Leadership Principles in Technology

Excerpts from

The Knowledge Loom: Educators Sharing and Learning Together

Web site

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The Knowledge Loom: Educators Sharing and Learning Together

http://knowledgeloom.org

The attached document is a user−generated download of selected content found on The Knowledge Loom Web site. Content on The Knowledge Loom is always being updated and changed. **Check online for the most current information.**

What is The Knowledge Loom?

The Knowledge Loom is an online professional development resource featuring specially organized spotlights on high−priority education issues, including:

- a list of promising practices (including an explanation of each practice and a summary of the research or theories that support the practice)
- stories about the practices in action in actual education settings
- lists of related resources found on other web sites.

The site is designed to help educators facilitate decision−making, planning, and benchmarking for improved teaching and learning through collaborative activities.

Are there other resources on The Knowledge Loom?

In addition to printable content, the site features interactive tools that allow users to share information and knowledge, read what panels of practitioners have to say about selected topics, ask questions of content experts, and print custom documents like this one. A companion guidebook, *Using The Knowledge Loom: Ideas and Tools for Collaborative Professional Development* (http://knowledgeloom.org/guidebook), can be downloaded. It offers activities and graphic organizers to support collaborative inquiry about what works in teaching and learning in support of school improvement.

What spotlight topics are currently available?

- Adolescent Literacy in the Content Areas
- Culturally Responsive Teaching
- Elementary Literacy
- Good Models of Teaching with Technology
- Leadership Principles in Technology
- Middle School Mathematics
- Principal as Instructional Leader
- Redesigning High Schools to Personalize Learning
- School, Family, and Community Partnerships
- Successful Professional Development
- Teaching for Artistic Behavior: Choice−Based Art

Overview of Spotlight: Leadership Principles in Technology

This overview provides an outline of all content components of this spotlight that are published on The Knowledge Loom Web site. The creator of this document may have printed only selected content from this spotlight. View complete content online (http://knowledgeloom.org/).

The nation's schools have benefited from a wave of financial, political, and community support for the incorporation of technology in the learning process. Legislation such as the Improving America's Schools Act of 1994 and the Telecommunications Act of 1996 resulted in the development of a national educational technology plan, "Getting America's Schools Ready for the 21st Century," as well as significant funding, including the E−rate. Despite these and similar initiatives that have successfully provided access to technology, software, and teacher training, numerous studies and reports have shown that schools are still struggling to effectively use technology to improve teaching and learning.

Technology integration is a complex challenge that is not easily addressed with a single intervention. While access to technology and teacher training are important, other key elements are necessary to ensure the effective use of technology in schools. One such element is leadership. The following principles, drawn from the findings of recent research, will help leaders−−school administrators, technology staff, and innovative practitioners−−make informed decisions and support the effective integration of technology.

Practices

Each practice includes an explanation, a summary of each story that exemplifies the practice, a research summary (review of the literature), a reference list of the literature, and a short list of related Web resources (URLs and full annotations provided online or in the Related Web Resources section if it has been printed).

- **Vision** − School leaders must articulate a shared vision of how technology will be effectively used to support teaching, learning, and school management.
- **Planning** − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.
- **Access** − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.
- **Integration** − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.
- **Assessment and Evaluation** − School leaders must utilize assessment and evaluation techniques to inform decision making and ensure continuous improvement in teaching and learning.
- **Support** − School leaders must ensure that a technical and pedagogical support system exists that facilitates the use and maintenance of technology in their schools.
- **Professional Development** − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.
- **Community Relationships** − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.
- **Ethical and Legal Issues** − School leaders must model and promote an understanding of ethical and legal issues related to the use of technology.

Stories

The Stories correspond to the summaries printed as part of each practice published on The Knowledge Loom. These are detailed examples of how the practices look in action in educational settings.

