

0110 Lessons

Every Educator
Should Know About

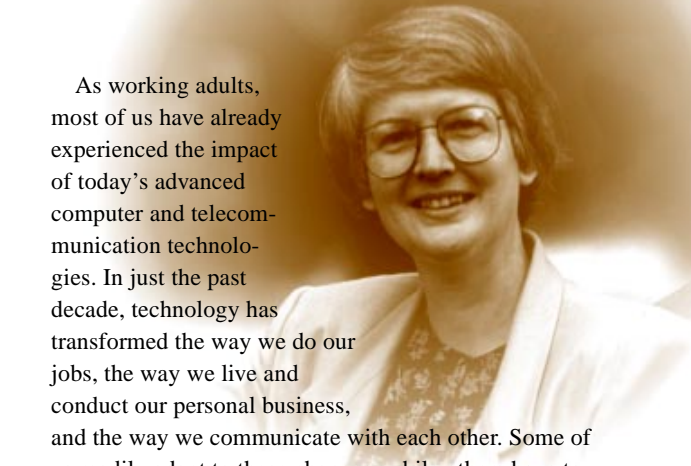
Technology
in the
Classroom



As working adults, most of us have already experienced the impact of today's advanced computer and telecommunication technologies. In just the past decade, technology has transformed the way we do our jobs, the way we live and conduct our personal business, and the way we communicate with each other. Some of us readily adapt to these changes, while others have to be coaxed into the Information Age, but the fact is, we really don't have much choice. As our world changes, either we change with it or we simply fall out of step with the rest of society.

As educators, however, we realize that our schools have not adapted to the changes as fully or effectively as the American public had hoped. We are well aware that most jobs will involve the use of some form of technology, and most of us recognize that today's information technology can, in theory, help transform teaching and learning. Accomplishing that transformation within the classroom is undeniably difficult, but it is critical if we are to offer the best learning possible to our nation's children.

ETS staff have worked with teachers on many research and development projects involving school-based technology, and we have learned a great deal about the difficulties involved in successfully integrating technology in our nation's classrooms. We are happy to share what we have learned, in the hope that this information will help you make sound choices for your students. Their futures depend on it.



Nancy S. Cole

Nancy S. Cole
President
Educational Testing Service

Educational Testing Service (ETS) is a private, nonprofit corporation devoted to measurement and research, primarily in the field of education. It was founded in 1947 by the American Council on Education, the Carnegie Foundation for the Advancement of Teaching, and the College Entrance Examination Board. Educational Testing Service is an Affirmative Action/Equal Opportunity Employer. Copyright © 1997 by Educational Testing Service. All rights reserved.

Since 1979, when the first Apple computer was proudly placed on a school desk, our schools have been struggling to fit Information Age technology into the same educational model we have used since the turn of the century. And even though almost every school district in the country now owns at least one computer, it is clear that technology has not significantly changed what goes on in the average American classroom.

Instead, we hear about isolated examples of break-the-mold schools where technology is being used to improve the way teachers teach and students learn. You can be sure that the educational pioneers in these remarkable schools have struggled and made mistakes, but their commitment to deploy modern technology as a tool for change enabled them to persevere. We cannot distill their trials and tribulations into a single formula that will work within the context of every school's unique blend of circumstances, but we believe there are ten critical lessons to be learned from their collective experience.



0001 **Begin by isolating your key learning goals and building a technology team**

Today's computers offer a dizzying array of tools and information resources to enhance the traditional aspects of the core curriculum, and these tools can be used to nurture the development of the high-level thinking, problem-solving, and decision-making skills that our children will need as citizens of the Information Age. But if these technological advancements are not firmly anchored to specific learning objectives, the money and time that is invested in classroom technology is essentially wasted.

The schools that have had the most success in infusing their classrooms with technology have learned that it is best to start with a common understanding of the learning goals that are most important to the community. As you redefine your learning goals, be sure to include all of your teachers in the process, and invite the parents of your schoolchildren to participate as well.

Once you have consensus on *what* you want your students to learn and the pedagogical ideas that you believe in, you can begin to think about *how* technology can be used to bolster student learning.

The best way to go about this is to form a technology team. The most effective technology teams typically include individuals who have expertise in curriculum design, instructional design, and student assessment, as well as library media specialists and technical support staff. We have been told that it is critically important for the principal to

serve on the team, as a visible reminder of the school's commitment to improved learning through technology.

