



For the Success of Each Learner

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Realizing the Promise of Technology Pages 11-14

## Why Use Technology?

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**Technological tools can foster students' abilities, revolutionize the way they work and think, and give them new access to the world.**



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If we removed all of the computers from schools tomorrow, would it make a big difference in the knowledge and skills students demonstrated upon graduation? Probably not. What if we removed all of the computers from *businesses* tomorrow? Most businesses would find it nearly impossible to continue.

Why is it that schools rumble along virtually unchanged by the presence of computers? As D'Ignazio (1993) describes it, businesses have been building electronic highways while education has been creating an electronic dirt road. And sometimes on a dirt road, it's just as easy to get out and walk.

Do computers and other technologies offer less to educators than they do the business community? Many educators would answer yes, feeling that the humanistic nature of education makes computers and other technologies less valuable. Increasing numbers of educators, however, are experiencing the power of technology.

Despite the popular inclination to equate computers and other high-tech electronic tools with the term *technology*, the definition includes two components: a *product*—the tool that embodies the technology—and a *process*—the information base of the technology. Both technological products and their systematic processes have a great deal to offer schools.

According to John Naisbitt in *Megatrends*, new technologies pass through three stages (1982). In the first stage, the new technology follows the "line of least resistance," into a ready market. At the second stage, users improve or replace previous technologies with the new technology. Finally, in the third stage, users discover new functions for the technology, based on its potentials. They ask, "What can we do now that was not possible before?" In the educational use of modern electronic technologies, we are just entering this third stage.

## Technology Use in Schools

For some time now, educators have been using computers at stage two—creating puzzles, delivering instruction, assessing student progress, and producing reports. But unlike their use in business, computer technologies in the classroom have increased, rather than decreased, teachers' workloads. Many teachers we have talked with reported that the computer spends more time turned off than on, and that money spent to maintain the computer might have been better spent on other instructional materials. These teachers have a hard time justifying the computer's existence in the classroom. Many schools have added computers in response to parental demand, rather than to compelling need.

In contrast, educators who have moved to stage three are asking, "How can these new tools contribute to a more powerful educational experience?" These educators are searching for a

paradigm shift, not just a way to squeeze technological tools between the existing bricks of yesterday's educational practices.

They begin their search by using the *process* of technology to determine needs and to design appropriate solutions (see Banathy 1991, Reigeluth 1991). They assess future demands on their graduates and the characteristics of their students and the community. They consider what is known about the learning process, and they investigate the tools and techniques available. Having completed their assessment, they design several alternatives. Educators at stage three understand that it is what the student *does* that counts. Only after they determine what the students must be doing do they determine appropriate roles for the professionals and the technological tools.

## Top 10 Reasons for Using Technology

In stage three, educators use technology as integral components of learning. Here is a stage-three "top 10 list" of reasons for using technology.

1. *Students learn and develop at different rates.* Technology can individualize instruction. Through computer networks called integrated learning systems, teachers can prescribe individual learning paths for students. Such systems offer thousands of lessons covering the same basic skills now taught in a lock-step way through textbooks to groups of students with incredibly different backgrounds, interests, and motivation. With an integrated learning system, students can move at an appropriate pace in a nonthreatening environment, developing a solid foundation of basic skills rather than the shaky foundation a calendar-based progression often creates.
2. *Graduates must be proficient at accessing, evaluating, and communicating information.* Educational technologies can—by design—provoke students to raise searching questions, enter debates, formulate opinions, engage in problem solving and critical thinking, and test their views of reality. Online tools and resources allow students to efficiently gather and evaluate information, then communicate their thoughts and findings. This communication may require reading; thinking; writing; creating charts, graphs, and other images; or the organization and production of information using spreadsheets and databases.
3. *Technology can foster an increase in the quantity and quality of students' thinking and writing.* Perhaps one of the best documented successes with computers in education is in developing students' writing. Several features of word processors seem to reduce the phobia often associated with writing. Writing on the computer has a temporary feel, making it easier to take creative and grammatical risks. Difficulty with the fine motor skills required by handwriting usually does not transfer to the keyboard; thus the word processor can reduce frustration. Editing and revising can occur almost as quickly as one thinks, and finished products printed from a word processor have a professional quality that generates a sense of accomplishment.
4. *Graduates must solve complex problems.* Higher-level process skills cannot be "taught" in the traditional sense; they cannot be transferred directly from the teacher to the learner. Students need to develop these skills for themselves, with appropriate guidance. They need to struggle with questions *they* have posed and search out their own answers. A collection of computer applications often called *productivity tools* could revolutionize the way students work and, more important, the way they think. Databases, spreadsheets, computer-assisted design, graphics programs, and multimedia authoring programs (programs for creating computer-based presentations or lessons) allow students to independently organize, analyze, interpret, develop, and evaluate their own work. These tools engage students in focused problem solving, allowing them to think through what they want to accomplish, quickly test and retest solution strategies, and immediately display the results.
5. *Technology can nurture artistic expression.* Modern technology-based art forms (video production, digital photography, computer-based animation, and the like) have great appeal, encouraging artistic expression among our diverse student population. These tools

provide forms of artistic communication for those students who have been constrained by the traditional options of verbal and written communication, and they increase motivation and foster creative problem-solving skills as students evaluate the many possible ways to communicate ideas.