Bastrop Independent School District
Bernice Hart Elementary School
Braxton and Gilmer County Public Schools
Canfield Avenue School (Elementary)
Carencro Middle School
Center for Applied Technology &Career Exploration (CATCE)
Columbia County Schools
Deer Park Elementary School
Idlewild Elementary School
Louisiana's America2000 Technology Innovation Program
Maine School Administrative District #11
Maryville Middle School
Mexico Academy and Central School District
Mississippi Department of Education
Poquoson City Schools
Roanoke City Public Schools
The Nueva School (Elementary)
Whitney Young Elementary School

Related Web Resources: 145

This is an annotated list of resources found on other Web sites that relate to the spotlight topic on The Knowledge Loom.

EdvantiaThe Education Alliance at Brown University

Practices

This section presents the Knowledge Loom practices for the spotlight you selected.

Each practice includes an explanation, a summary of each story that exemplifies the practice, a research summary (review of the literature), a reference list of the literature, and a short list of related Web resources (URLs and full annotations provided online or in the Related Web Resources section of this document).

For an overview of additional content presented on The Knowledge Loom Web site that may not have been selected for this print document, see the Overview of Spotlight located earlier in the document.

Vision − School leaders must articulate a shared vision of how technology will be effectively used to support teaching, learning, and school management.

Many stakeholders are affected by the integration of technology in schools; therefore, it is imperative that all audiences be identified and involved in the process. Creating and communicating your vision requires that you understand how educational technology impacts each audience and why it is important to each. When the vision is expressed in ways that are meaningful, stakeholders are more likely to share in the vision.

Questions to Think About:

- How do you convince stakeholders that technology expenditures are a good investment with big returns on that investment?
- What information regarding curriculum, instruction, school management, and learning technologies will lead to increased buy−in?
- What steps should you take in your school or district to address new information literacy skills necessary for today's workforce?
- How will innovations in educational technology impact pedagogy, curriculum, and assessment? How will these innovations impact the basic organization of schools, such as building use, scheduling, and the division of the school day?

Story Summaries

Maine School Administrative District #11

- School district in rural Maine a model for educational uses of technology
- Technology integrated into curriculum, professional development, and school management
- Technology viewed as tool for motivating and teaching students and means of preparing them for the modern workforce

Thanks to the vision of its superintendent, administrators, and teacher leaders and the support of the local community, the schools of Maine School Administrative District #11 (MSAD #11), in the rural center of the state, have become a model for educational technology. According to this vision, technology should be used to motivate students and enhance their learning; prepare them in concrete ways for the modern workforce; and simplify school management and communication. District leaders have realized this vision by volunteering their own time to help develop the necessary infrastructure, soliciting funding through grants and community businesses, and investing heavily in high quality professional development on educational technology.

Center for Applied Technology &Career Exploration (CATCE)

- Superintendent articulated vision that garnered local funding
- $16 million raised for technology facility and internship program
- Information technology opportunities now afforded to students in timber and textile region

CATCE was conceived and developed around three primary goals:

1. Prepare students for the work of the 21st Century.
2. Motivate and inspire students.
3. Address the issue of overcrowding at the secondary level.

Students at CATCE are immersed in a corporate atmosphere and experience an unfamiliar work environment. All eighth grade students attend for one semester and have the option to return in ninth grade. While enrolled, they act as "interns" and investigate three of eight career tracks projected to have the greatest growth when they enter the workforce. In each career area, a content expert joins a master teacher to design and lead activities. Students participate in problem−based assignments and seek answers to real−world questions. Technology is central to all units, and students have access to unique equipment in each career area.

Columbia County Schools

- At least one model technology classroom in every school of 12 districts
- Consortium of 12 rural school districts and 3 cooperating universities
- This program is fashioned after the Apple Classrooms of Tomorrow (ACOT) model

The high−tech mission of the consortium is to foster technological innovation among teachers and help students develop accountability for their own learning. The program is based on the Apple Classrooms of Tomorrow model, which suggests that teachers progress through five predictable stages as they learn to use technology for instruction: entry, adoption, adaptation, appropriation, and innovation. The vision is that technology is not used for technology's sake but that there is a purposeful and advantageous component. Teachers not only learn to use technology but also confront deeply held beliefs about schooling; consider how a child experiences instruction; and learn to involve students in active collaborative tasks. They learn, practice, and pass on new skills.