Technology-rich schools report that the team's effectiveness is enhanced when the team members possess some prior experience with and enthusiasm for information technology. Later on, your team members can provide your more reluctant teachers with the technical and moral support they'll need to teach with technology.

0010 **Think of technology as a tool, not a subject**

The entire range of technologies available today — from graphing calculators to telecommunications and multimedia computers powerful enough to run sophisticated software and interactive CD-ROMs — are simply tools that can be used to enhance learning in and across all subject areas in a stimulating and meaningful way.



It is not unusual for today's schoolchildren, particularly those from the more affluent communities, to possess more sophisticated computer skills than their teachers. Many are thoroughly accustomed to the trappings of technology; they have been changing the television channels from across the room with remote controls since they were toddlers, and in many families they are still the only ones who know how to program the VCR.

As a result, many schools are rethinking the effectiveness of the once-a-week computer lab to teach groups of students basic computer literacy skills and specific software applications, such as word processing programs. Many of today's schoolchildren, raised with talking toys and hand-held video games, see this as simplistic instruction, and there is no intrinsic educational value in teaching students how to use hardware and software that will be obsolete before they finish high school. The new goal is to teach students to view the ever-changing technology as a way of coping with the information explosion that is modern life.

Some schools have dismantled their computer labs and reinstalled the machines in the classrooms to provide more routine access to technology for both the students and the teacher. Others have retrofitted their computer labs to serve as the modern-day equivalent of a study hall, where students use powerful multimedia computers, complete with Internet access and sophisticated software programs, to work on school assignments in any subject area.



0011 Find your gurus and nurture them

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Every school has at least one technophile who was an early believer in the computer's potential to galvanize teaching and learning. These innovative educators were reading and thinking about how technology could be used to engage and excite today's learners long before the rest of us.

Intrepid technology gurus — who are often self-taught and who seem to be continuously researching the best deal they can find on a more powerful, more sophisticated computer for their home — are the most valuable technological asset any school administrator can have. Seek them out, and cherish and support their courage and enthusiasm.

If, for example, you have an impossibly small budget for technological acquisitions, these computer gurus should be the first to benefit. Their eagerness to explore the teaching potential of any new technology will help them develop stimulating classroom uses of your investment. Most children, we know, are enthralled with computers and will stay focused longer when computers are used to enhance the lessons. Their active engagement in the lessons offered by a computer-savvy teacher will, in turn, inspire the computer-resistant teachers; those who are intrigued but intimidated about teaching with technology.

True technophiles are always evangelists looking for converts. Computer-savvy teachers are usually more than happy to demonstrate to the willing novice how the computers can be used to excite and motivate young learners. This informal type of hands-on tutoring from an enthusiastic colleague is invariably the most effective teacher training. If you see that your

school's computer gurus are mentoring growing numbers of increasingly receptive teachers, try to show your support by setting aside some time for group training sessions.

At least once a year, ask your computer-savvy teachers what kind of technological advancement they wish they could have, and what they would do with it. If your technology planning team believes the teachers' wish lists are likely to support the learning objectives established for their students, trust their instincts. Try to find the resources to get your teachers what they need. Even if you are unlikely to receive the needed resources in the foreseeable future, this input will be useful as you develop your long-term technology plans.

0100 **Give your teachers plenty of training and time**

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If technology-rich schools were to compose a national anthem to inspire the technological revolution in our classrooms, this would surely be the chorus: *Designate at least a third of your technology budget for teacher training.*

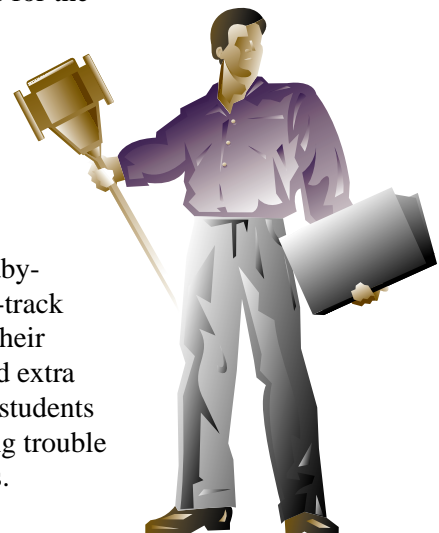
School leaders report that the learning curve is steeper for teachers than it is for the children, and many have told us that the biggest mistake they made when introducing computers and other technologies into their classrooms was underestimating the amount of training the teachers would need. A one- or two-hour course on basic computer literacy may be a necessary first step, but it will not be enough to produce any important effects. Teachers need ongoing training to take full advantage of both the available technology as well as the innovations that are just around the corner.

