Realizing the Potential of Educational Technology

Educational technology has reached a turning point: from exotic curiosity to useful tool for improving curriculum and instruction.

Photographs by Jeff Olson

Misha Miller, a 5th grader at Bloomington, Minnesota's Normaldale Hills Elementary School, shows that she has solved the first LOGO challenge of the day.

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Many educational leaders believe that "the drive to integrate computers into every aspect of education has lost much of its climbing power . . . and progress is largely stalled on a plateau." Some experts blame the "stall" on lack of developmental research, equipment, and quality software.[1]

The "experts" are wrong. A growing body of evidence suggests that 1985–86 is a turning point school year in which educational technology has moved from a curiosity to a useful tool that will help schools provide better curriculum and instruction. After several years of decision making based on technological biases and hunches, educators have access to the first generation of legitimate research and analysis of trends in educational technology. Although it is less easy to document, 1985–86 may also become known as the year in which extreme claims—technology totally replacing teachers, on the one hand, or being just another fad, on the other—have been replaced by a more balanced understanding of what technology can and cannot do. This year may also mark the departure from the overemphasis on programming in favor of broad-based use of technology in many subject areas to enhance thinking and learning. To accomplish this, educators are moving toward flexible "utility software"—word processors, spreadsheets, and databases—to match the technology to their own creativity.

Recent advances in educational technology have moved the media beyond passive modes, such as instructional television, films, and first-generation computer courseware, to interactive technologies that address individual interests and needs. When linked to satellites and other telecommunication devices, for example, utility courseware, two-way television, interactive video disks, and electronic databases can dramatically reduce communication distances and open opportunities for accessing international information.

Also new, the simultaneous use of multiple technologies such as the computer and video disk or videotape used interactively can improve computer-alone applications. Sophisticated video disk programs, now used by business, give schools a vision of what will be possible when they decide to use these technologies in combination. Minnesota Technology Demonstration Sites, for example, are finding numerous applications for computers linked to two-way television at several remote locations.

Technological Turnaround

Evidence for a technological turnaround comes from several sources. First, the equipment found in schools is increasing. Henry Jay Becker of the Center for Social Organization of Schools, Johns Hopkins University, extrapolates in his 1985 survey of 2,300 public and private schools that there are one million computers in American elementary and secondary schools. Most elementary schools have five or more computers, and half of all high schools have 15 or more computers. One-fourth of the nation's school teachers—over 500 thousand—are using computers. The number of computers in schools has quadrupled in the last two years. The best projections are that there will be 3 million computers in elementary and secondary schools by 1990—even given the national decline in the purchase of personal computers.[2]

Second, use of technology is entering a new era for schools because research shows that computer-assisted instruction achieves positive results. A number of major studies[3] document the following results.

1. Computer instruction that assists teachers enables students to learn 10 to 40 percent more in a given time if objectives are specifically defined, appropriate software is provided, and students are given 12 to 20 minutes of quality computer-assisted instruction four times a week.

2. Students' long-term retention rates following computer-assisted instruction are at least equal to and often better than those for conventional instruction.

3. When computer-assisted instruction supplements the curriculum, students have higher or equally positive attitudes toward school.

Other studies supporting computer-assisted instruction are equally persuasive. The Arkansas Commission on Microcomputer Instruction recently completed the "Instructional Microcomputer Project for Arkansas Classrooms." In this exceptionally well-designed study involving 212 experimental classes, researchers found that students using computer-assisted instruction gained an additional 24 to 29 percent of a year's growth in reading, mathematics, and language arts after a year, over students in control groups with similar backgrounds. In addition, the equipment was cost effective—only $100 more per student per year amortized over a five-year period.[4]

Newer uses of technology that mirror problem solving and enhance thinking skills are giving students the skills they need for optimal employability in an information age. Eighty percent of students currently in school will technologically manipulate information in their work by the year 2000. Thus, Minnesota educators believe that learning to use computer utilities and databases should be given high priority. The Department of Education's recent publication, *Information Technology Learner Outcomes*, summarizes what they believe students will need to function in this emerging society and expresses their concern for attending to the technological implications of group processes, ethics, aesthetics, communications, and rapid change.[5]

Creative Use of Utility Equipment

The significance of utility software is highlighted in *Electronic Learning's* ideal school software library, in which the first eight of the ten top selections are examples of utility software that is not content specific.[6] Curriculum development projects at some Minnesota Technology Demonstration Sites have shown that many of the best applications of technology are those in which creative elementary and secondary

"Educators are moving toward flexible 'utility software'—word processors, spreadsheets, and databases—to match the technology to their own creativity."