Research Summary

Technology Leadership Research Summary

- ***The Global Community***
    - The new workforce demands new literacy skills
- ***Systemic Reform***
    - A new way of thinking, a new way of teaching
    - New roles
- ***The Future***

The Global Community

Our nostalgic view of the one−room schoolhouse of the past is a far cry from the realities of schools today. Now leaders must deal with the challenges of increasing access to technology, connecting classrooms to the Internet, and the challenges of retrofitting buildings −− all of which involve a new level of complexity in planning, funding, training, and support.

Information technologies have had such a tremendous impact on all facets of society that schools must increasingly pay attention. An Internet connection and a Web browser are the only tools needed to enter the new global market, where information is abundant, competition is fierce, and success is often fleeting. The dynamics of information technologies have changed the ways we work, learn, and live (Dede, 1998; U.S. Department of Commerce, 1998; Jones, et. al, 1995; Kozma &Schank, 1998; Lewis, 1999; Panel on Educational Technology, 1997; Rockman, 1998; Thornburg, 1998, 2000).

David Thornburg, Director of the Thornburg Center and Senior Fellow of the Congressional Institute for the Future, suggests that the familiar "Three R's" of education be supplemented by a new set of "Three C's." Thornburg (1998) writes that the skills of communication, collaboration, and creative problem solving are all critical in this new information age. But even these Three C's are not enough, for, as Thornburg adds, other equally important skills include technological fluency and the ability to locate and process information.

These new demands raise many questions that must be considered as we prepare the citizens of this new economy. Answers to these questions can help shape a shared vision among school personnel and the community at large.

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The new workforce demands new literacy skills. Changes in the way business is transacted in the information economy directly impact our schools. As barriers to trade fall, the emerging global network demands a workforce prepared to compete in an integrated world economy (Panel on Educational Technology, 1997). New workforce requirements demand new skill sets from the product of our schools −− students.

Many business and education professionals agree that today's work requires greater emphasis on higher−level skills, such as critical thinking and problem solving (CEO Forum, 1999; Jones, et. al, 1995; Panel on Educational Technology, 1997). In addition to these higher−level skills, it is essential to develop the ability to function in collaborative teams (Lewis, 1999; Rockman, 1998; Thornburg, 1998; Wiedmer, 1998), where workers may be required to develop plans, broker consensus, seek and accept criticism, give credit to others, and solicit help (Kozma &Schank, 1998).

The rapid explosion of information also requires workers to develop skills for managing all of this information (Thornburg, 1998). Necessary literacy skills include abilities to search and sort, analyze, evaluate, and synthesize information relevant to a particular task or need. This information must then be applied to generate new data, information, or products (Kozma &Schank, 1998). The shift to electronic commerce requires not only different skills, but also often a more rigorous education in mathematics and science along with other higher−level cognitive reasoning abilities (Dede, 1998; Department of Commerce, 1998).

Effective communication skills have also become key attributes for workers in this economy (Lewis, 1999; Lowe &Vespestad, 1999; Rockman, 1998; Stokes, 2000), as we must create, store, and distribute information through a variety of media and across countless venues. Lewis (1999) comments that as we become familiar with fast and direct feedback we can increasingly use two or more media simultaneously. Information is becoming fragmented, multi−channeled, and simultaneous.

Technology not only generates a need for these information literacy skills, but also supports them. Technology can prepare students for work by helping them develop basic information skills by simulating today's work with real−life examples and reality−based experiences, and by motivating them to learn (Rockman, 1998). The CEO Forum on Education and Technology lists the skills employers most often want in students entering the current workforce:

1. students must be technologically fluent,

2. they must know how to learn, and
3. they must be able to use technology to communicate, collaborate, and support critical thinking and creative problem solving (CEO Forum, 1999).

The demand for new or heightened skills in the work force has direct implications for schools.

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Systemic Reform

A new way of thinking, a new way of teaching. Papert (1993) describes an imaginary journey by two groups of time travelers: surgeons and teachers. If these travelers were to come forward in time from an earlier century, Papert surmises the surgeons would be bewildered by the changes in procedures and equipment. Not so for the teachers, who would have little trouble adjusting to a current classroom, for little has changed in approaches to teaching and learning. Peck and Dorricott (1994) put a different twist on this scenario when they consider the impact of removing all computers from schools and businesses. While many schools would feel little impact, most businesses today would find it nearly impossible to function.

The new demands on schools require rethinking the processes of teaching and learning. The U.S. Department of Education's Office of Educational Technology is doing just that. In response to developments in information technology, the Office of Educational Technology is revising the national technology goals first presented in 1996. The call for the systemic reform of education to meet the needs of the changing workforce has produced a wealth of discussion and debate (Dede, 1998; Honey &Hawkins, 1999; Honey, Culp, &Carigg, 1999; Jones et. al, 1995; Kozma &Schank, 1998; McClintock, 1995; Miller &Olson, 1995; Thornburg, 2000). In the **Report of the Forum on Technology in Education**, Levin and Darden (1999) describe camps in the school reform debate as the "reformists" and "incrementalists." The purposes, impacts, and uses of educational technology are viewed differently by these camps, and by others who seek a more middle−ground, hybrid approach.

School leaders must understand how educational technology impacts our stakeholders, whether local or more global in nature. We must be able to create and communicate a vision that synthesizes the needs of diverse groups while fostering continued excellence in teaching and learning within local schools and districts.

Dede (1998) writes that many visions of educational technology place too much emphasis on instructional activities centered on presentation and motivation. He describes this model as "kids continuously working on machines with teachers wandering around coaching the confused" (p. 203). This emphasis on presentation and motivation is not limited to classrooms with technology −− it continues an antiquated model of instruction. The effective integration of new and emerging technologies requires simultaneous innovations in pedagogy, curriculum, assessment, and school organization (Dede, 1998), not just more wires and boxes.

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New roles. Systemic reform that promotes innovations requires school leaders, teachers, and students to adopt new roles. Shifts in teaching and learning prompted by the integration of information technologies may cause us to rethink our core beliefs about our roles as educators.

Obviously, the teacher is critical to effective integration of technology in the classroom (Hannafin, 1999, Lewis, 1999). Hannafin describes the reformed role of the teacher in an open−ended learning environment as that of "knowledgeable other" and "scaffold−builder." Lanier (1997) states that teachers must go beyond being masters of subject matter to counsel students as they mature and inspire in them a love of learning. Mirroring the requirements of the new workforce, new roles for teachers de−emphasize the presentation of facts and instead ask teachers to help children learn how to think critically, solve problems, and make informed decisions (Kozma &Schank, 1998; Lanier, 1997).

Administrators, too, play an important role in technology integration. Unfortunately, training for handling the ever−growing complexities of technology integration is often weak or nonexistent. To help classroom teachers interface between students and educational technology, administrators need ongoing training and support in understanding technology management issues, impacts of technology on educational change, and administrative uses of technology (Schoeny, Heaton, &Washington, 1999).

As the curriculum leaders, administrators provide valuable support to teachers (Coley, Cradler, &Engel, 1997; Ritchie, 1996). Ritchie (1996) lists eight variables that impact technology adoption and implementation in classrooms. Of these, a lack of administrative support is identified as the most critical, for without it one or more of the other variables, such as inadequate professional development or lack of funds, is more likely to become a roadblock to effective integration.

Leadership should be a shared endeavor, and school leaders must listen and respond to teachers' concerns about technology integration (Fisher and Dove, 1999). The need for shared decision making and ownership echoes the findings of the seminal Apple Classrooms of Tomorrow longitudinal studies (Dwyer, Ringstaff, &Sandholtz, 1991.) As educators' roles evolve, Lewis (1999) reminds that a focus on the student should be the key to setting the foundation for change.