In addition to formal training, your teachers need to have convenient *access* to the technology and plenty of time to explore what they can do with it. Only when they have become confident and competent computer users will your teachers be able to creatively merge technology with curriculum and pedagogy to enhance student learning. As their leader, you can demonstrate your commitment to the true integration of technology by arranging for your teachers to have sufficient release time to learn about computers, to explore their potential, to confer with other technology-using teachers, and to plan how the technology can be used to enhance their teaching.

0101 **Give new technology to the teachers first**

5

The earliest school computers were typically loaded with drill-and-practice software and installed in the classrooms before teachers had an opportunity to learn much beyond how to turn them on. As a result, teachers often used them as rewards for the students who finished their "regular" schoolwork. The computers became the equivalent of an electronic baby-sitter for the on-track students while their teachers devoted extra attention to the students who were having trouble with the lessons.



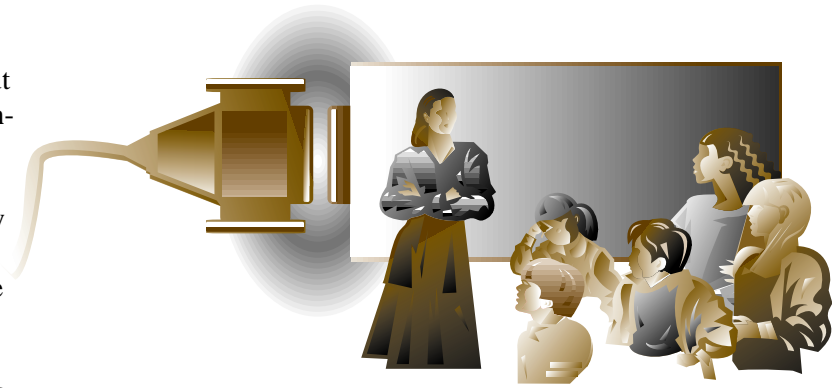
In retrospect, the schools' eagerness to put computers in the classroom was unintentionally neutralized by teachers who simply weren't prepared to infuse the technology into their daily classroom routine. For many teachers, the computers were just another distraction that had no real purpose or place in their lesson plans. Because teachers are ultimately the ones who must decide when and how to use the computers to achieve the learning goals in their classrooms, common sense dictates that they be the first to experience what the technology can do.

In an ideal world, the best way to build a technologically literate teaching force would be to install multimedia computers with e-mail capabilities and Internet access on every teacher's desk. With this technology at their disposal, teachers can communicate with colleagues in a different part of the building or a different part of the world, or share information and images to supplement their lesson plans, all without leaving their desks.

If your current budget won't allow this (and most don't), consider installing computers on the desks of those teachers who truly *want* one. If even this is impossible, try installing one in the teachers' lounge, or any other space that can be designated for teachers only.

0110 **Waste nothing, 6 recycle everything**

Current estimates indicate that there is one computer for every 11 students in America's schools. Lots of classrooms have no computers at all, and yet we know there are thousands of obsolete computers collecting dust in school supply closets all across the country.



These older computers may not have enough power to run today's sophisticated software programs, but that doesn't mean they are worthless.

Your teachers can use even the most modest computers to generate and revise their lesson plans, tests, and worksheets. Teachers can use very basic office software to streamline their many administrative tasks, such as keeping attendance and grade records, or producing progress reports and notes to parents.

If your teachers don't need them, consider loading them with simple word processing programs and installing them in your language arts classrooms. It's well-documented that lethargic student writers are more motivated to rewrite and polish their essays if they can do it on a computer.

If your students absolutely don't need these machines, surely there are students in a nearby school who do. It may be possible for you to make a long-term loan of the machines to economically strapped schools in your state; check with your district business administrator.

It also pays to investigate whether there are any local businesses or computer stores in your area that would be willing to upgrade

your older machines. A nonprofit volunteer group in the Silicon Valley, for example, donated 1,000 computers, plus modems and other equipment, to the San Francisco Unified School District. Each computer had been reengineered from two or three castoffs donated by area businesses. Check the yellow pages of your telephone directory to see if any similar enterprises are operating in your area.

