Now and 10 years Ago


Think about some of the things you currently know about computers. For example, you are probably familiar with graphical, mouse-driven interfaces. You know that many microcomputers now have two to four megabytes of primary storage and 40- to 80-megabyte hard disk systems. You know that many schools have CD-ROM and videodisc players, networked computers, and laser printers.

You are probably familiar with such computer tools as word processing, graphics, database, and spreadsheet packages. You may use special software for desktop publishing and presentation, music composition and performance, or for helping students solve mathematics problems.

You may know that integrated learning systems are selling very well, and that many companies are successfully developing and marketing a wide variety of educational software. You know about hypertext, hypermedia, and that students are able to produce exciting products in a hypermedia environment. You know that the fields of television and computing are beginning to overlap.

Perhaps you have used an inexpensive graphing calculator that contains built-in functions that help to solve a wide range of math problems. You have heard of "virtual reality" and artificial intelligence, and know that expert systems are commonly used to help solve a variety of problems in business and industry.

Finally, you know that most teachers are not comfortable with computers. Relatively few teachers routinely integrate the capabilities of current computer systems into their professional activities. It is a rare classroom in which students routinely use computers as an aid to problem solving and to processing information. To a great extent, progress in computer hardware and software continues to outstrip our staff development system.

10 years Ago (A Thinking Exercise)

Now imagine that you could retain all of your current knowledge as you were transported 10 years into the past. You are given the position of computer coordinator. What decisions would you make and implement that would appropriately lead your school district into its future? How would you structure staff development? What hardware and software would you acquire? What changes would you attempt to make in the overall school curriculum?

What are common mistakes that schools have made in the past 10 years that you would avoid?

Building the Future

I find three things interesting about the above exercise. First, most of the hardware and software "advances" that have occurred in information technologies during the past decade were relatively easy to forecast. Most of the major ideas had already been developed 10 years ago. A
person who was up to date on information technologies at the time and who understood simple forecasting techniques could have done a pretty good job of predicting what would become readily available.

Second, it is relatively difficult to accurately forecast the level of implementation of information technologies that will occur in schools. The school "market" is quite a bit different than the ordinary consumer market. One reason for this is that the consumers, be they students or teachers, are not the ones providing the funds. The second reason is that many of the major decisions that schools make are made for political reasons, rather than founded in a clear understanding of how best to improve the quality of education for students.

Third, major mistakes have been made, and some of them could have been avoided by more careful planning. Some mistakes have wasted a great deal of money. In many cases, schools have acquired inappropriate hardware and software. In other cases, programs of study have (predictably) failed due to inadequately trained teachers and inadequate facilities and materials.

Such mistakes have damaged the credibility of information technology leaders in education. The field has not "delivered" nearly as much as many of its proponents have promised.

**Recommendations**

I believe that the field of information technologies in education is in its infancy. The current and soon to be available hardware and software resources have the potential to make major contributions to the quality of our educational system.

The key issue is, will these potentials be reached? Will the current school reform and restructuring movements adequately address the potentials of information technologies? Can we, as leaders, successful guide our educational system in dealing with Information Age technology? What are the best decisions to be making right now, and what are major pitfalls to be avoided?

School restructuring must be firmly rooted in a careful examination of the current state of the art of information technologies. This will provide us with very good insight into the information technologies that schools can expect to have available during the next 10 years.

**Retrospective Comments 5/2/00**

This series of eight editorials was outlined during the spring of 1991, and quite a bit of the writing of the eight editorials occurred during that spring. The series reflects an optimism about the continuing growth in the capabilities of microcomputers and in their increasing availability in schools.

I find it interesting to see that many of the 1991 comments still hold today. We are putting more and more IT into schools. More and more people are saying, "Show me the evidence that schools are better because of this large investment in IT." The evidence is still hard to find.

This 1991 editorial does not mention a 1984 editorial that I wrote titled The Two-percent Solution. In that editorial, I analyzed how a school district might spend two-percent of its annual budget for IT hardware, software, training, technical support, and so on. In 1984, the average of such expenditures in the US was perhaps one-percent of school budgets. Interesting, by 1991, the two-percent figure had still not been reached on a wide scale basis. Indeed, it was not until the 1999-2000 school year that the nationwide IT expenditures in public schools in the US reached the level of approximately two-percent of total expenditures.
Equally interesting is the fact that Moore's Law is not mentioned in the 1991 Editorial. Moore's Law about the increasing capability of computers that can be purchased for a fixed price had proven to be accurate for many years before 1991, and has continued to hold since 1991. Indeed, there has been an acceleration in the amount of compute power (CPU speed, primary memory) that can be purchased for a given amount of money. Thus, projections in these areas based on Moore's Law have proved relatively accurate since the 1991 Editorial was written.

In a number of ways, this article was rather weak in helping the reader to plan for the future that actually came during the decade after its publication. The Editorial does not provide much in the way of detail on connectivity or disk storage. The World Wide Web has come into routine use. Something akin to Moore's Law for computer hardware has proven to be a good predictor of growth in hard disk capability and in network speeds. Thus, over the past decade (and, presumably for the next decade or so) we have had exponential rates of improvement in computer speed, primary memory, secondary memory, and networking.

By use of your web browser, you can find lots of articles about Moore and his "law." Here are two typical articles:


Magnetic disk drives first became commercially available in 1957. During their early years, the rate of improvement in storage capacity was not as high as the rate of change experienced by integrated circuits during their early years (as summarized by Moore's Law). However, in recent years the rate of improvement in disk capacity has outpaced the rate of change of integrated circuits. An excellent summary of disk drive technology is provided in: