessons learned, a printout too may be easily obtained if a printer is available. The program can be designed to score a performance simultaneously so that the students can, if desired, obtain a mark as soon as a lesson is completed or even in the course of a lesson to allow comparison of their performance with that of others.

There are several disadvantages to computer-aided instruction. Inevitably there is a certain lack of flexibility in the way questions may be answered depending on the matching responses the computer has been programmed to accept. This lack of flexibility is in contrast to the almost infinite variety that may be introduced in normal teacher-learner interaction.

One potential disadvantage of computer-assisted instruction is the relative complexity of producing programs of this nature. Fortunately, this complexity is becoming increasingly less a problem with time; currently available software has eliminated much of the sweat and tears from the programming aspect of teaching. Once a lesson is prepared, it is very easy to reproduce and so may be made available to large numbers of students. Fear of new technology—once a major hurdle—has rapidly dissipated as microcomputers have become ubiquitous. A knowledge of typing is an obvious advantage, although it seems likely that speech recognition by computers is not far off. The cost of computers is also falling rapidly, and in the last five years the number of computers in private homes and educational institutions has increased dramatically and shows no sign of tapering off. Computer-assisted instruction will join audiovisual equipment as an essential part of medical education.

PILOT and Medical Education

The aim of PILOT (Programed Inquiry Learning or Teaching) is to enable the neophyte computer operator to become competent quickly in the

production of educational programs without having to delve into the intricacies of a complex computer language, such as BASIC. PILOT allows a teacher to learn the essentials of producing an educational program in little more than 30 minutes. Although there are many subtleties that take much longer to master for those wishing to develop sophisticated programs, the beginner can produce useful material with PILOT almost immediately.

PILOT is a programming language—really a “dialect” of PASCAL—that has been modified for microcomputers, particularly the Apple computer, but that is now available for other computer systems. With the Apple system, teachers who wish to develop their own program will require a computer with two disk drives, but if a pupil wishes to use a program that has already been constructed, the system can be operated with only one disk drive.

In the preparation of lessons the PILOT “Author” diskette is inserted in the first disk drive, and a blank diskette is inserted in the other disk drive. The formatting of the second diskette and all maneuvers are easily executed using instructions programmed onto the “Author” diskette.

The program is divided into several sections, each of which can be called up from a table of contents known as the “menu.” The section used most frequently, “The Lesson Text Editor,” allows the teacher to insert questions or explanatory text. Most lessons will use this section for much of their content. Other sections enable the programmer to produce graphics (ie, illustrations and diagrams), to compose or reproduce up to 100 notes of music, and to develop a character set to add variety to the text.

It is very simple to call up each section previously programmed so that appropriate illustrations, sound effects, etc, can be inserted into the text to increase clarity and provide visual interest or emphasis. Thus, it is possible to insert a particular sound effect for a correct answer and a different one for an incorrect answer. For example, a few bars of the “Hallelujah” chorus could be reproduced at appropriate intervals!

The Apple II computer the author uses has limited but acceptable graphic facilities. Any illustrations are of necessity somewhat crude, and color

rendition is likewise limited. Nonetheless, the graphics are adequate for most instructional purposes and can brighten up an otherwise dull lesson. The development of graphics is also rendered easy, and the budding artist may make as many trial strokes as desired before accepting the most pleasing one. Even after a line is entered there is no difficulty in erasing it. PILOT comes with a powerful editing function that makes modifications and enhancement of a quickly developed skeleton program very simple. Insertion and deletion of text are performed with the same simplicity as is available in the best word-processing programs. Upper and lower case lettering is provided even when this facility is not built into the computer, as is the case with the Apple II.

The PILOT system does have some weaknesses. Although it is possible to program a lesson so that several different responses are acceptable matches, and each leads the student to a different area of the lesson, one has to search diligently in the comprehensive instruction manual to discover how to achieve this very fundamental response. The complexity of the instructions is probably the greatest barrier to more widespread use of PILOT by teachers. A simplified instruction manual, better adapted to the needs of the novice programmer, would be a signal advance.

Another disadvantage is the existing limitation on the length of programs because of diskette space problems. Considering the amount of material that can be stored on one diskette when using

word-processing programs, the relatively short length of lessons permissible with PILOT is astonishing. Apparently this limitation is due to the amount of disk space occupied by the language itself. However, each new lesson may be made to run automatically into the next using the L (for Link) command.

Despite these annoying problems, PILOT represents a powerful educational tool capable of providing pleasure and satisfaction to both learner and teacher. The software system is in wide use, and has recently been upgraded and improved.

Student acceptability appears high. At the University of Auckland programs have been used primarily in a seminar situation to heighten and stimulate interest in a topic. One student is nominated to operate the computer, with the rest of the class giving advice and encouragement. Obviously, as the novelty of the technique is an important factor, student interest may diminish somewhat with familiarity. To date, there has always been a demand for more, and the students have requested that computers be placed in the self-learning carrel area to stand alongside tape-slide and other audiovisual equipment.

The advent of the inexpensive microcomputer seems likely to make such computers and the associated educational software an everyday part of undergraduate medical education. PILOT can be a painless and effective way for teachers in family medicine to use computers in student and resident teaching.

Suggested Reading

1. Richards JG: "PILOT"—An example of computer software designed for teachers. *NZ Fam Physician*. Winter 1983, pp 154-155
2. Smith MR: PILOT tutorial. *Creative Computing* 8(11): 181, 1982
3. Smith MR: PILOT tutorial, part 2. *Creative Computing* 8(12):243, 1982