One of the most crippling roadblocks to routine use of technology in the schools is the lack of any in-house technical support when a system shuts down. The time spent waiting for a district technical support person to arrive is frustrating for both the teachers and their students. Very often the problem turns out to be something as simple as an unplugged machine or a loose connection, and it doesn't take much expertise to correct such problems. Encourage your gurus and most computer-savvy students to learn how to troubleshoot and correct common technical problems.

0111 **Enlist community support for what you're trying to do**

Building a technology-rich learning environment for your students requires committed leadership, motivated teachers, and a supportive community. Although many parents recognize that learning computer skills will give their children an important advantage in the job market, they may not have more than the vaguest notion of what those skills are.

Consider using an open house or a PTA meeting to showcase your school's use of computer technology. Ask your best computer-using teachers to develop and present a parent's primer on technology, and let your students show their parents what they can do with the computers. Invite representatives from local businesses and industries to come and discuss the kinds of technological skills they look for when they hire new employees.

Bear in mind that growing numbers of corporations and universities are willing to "adopt" local schools. These are mutually beneficial relationships; the business earns the goodwill of the community by doing something to help the local children, while the school gains some inexpensive (or free) computers and technical expertise.

And don't overlook the parents of your students as a potential source of assistance for your school. Don't be afraid to survey the parents to see if any of them would be willing to share whatever technological expertise they have acquired, either on the job or on their own.

Contact your local library to see if it would be willing to help your school students bridge the technological gap. Libraries are working hard to find the best ways to provide public access to multimedia technology, current software applications, and the Internet. Many believe that libraries may soon be the place where people without access to computers can go to get on line.



1000 **Confront the** 8 **mighty Internet**

By the year 2000 President Clinton wants every classroom in America to have powerful computers, good software, technology-literate teachers, and access to the Internet. While government agencies at the national, state, and local level wrestle with the implementation issues of the Telecommunications Act of 1996, teachers and researchers continue to debate the educational benefits of giving students direct access to the Internet.

The Internet is an unimaginably vast storehouse of unedited, uncontrolled material, and it continues to grow at a near exponential rate. Think of it as a colossal library where truckloads of new materials are delivered every day, but where there are no librarians to tell you what might be on the shelves.

The good news is that the Internet and the World Wide Web offer our students—even in the most isolated rural schools— instant access to the best museums, libraries, and educational institutions in the world.

The bad news is that no one is in charge, and anyone can put anything on the Internet, including material that is silly, grotesque, or just plain wrong.

Internet users coined the term “surfing the net” because even an experienced user can spend hour after hour serendipitously riding

the waves of information that come rolling across the computer screen. Some educators say that permitting students to spend hours collecting research on the Internet is a waste of the school’s most precious classroom commodity — time. Others insist that the Internet is precisely the sort of resource we need to nurture and encourage a self-directed, exploratory kind of learning.

There are other intriguing issues to consider, but the undeniable fact is this: At this very moment, there are more information resources, lesson plans, virtual field trips, and up-to-the-minute data on learning styles and teaching practices available to your teachers through the Internet than your school district will ever be able to provide.

1001 **Accept the harsh** 9 **realities**

Our schools must change if they hope to prepare our children for the demands of the Information Age. Someone recently estimated that more new information has been produced in the past 30 years than in the previous 5000. It is impossible, and unnecessary, for our schools to teach it all. The critical life skill for the 21st Century may well be the ability to locate, sift through, organize, verify, synthesize, and critically analyze information as we need it.



Our schools may never possess state-of-the-art technology. Before you can take a brand new computer out of its box, a newer, faster, more powerful version has hit the market. But if your plan is to wait for the right technology at the right price, you may find yourself waiting forever.

The majority of today's school buildings have antiquated electrical systems, and it may never be financially feasible to install telecommunication technologies in these older buildings. However, this is one area where the thundering pace of technological progress may work in your favor. New advancements are being made every day, and it is likely that wireless technology, similar to the kind currently employed in some portable laptop computers, will soon be perfected to permit telecommunication networks in buildings with formidable architectural barriers.

Every school has computer-phobic teachers. Technology can be very intimidating to teachers. Their professional training was conducted in a primarily print environment, and many think of teaching as an orderly, linear, sequential enterprise. Technology wreaks havoc with traditional classroom dynamics, and not all teachers will be able to make the necessary adjustments. Technology-rich schools have learned not to waste their precious training dollars on teachers who are not interested in the opportunity. Sooner or later, all good teachers are willing to try anything that will improve their teaching skills. It will take time, probably years, but eventually your best teachers will become convinced that the new technologies are genuine teaching tools.

