

# Chapter 7

## INTRODUCTION

### EXPECTED BENEFITS OF EDUCATIONAL TECHNOLOGY

A recent article from the RAND Corporation succinctly expressed three potential benefits of using technology in education:

1. Reduce the cost of delivering education.
2. Increase access to knowledge.
3. Transform the processes as well as the products of learning.

Elaborating on this third potential benefit, the article says: “The most promising applications of new information technologies in education do not simply enhance educational productivity: they *transform* the processes and products of learning and teaching.” Notice that we are talking not only about transforming the *processes* of delivering education but also about the transforming the *products* of that education. We are talking about producing students with greater knowledge, better problem-solving skills, and more dedicated community-mindedness. We are talking about methods of delivery that were not possible or feasible without the tools of technology.

Business leaders and policy makers now believe that graduates of American schools won't be prepared for 21st century life unless there is a redefinition of the basic ideas and beliefs, the commitments, and the social order of schools (Timar and Kirp, 1989). They advocate beginning with a vision of ideal future graduates that clearly matches the realities and needs of 21st century life (Schlechy, 1990, Behrens, 1989, Fullan, 1991). In 1991 the U.S. Secretary of Labor's Commission on Achieving Necessary Skills (SCANS Report) described a vision of the educational outcomes the business community requires. They identified five specific competencies that will be demanded of 21st century workers:

1. The effective, productive use of resources - can wisely utilize time, money, materials and facilities, and human resources.
2. The exercise of interpersonal skills - can participate as a member of a team, can teach others new skills, can serve clients/customers, exercise leadership, negotiate and resolve divergent interests, and can work with men and women from diverse backgrounds.
3. The effective *acquisition and use of information* - can acquire, evaluate, organize, maintain, interpret, and communicate information and use computers to process information.
4. The ability to *understand complex systems and inter-relationships* - knows how social, organizational, and technological systems work, can monitor and correct their performance, and improve

or design new systems.

5. The ability to *work with a variety of technologies* - can select, apply, maintain, and trouble-shoot equipment.

## **VISIONS OF RESTRUCTURED 21ST CENTURY SCHOOLS**

When asked to describe their visions of an ideal system of schooling for the 21st century, American leaders in school reform and restructuring repeatedly mentioned five themes (Holmes, 1991). Their ideal system of schooling focused on:

- 1) Creating a caring community of students.
- 2) Modeling democracy in every aspect of school life.
- 3) Conserving and developing all human resources.
- 4) Nurturing problem solving skills.
- 5) Maintaining flexibility in every aspect of its operation so that the school can efficiently respond to a rapidly changing society.

How should this collective vision of ideal 21st century schooling impact the design and construction of new, technology-smart facilities? How can a building be configured, for example, so that it furthers the creation of a community of learners? The spatial relationships of the school will have to encourage interaction among all members of the school-based learning community, rather than isolate them. The infrastructure of the building should also be configured so that telecommunication connections are possible between the school and community entities outside the school.

If conserving and developing *all* human resources is part of a vision of schooling, then capacities for technologies that address multiple learning styles and allow full participation in the learning arena by all individuals (i.e., multimedia reading materials, captioned videos, Braille readers, adaptive keyboard devices) will be an integral part of the school's infrastructure. Increased space for individual tutoring and counseling, and for telecommunication connections to community social service agencies and to parents must also become a part of the architectural program.

Finally, if flexibility is valued, then every aspect of the school building should be designed accordingly. What might this mean? Chairs and tables with easily and quickly adjustable heights, walls that expand and are easily removed, omnipresent electrical and network access, the elimination of "master-slave" clocks and bells, and movable lighting modules should all be features of the building design. Flexible school infrastructures should:

- Allow for the future growth and development of new technologies, especially the incorporation of new technologies and media that will be helpful in locating, obtaining, and processing information;
- Allow for the efficient expansion of the curriculum by storing documents on networked computers;
- Encourage the continuous professional growth of all its members by tailoring the building design

to meet the needs of adult, as well as student learners (Trelogan, 1989; Cummings et al, 1987).

Before attempting to design a building to accommodate new technologies, the district must have a clear vision of the nature of the schooling to be supported by the facility. What is the district's vision of an ideal system of schooling? What is their vision of ideal educational processes and outcomes?

Final designs for new or reconstructed (renovated) school facilities ought to be able to answer "yes" to the following questions:

1. Is this facility design flexible enough to accommodate continuous change?
2. Is this facility responsive to the needs of a diverse group of learners?

