The Future of Computers in Education


During the past year, I have given a number of talks on the future of computers in education. These are fun to give, partly because many members of the audience feel some personal involvement in the rapid progress that has occurred and is likely to continue.

Recently I organized my "Futures" presentation into a paper for a conference proceedings. I wrote about the past, present and future of hardware. There [in hardware] the progress has been nearly unbelievable, and rapid progress will continue. I wrote about systems and applications software. Progress has been steady, and continued steady progress seems inevitable. I wrote about progress in telecommunications and networking, and the rosy future of these fields. I wrote about computer science, which is slowly maturing into a solid academic discipline. I addressed computers in education, using a variant of the "Tutor, Tool, Tutee" model developed by Robert Taylor. I wrote about teacher training and instructional support materials.

As the paper got longer and more complex, I began to ask myself if all of the length and complexity were necessary. "Why can't I capture the essence of the future of computers in education in a few paragraphs, written so that all educators can understand?" All educators already understand the importance of information and how one processes information to solve problems. A computer is merely a very fast machine designed to aid in the storage and processing of information.

With this simple model of computers in mind, the future of computers in education is easy to represent. One begins with a few observations about the importance of accessing and making use of (that is, processing) information. The basics of education (reading, writing, arithmetic, speaking, listening) are all concerned with accessing and processing information. Thus, any aids to this endeavor are potentially quite important to education.

Next one points out a couple of things that all educators know. First, if you want a student to learn to use a tool, you give specific instruction in its use and you provide an environment in which the tool will be routinely used. Second, tools (such as paper, pencil, and book) shape thought processes. That is, one's whole way of working with intellectual problems is intertwined with the intellectual tools one uses.

The next step is to point out four rather obvious facts about computers.

1. Computers are useful components in many manufactured products (cars, microwave ovens, wrist watches), and such use will continue to increase.

2. Computers are a useful aid to productivity (office workers, engineers, factory automation), and such use will continue to increase.

3. The cost of a given amount of compute power (raw CPU speed and primary memory) continues to decline because of progress in integrated circuitry technology.
4. Computers are making information more accessible, and are increasingly helping people process information to solve intellectual problems.

Finally, one states several conclusions that are probably self-evident.

1. Eventually almost all students in this country will grow up in a computer-rich environment, having easy access to very powerful computers both at school and at home.

2. The content of the curriculum will need to adjust to take into consideration the changing capabilities of students who have grown up with computers.

3. Use of computer-assisted instruction will grow steadily.

4. Educators will need to adjust to the changing curriculum, instructional environment and students.

A few closing remarks complete the presentation. For example, one might make a prediction that computers-in-schools' progress during the next 15 years will be many times what it has been in the past 15 years. Or one might point out the need for more money and more teacher training to help us achieve the full potential that computers offer in education.

Three things strike me as particularly interesting about this presentation. First, I will be able to use the same paper five or 10 years from now, making only a few changes to reflect some details of technological progress! Second, the presentation has a relatively low level of high-tech ideas and terminology. An educator doesn't need to have taken a computer course, or even used a computer, to follow the general ideas being discussed. Third, relatively few educators are strongly involved in changing their current educational behaviors in a manner consistent with the future being predicted. That is, computers have had relatively little impact on the content or pedagogy of the conventional curriculum. To a very large extent, computers have been an add-on part of our school curriculum.

For me, this analysis identifies the key issue for the future of computers in education. If computers remain mainly an add-on part of the curriculum, they will continue to have relatively little impact or significance. When computers are integrated into the everyday content and pedagogy of the ordinary classroom, education will have moved into the information era. The key to this is integration of appropriate information-oriented problem solving ideas and processes into the regular curriculum. Eventually every teacher will need to be involved. Are you involved now?