Technology cannot fix every problem in our schools. However, in the hands of well-trained

and confident teachers, it can be used to motivate passive students into active learners, deliver instruction in formats that match individual learning styles, embed subject matter instruction in an authentic, real-world context, and bring a world of up-to-the-minute resources and information into even the poorest classroom.

1010 It's never too late 10 to start

The technology revolution in our schools has not sailed without you. If you are still trying to find the resources to bring computers and telecommunications to your school, make telephone calls, write letters, and *ask for help*. There is a considerable amount of financial and technical assistance available from federal, state, and even private sources to help bring schools into the Information Age. Almost every school we've worked with received some, if not most, of their technology budget from sources other than their local school district.

Locating this assistance does require a bit of legwork. Do everything you can to locate the resources your teachers want and need to bring technology to their students. Even a single multimedia computer installed in a location where your teachers can experiment with it will help get your teaching team motivated.

The important thing is to begin, no matter how small the scale. Even the model computer schools are continuously experimenting with new ways to use technology to improve teaching and learning. There are no short and simple solutions for infusing our schools with technology, and the process will simply become an ongoing part of every educator's life.

0000 Resources and Information

ACCESS ERIC

1600 Research Boulevard
Rockville, MD 20850
1-800-LET-ERIC

ERIC (Educational Resources Information Center) is a nationwide information service designed to make education literature readily accessible. Write or call for a free copy of Getting Online: A Friendly Guide for Teachers, Students, and Parents.

Center for Children and Technology

Bank Street College of Education
610 West 112th Street
New York, NY 10025
(212) 875-4560

This research center also serves as the National Center for Technology in Education, a project of the Office of Educational Research and Improvement, U.S. Department of Education. The center investigates the roles of technology in children's lives—both in the classroom and in general—and the design and development of prototypical software that supports engaged, active learning. It offers a free quarterly newsletter and low-cost publications.

Computer Learning Foundation

Box 60007
Palo Alto, CA 94306
(415) 327-3347

This nonprofit educational foundation is dedicated to advancing computer literacy. Write to request a free copy of Computer Learning, a booklet that describes the group's projects and publications supporting technology in education. Offerings include lesson plan books that aid in curriculum integration.

ERIC Clearinghouse on Information and Technology

Syracuse University
4-194 Center for Science and Technology
Syracuse, NY 13244-4100
1-800-464-9107

ERIC/IT specializes in educational technology and library/information science and processes documents in these areas for the ERIC database. The clearinghouse also provides user services and publications related to its scope areas, including help sheets for using the Internet.

The Foundation Center

This independent nonprofit organization was established to provide an authoritative source of information on foundation and corporate giving. The Center maintains a comprehensive database of grant programs and publishes The Foundation Directory, the classic reference work for grant seekers. Information is provided at no charge at five Foundation Center libraries in New York, San Francisco, Cleveland, Atlanta, and

Washington DC and 200 cooperating libraries across the country. To locate the collection nearest you, call 1-800-424-9836.

Software Publisher's Association

1730 M Street NW
Suite 700
Washington, DC 20036
(202) 452-1600

Visit the SPA website at www.spa.org or call or write for a copy of An Educator's Guide to Assessing the Cost of Donated Computers or their interesting position statement on Donated Computer Initiatives for Schools.

National School Boards Association

1680 Duke Street
Alexandria, VA 22314
(703) 838-6214

The NSBA sponsors a variety of initiatives to promote enhanced student learning through the judicious and appropriate use of technology, including Electronic School, an electronic periodical on the World Wide Web, and the Institute for the Transfer of Technology to Education, which offers publications, conferences, and seminars for school board members and other educators on the effective use of technology in education.

The Teacher Enhancement Program

National Science Foundation

4201 Wilson Boulevard
Arlington, VA 22230
(703) 306-1651

Contact NSF for information on The Teacher Enhancement Program, which seeks to improve the interdisciplinary and pedagogical knowledge of teachers and other educators who play a significant role in providing high-quality math, science, and technology education for students from pre-kindergarten through 12th grade.

Tech Corps

P.O. Box 832
Sudbury, MA 01776-0832
(508) 620-7749

Tech Corps is a national organization of volunteers assisting schools throughout the country with their efforts to enhance the use of technology in education. Tech Corps is also a participant in 21st Century Teachers, a coalition of national education organizations dedicated to encouraging, recognizing, and supporting educators who are developing skills in new technologies and using them in innovative ways with students and colleagues.

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