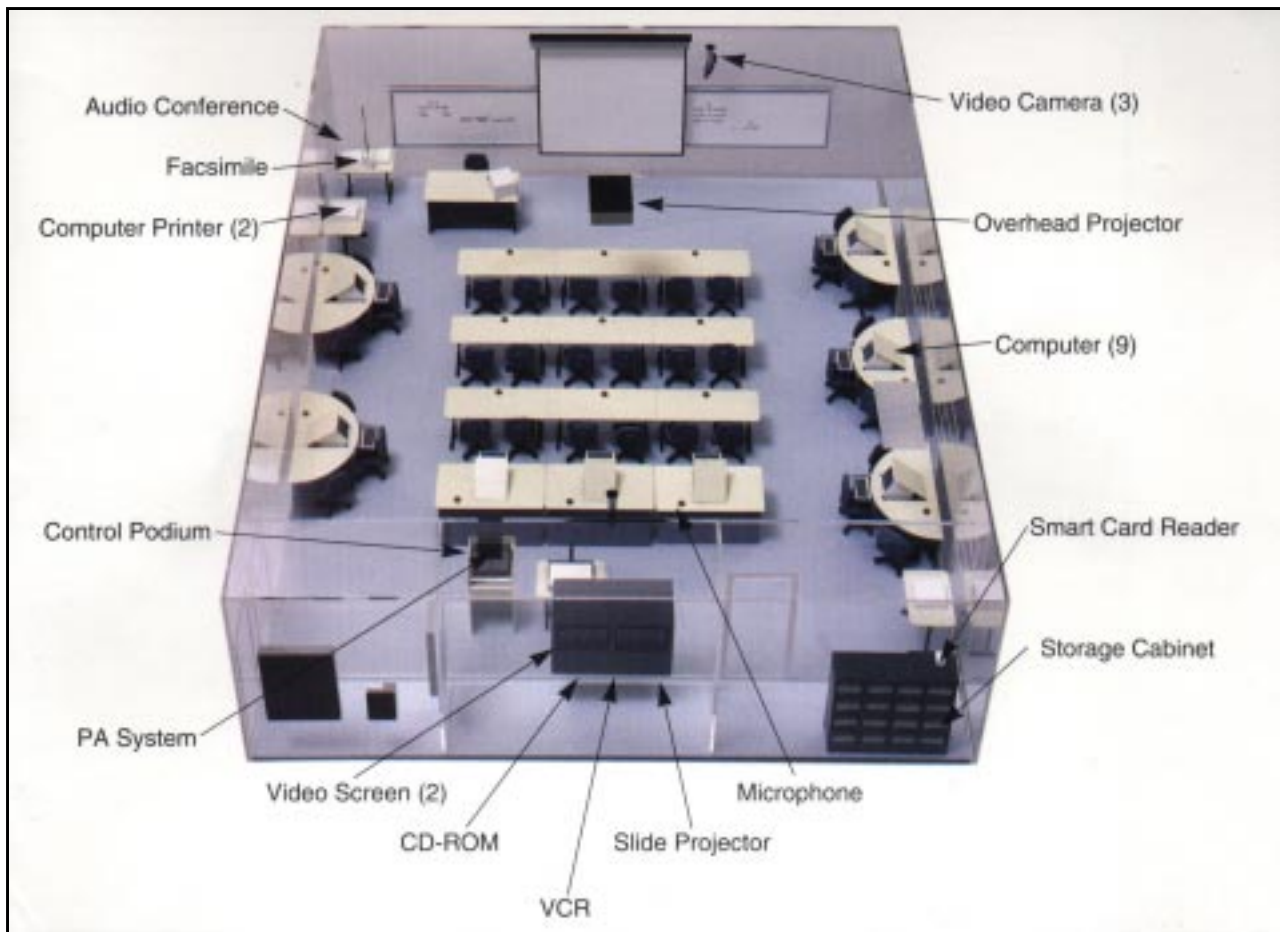
### **PLANNING FOR TECHNOLOGY-RICH SCHOOLS**

Educators are faced with a major challenge: *how to plan school buildings that will accommodate new technologies in a quality, cost-effective manner*. Educators must either plan new school buildings or redesign/retrofit existing buildings to reflect their educational vision and to accommodate the new technologies. Most often, the task is one of retrofitting an old building. Space use in these old schools will change dramatically as schools restructure to create a 21st century teaching and learning environment. The number of rooms, the size of rooms, the nature of rooms all will change, as will the furnishings that occupy the newly configured spaces. (See Figure 1-1 for a representative example of this new look.)

To match these radical changes in curriculum and instruction, participants at the 1992 Architecture and Education Conference (Halstead, 1992) forecast radically different school designs for the future. They report that the classroom of the future will be more like a studio - with information-rich workstations and research space provided for each student. Teachers, instead of being lecturers, will be participant observers, mentors, and coaches in the learning process. There will be an array of spaces of various sizes - central gathering places; presentation places for the school community; work spaces for cooperative learning by groups of different sizes; quiet, private areas for one-on-one sessions with a teacher, mentor, community social service agency representative or fellow student; nooks where students can think and work independently; offices for teachers where they can work as true professionals.

