Rothe, J.P. A Critical Look at Communications Technology and Distance Education. Journal of Distance Education, (in press).
Wicklein, J. Wired City, USA. Atlantic Monthly, February 1979, 243(2).

Three Roles for the Computer in Education
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At the present time, the computer has three major, but quite distinctive, roles to play in education: (a) as an object to be understood both in relationship to the circumstances and society in which we live and as useful means (when combined with appropriate software) for getting things done more efficiently; (b) as an object of study in its own right, as knowledge and skills to be mastered, and (c) as a means of assisting the learning process.

The First Role: Learning About the Effects of Computers
Regarding the first role, computers are certain to have progressive and far-reaching effects on future society. Developments have reached the point where every child must achieve some degree of computer literacy, if nothing else but to understand what is happening in the world around him or her. Since most educators feel this need personally, considerable attention is being devoted to this problem and little more will be said here.

The Second Role: Learning About Computers
The second major role for computers in education is sometimes equated with the first but is sufficiently different to warrant separate consideration. The emphasis in this case is on the computer itself. This includes learning how computers operate and developing the knowledge and skills necessary for getting computers to do what one wants (e.g., learning to program). Just as students should become as verbally and mathematically literate as possible, few educators would deny the need for today's youth to get as much training in these new areas as they can reasonably absorb.

Some proponents of computer training, however, go considerably beyond these admirable goals. This view seems to be especially widespread among proponents of the LOGO programming language. In general, these individuals view learning in a manner analogous to the long discredited "mental

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The Third Role: Using Computers to Promote School Learning

The third major role computers can play in promoting school learning is in computer-based instruction (CBI). The variety of computerized educational systems which exist today largely defy neat categorization. Nonetheless, contemporary CBI software systems tend to fall into one (or more) of three nonexclusive categories: drill-and-practice, tutorial systems, and simulations and educational modeling. Drill-and-practice refers to those CBI systems which are designed primarily to exercise previously-learned skills. In arithmetic, for example, good drill-and-practice CBI systems attempt to build on student familiarity with computational algorithms, providing practice which leads to higher levels of skill (i.e., to faster, more accurate performance). Drill-and-practice systems have been developed for a wide variety of topics, ranging from enhancing typing skills to expanding foreign language vocabulary. Generally speaking, today's low-cost microcomputers provide a highly cost-effective means for developing and delivering drill-and-practice CBI, a fact which has not gone unnoticed by educational publishers.

As the label implies, tutorial CBI systems are designed to teach new information as well as to exercise previously available knowledge. Building on the previous illustration, for example, a tutorial CBI system in arithmetic might explicitly introduce a student to the computational algorithms, rather than just exercise previously-acquired algorithms. Tutorial systems can be envisaged in almost every conceivable area, ranging from teaching basic concepts and principles (e.g., rules) to teaching complex, highly interrelated bodies of content. Generally speaking, to be classified as a tutorial system, the information taught must involve more than simply learning new facts (e.g., in learning new vocabulary). The latter generally can be learned by simple drill-and-practice.

The simulation and educational modeling category is less well-defined because the available CBI systems, which might be so classified, range from serious education to pure amusement. One could argue that every well-designed CBI system has some educational value—even Pac-Man probably has some redeeming features. The relevant educational question, as always, is the value of what is learned when judged in terms of the time spent, and particularly whether all or some of that time might be better spent on other activities.

Unlike tutorials, which tend (but need not) emphasize instruction by verbal means, simulations emphasize instruction by illustration. In the simplest cases, for example, a simulation might consist of little more than an animated visual illustration showing, say, how an internal combustion engine operates. This type of simulation, of course, might just as well be accomplished by film or a mechanical modeling device. As with all CBI applications, simulations must be interactive if they are to fully utilize the capabilities of the computer.

All three kinds of CBI application have a valuable role to play in education. Drill-and-practice is best where students need a high level of skill in a well-defined area. Tutorial systems are best where what must be learned is clearly defined and where learning should be as efficient as possible. Simulations and educational modeling are best where the desired learning is more diffuse and/or less clearly defined. In this type of situation, one wants to introduce students to a wide variety of related situations in the hope that they will acquire a significant portion of what is known.