Photograph by Jill Dopkjak

Margret Ogren, 3rd grade teacher at Harriet Bishop Elementary School in Rochester, Minnesota, works with Joanne McLonghlen and Christopher Halling

school teachers are using word processors, spreadsheets, graphics generators, journalism tools, sensors, and databases to develop challenging curriculum. These applications—from curriculum in school health practices to refined laboratory and historical simulations—will be demonstrated at a "Technology Supports the Curriculum" conference, 2–4 October 1986 in Bloomington, Minnesota.

Content Software

While many educators believe that utility applications offer the most potential, significantly improved content courseware is also increasingly available. For example, *Story Lords*, a reading series developed by the Wisconsin Department of Education, integrates high-quality software into the curriculum, making learning theory and content objectives—as well as meeting the needs of students—primary considerations.[7]

Numerous commercial developers are giving similar attention to learning theory and specific curriculum objectives. Software is being produced in areas that have been virtually ignored in the past. *The Educational Software Selector*,[8] published by Educational Products Information Exchange, indicates that logic/problem-solving programs increased by 90 percent (to about 90 programs) and fine arts programs increased by 46 percent (to about 150 programs).

Challenges and Issues

A 1982 survey reported that school programming courses used over half of the computer time available.[9] If we are honest with ourselves, we will admit that programming was able to grab such a large share of scarce technological resources because educators, not knowing what else to do with the machines, wanted to quarantine them until they felt they would not harm the rest of the curriculum. Thus, computers were restricted to use by students and teachers with the mathematical skills to learn in a systematic and linear style.

To ensure that computer use will not remain the exclusive prerogative of mathematically talented teachers and students, all teachers will need adequate inservice training in the use of technology. To date, we have not demonstrated the many ways technology can make a teacher's job easier and more rewarding by increasing the educational performance of students.

Whatever the constraints, however, there is compelling evidence for believing that educational technology is getting off its hands and knees and learning to walk. Many of us believe that technology is not "stalled on a plateau," but it *is* developing a more stable base. As a learning tool, it will prove to be as important for certain tasks as textbooks and blackboards.□

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2. Gary M. Ingersoll and Carl B. Smith, "Availability and Growth of Microcomputers in American Schools," *T.H.E. Journal* 12 (August 1984): 84–87. Also, Education Turnkey Systems, *Uses of Computers in Education* (Washington, D.C.: National Commission for Employment Policy, 1985). Also, Talmis, Inc., "Survey Results on the Use of Computers in Schools" (Oak Park, Ill.: Talmis, Inc., 1984).

3. Charles L. Blaschke, *Computer Assisted Instruction (CAI): The Bottom Line* (Falls Church, Va.: Educational Technology Systems, Inc., 1985). Also, M. D. Roblyer, *Measuring the Impact of Computers in Instruction: A Non-Technical Review of Research for Education* (Washington, D.C.: Association for Educational Data Systems, 1985). Also, Marvin N. Tolham and Ruel A. Allred, *What Research Says to the Teacher—The Computer and Education* (Washington, D.C.: National Education Association, 1984).

4. Gary G. Bittner, "Education in the Microcomputer Revolution" in *Microcomputers in Education*. (Tempe, Ariz.: Arizona State University Press, 1983) 17.

5. Gilbert M. Valdez et al., *Information Technology Learner Outcomes* (St. Paul, Minn.: Minnesota Department of Education, 1985).

6. Tony Sorentino et al., "My Ideal Software Library," *Electronic Learning* (May/June, 1985): 38–41.

7. Wisconsin Department of Education, *Story Lords* (Madison: Wis. Department of Education, 1985).

8. EPIE, "TESS Tables Tally Trends," *The Education Software Selector* (February 1985): 3–4.

9. Henry J. Becker, "School Uses of Microcomputers: Reports from a National Survey" (Baltimore, Md.: Center for Social Organization of Schools, The Johns Hopkins University, 1983, 1984).

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