Already new school buildings are reflecting this changed vision of schooling. The "Saturn" school in St. Paul, Minnesota (Hopkins, 1991), designed to create a 21st century school work space, utilizes each room for a particular function. A visitor remarked that there isn't a single room that looks like a traditional classroom. Gone are "Miss Jones' 1st Grade" and all-purpose "Room 311" that might house history one period, English the next. Instead, there is an Art Room, a Music Room, etc.

Technology-rich schools look and feel different. Whole class instruction is less frequent. Using technology, students work together in small groups. Desks are often clustered in groups rather than standing in stiff rows. Students are up and around. There is conversation. There is action. There is active learning!

**Figure 1-1. A Representative Technology Rich Classroom**

The traditionally configured library is becoming a memory. Much of the reference section has been replaced by a computer, equipped with CD-ROM drives, which provides instant electronic access to an extensive array of reference books and other materials. With the power of technology, entire encyclopedias and other reference books can be stored on one CD-ROM disc and transmitted to any room in a school via networked computers. Whole books can be “checked out” (read or printed) from computer terminals, and they can be read by more than one person at a time.

Designing new buildings or designing a retrofit of an existing building without a long-term vision — including five year technology requirements — can waste millions of tax dollars. Renovating a building’s infrastructure is far more costly than designing capabilities into it initially. For example, it generally costs three times as much to cable an existing building than to cable a new building.

The facilities and equipment designed should support all current activities in an aesthetically pleasing manner and be adaptable to future educational technology needs. Educational decision-makers must plan and build a school that is *not* obsolete the day it opens. It is difficult to explain to tax payers how a district can spend millions of dollars for a new school one year, and then need more money only a few years later to restructure the same building to handle a new technology program.

## **EDUCATIONAL TECHNOLOGY LEGISLATION AND RESOURCES**

### **Long Range Plan for Technology**

Some states, such as Texas, recognizing the transforming power of educational technologies, have taken dramatic steps to foster its implementation. In 1988 Texas took a national leadership role by adopting the *Long Range Plan for Technology of the State Board of Education*, a document that plots the course for meeting educational needs through the application of technology from 1988 to 2000 (Texas Education Agency, 1991). As a result of lessons learned since inception of the plan, a new version was published in 1996 covering the years 1996-2010. The passage of legislation providing statutory authority and the appropriations necessary to initiate this technology plan demonstrate exceptional commitment to the infusion of technology into education. As a continuing part of the original plan, a technology equipment allotment of \$30 - \$50 per student per year is established over a five year period. To qualify for these funds, each Texas school district must write and submit a detailed technology plan. Collaboratively developed, the technology plan must explain the district's educational vision and goals and objectives, and it must specify which technologies would be utilized to enact their plan. School districts are also required to reserve funds for staff development in technology use. Thus, a major, step has been taken to ensure that these tax dollars would be spent wisely.

A major aspect of the revised plan is a program for infusing specified technological knowledge and skills into the school curricula at all age groups. This plan, known as the Texas Essential Knowledge and Skills (TEKS) was developed by a task force of teachers and administrators established by Education Commissioner Mike Moses.

In July, 1992, the Texas State Board of Education also issued the *School Facilities Standards*, a series of space guidelines for Texas schools that include classroom space requirements for computer-based technology.

### **Recent Legislation**

Several recent legislative enactments with regard to distance education are of primary interest to Texas educators.

Senate Bill 1 (1995) states that the mission of public education in Texas is to ensure that all Texas children have access to a quality education that enables them to achieve their potential and fully participate now and in the future in the social, economic, and educational opportunities of our state and nation." It shifts authority and accountability to local authorities, and it calls for the development of the Texas Essential Knowledge and Skills (TEKS) to replace the Essential Elements adopted in 1984.

House Bill No. 2128 (1995), aimed at, but not limited to, K-12 public schools, imposes requirements on telecommunications carriers and establishes funding to bring telecommunications facilities to all schools in Texas.

House Bill No. 85 (1995) requires the Texas Higher Education Coordinating Board to study and make recommendations regarding a telecommunications master plan for the higher education institutions of Texas.

Senate Bill No. 66 (1994) requested the Texas Higher Education Coordinating Board to prepare a progress report on the use of telecommunications in the state's higher education institutions. The Board responded with a survey and recommendations.

The Federal Telecommunications Act of 1996, aimed primarily at K-12 schools, deals with distribution, rate structures, measures to inhibit delivery of pornography, and a more competitive environment among telecommunications carriers.

Goals 2000: Educate America Act (1994) calls for state planning to improve student achievement by integrating technology into classrooms and school libraries. This legislation led Commissioner Mike Moses to appoint the Texas Task Force on Educational Technologies to re-examine the State Board of Education's original long range plan for technology.

Further information about most of these enactments can be gained from the following TCET documents:

*Distance Education: Research, Current Practice, and TEKS, Chapter 5.*

*Wide Area Networking Guide for Texas School Districts, 2nd Ed., Appendix E.*