6. *Graduates must be globally aware and able to use resources that exist outside the school.* With few exceptions, children's domains of discovery during the school day are limited to the classroom and the school. Technological tools allow students to inexpensively and instantly reach around the world, learning first-hand about other cultures. Various technologies can provide up-to-date maps and demographic data, and computer-based wire services can bring a newsroom-quality stream of current events into the school.
7. *Technology creates opportunities for students to do meaningful work.* Students need to produce products that have value outside school, receive feedback on their work, and experience the rewards of publication or exhibition. Technology can provide a widespread audience for students' work. Computers link students to the world, provide new reasons to write, and offer new sources of feedback on ideas. Students' video products shown on local cable stations can produce high levels of motivation and accomplishment.
8. *All students need access to high-level and high-interest courses.* Electronic media can bring experiences and information previously unimagined by students into the classroom. Through instructional television, students can view and discuss events they otherwise could not experience. Laserdiscs and CD-ROMs put thousands of images and topics at students' fingertips. Distance education technologies can bring important learning experiences to students, even in districts where small student populations have made some courses impossible to offer.
9. *Students must feel comfortable with the tools of the Information Age.* Computers and other technologies are an increasingly important part of the world in which students live. Many of today's information producers are converting their knowledge bases to digital format and are constructing new technologies to increase speed, capacity, and reliability of dissemination. As telephone, computer, television, and other media merge, incredible resources will become available. An "I tell you, you tell me, and I'll grade you" model of education will not prepare students to take advantage of these resources.
10. *Schools must increase their productivity and efficiency.* Technology can re-place (not replace) the teacher. When stage-three educators determine what students should do and how teachers and technologies can support students, many of the routine tasks done by teachers can be reassigned to technology, elevating the role of teacher.

Some things only teachers can do. Teachers can build strong, productive relationships with students. Technologies can't. Teachers can motivate students to love learning. Technologies can't. Teachers can identify and meet students' emotional needs. Technologies can't. Technology-based solutions in education can, and must, free the teacher to do the important work that requires human interaction, continuous evaluation, and improvement of the learning environment.

Computer-based technologies can administer individualized lesson sequences that branch and remediate according to students' unique needs, quickly and automatically track progress, perform data analysis, and generate reports. Other computer-based tools enable teachers to quickly generate individualized communications to parents, create lesson plans, and select instructional materials from a rich resource database. If entire schools or districts use such capabilities, record keeping and communication can be dramatically enhanced.

## Growing with Technology

When educators allow students to interact with technologies in meaningful ways for significant periods of time, the growth that follows will encourage educators to try new things. In an E-mail message to us, Chris Held, an innovative educator in Bellevue, Washington, said, "Technology is often the Trojan Horse through which innovation enters the school." To see students so engaged

in learning that they lose track of time, to see a level of excitement that causes students to come to school early and stay late, and to have time to develop strong relationships with students and to meet their individual needs, will inspire educators to take more frequent and larger steps into stage three.

Modern technological tools allow educators to fulfill age-old dreams. We can individualize instruction. We can create simulations through which students can discover important relationships and construct new knowledge. We can even put the reins into the hands of students and watch as these tools take them to destinations they envision. Or, we can lose much of the potential these tools have by using them to help us do the same things we've been doing. As George Leonard puts it:

And now ... in the space age, the reformers are offering the nation an educational horse and buggy. They would improve the buggy, keep the passengers in it longer, and pay the driver more. But it would still be a horse and buggy (1984).

Systematic use of the processes and tools of technology can enable us to go beyond simply polishing the buggy for a longer ride. Keith Geiger, president of the National Education Association, summarized the situation well:

The problem is this: we are still too timid to restructure our schools in profound, rather than in superficial ways. And only when we stop being timid will we stop undermining the educational potential of this new technology (1990).

Thousands of pioneers in classrooms around the world are pushing back education's boundaries, intent on avoiding the dirt road designed for the horse and buggy. They are starting, instead, with a systematically designed blueprint for a new kind of school—one designed for learning, rather than teaching. Technologies become powerful tools in the hands of these pioneers.

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