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## Computer-Assisted Instruction

In a complex, evolving society, demands for education continue to expand. The education enterprise has an annual budget of more than \$50 billion. Even so, there are important unfilled needs, such as that for continuing education. There is also persistent pressure for improvement in teaching effectiveness. The educational system has been slow to improve its methods and in some areas may have retrogressed, for most teaching is performed by those of moderate gifts or experience. One cynic has said, "There has been no major invention in education since the printing press." With costs growing rapidly and taxpayers and students discontented, education is ripe for major change.

The forces now visibly fostering change may soon be overshadowed by the emergence of an even greater force—technological development in the form of computer-based education. The full impact of the new technology will not be felt for many years. Great developments in hardware, in software, and in understanding the learning process must yet be accomplished. However, enough has occurred to make Donald Bitzer of the University of Illinois feel confident that "computer-assisted instruction is destined to have an impact on society of a magnitude comparable to that of the automobile."

If computer-assisted instruction (CAI) is to have such impact, it must provide high-quality instruction at low cost and great convenience, and it must make possible unique training experiences. One of its major advantages is the ability to provide individualized instruction, so that the student can learn in his own way and at his own pace. Students respond very well to this matching of their needs. They work very diligently with the computer. If the student is bright he moves ahead rapidly. If he is slow, he does not feel lost. This advantage has been particularly apparent in those aspects of learning that require drill and practice. For example, competence in performing arithmetical operations has been achieved through CAI in a third to a fifth the time required by conventional means. The programming and perfecting of techniques for teaching a variety of advanced courses will require more time. However, the developers of CAI point to an important asset that they utilize. While the computer is teaching it records the student's responses. These responses determine what material is presented next. They also guide improvements in the curriculum.

The CAI equipment at present available is expensive in terms of cost per student per hour of use and can service only small classes. Some of the equipment performs functions that can be served in cheaper, simpler ways. If CAI is to be used widely, new equipment must be invented and perfected. Under development at the University of Illinois is a facility aimed at exploiting the great time-sharing potential of the CDC-6600 computer. If developmental work is successful, the facility will eventually include about 4000 consoles, some of them at Urbana but many in junior colleges, grade schools, and high schools around the state. The hoped-for cost per student per hour of use is 25 cents.

If the development comes up to expectations, the present educational system will be faced with great tensions and opportunities. However, experts in CAI feel that the usefulness of the computer will be most revolutionary in teaching children aged 3 to 6 and in the area of continuing education. They predict that it will become feasible for individuals and families to have computer terminals in their own homes and to tap course material covering a broad spectrum of subjects.

—PHILIP H. ABELSON