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The Future

These many factors will influence your vision, as a school leader, for the integration of technology in your school or district. Gathering and synthesizing data from stakeholders will help to define and articulate that vision to drive decision−making around planning, professional development, support, and assessment of and with technology. Understanding the impacts of technology and the diverse expectations of your school, community, and business audiences are key to realizing this vision.

Having technology is not enough. **Using** technology to meet the many needs of your stakeholders makes it valuable. As Thornburg (2000) writes, "How you use technology in education is more important than if you use it at all."

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Related Web Resources

Becoming a Technologically Savvy Administrator (74)
Edtechnot.com (9)
ISTE Technology Foundation Standards for Students (19)
Technology in K−12 Education: Envisioning a New Future (63)
The Florida Educational Technology Corporation Conference (56)
Understanding the Impact of Media on Children and Teens (20)
Wired Schools: It Takes a Village (13)

Access − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.

Students and teachers need convenient, reliable access to technology throughout the day. To make technology a viable instructional tool, school leaders must ensure equitable access for all students −− including students with disabilities. Whether in a classroom or lab setting, it's important to provide students and teachers with easy access to the school's technology resources, perhaps even extending opportunities beyond the confines of the traditional school day. Issues such as security and acceptable use become paramount as the school's technology resources are extended to encompass family and community members.

Questions to Think About:

- What are effective strategies for addressing equity issues?
- What technologies are available for providing support for students with disabilities?
- What networking options allow for greater connectivity of computers from all points in the school or district?
- What are some lower−cost options to providing technological support besides a desktop computer for every student?
- How does access to technology beyond the confines of school walls and school day affect teaching and learning in your school or district?

Story Summaries

Roanoke City Public Schools

- "Computing Seniors/Computing Parents" started in one school with a mini−grant of $500 in 1996 and has expanded to 17 schools with an annual budget of $49,000.
- Opens schools' vacant computer labs in the evening
- 500 participants annually and 500 names on a waiting list
- 17 participating schools in 1998−99
- Numerous awards

Recognizing an opportunity to utilize idle computers and increase access to a segment of the population often overlooked, school leaders offer technology courses in vacant computer labs during evening hours to senior citizens and parents. Knowledgeable Roanoke teachers serve as paid program instructors, and a support staff member acts as a paid instructional aide. Courses range from 10 to 12 weeks in length and cover such topics as technology vocabulary, Windows, and word processing. The program is a win−win situation, as both community members and students benefit from increased access to technology. Senior citizens and parents experience a renewed sense of learning and are motivated to support local public education.

Bernice Hart Elementary School

- Students scored higher than students of 15 regional schools with similar demographics
- 90% minority

- School opened August 1998
- Student mobility rate of 40%
- Selected for a Texas Successful School Award based on test scores

Even before the school opened, a core team of administrators assembled a planning team to develop a vision for the school and to design a learning environment to support the vision. Each classroom was equipped with at least two networked computer stations with direct connections to the Internet and e−mail, but computers were not enough. Working with the district, the leaders built a state−of−the−art technology infrastructure including software, CD−ROMs, VCRs, laser printers, televisions, camcorders, scanners, LCD projectors, digital and 35mm cameras, cable television, classroom telephones with voice mail, and a radio station broadcasting to the neighborhood.

Deer Park Elementary School

- Curriculum reflects increased potential for technology integration
- Technology facilitates project−based learning
- Even youngest students can learn information literacy skills

Deer Park opened its doors with the goal of providing a high degree of access to technology for all of its students and staff. The school is a "Total Technology School," as designated by Fairfax County Public Schools, and supports at least four computers with local network and Internet connections in every classroom. Classrooms also have large television monitors for presentation use and support a variety of media formats. A Windows NT fileserver allows teachers to access files and work from any computer terminal throughout the building.

Carencro Middle School

- In 1999 every classroom received four computers with Internet access, a printer, a TV, and a VCR
- 7th grade students increased their composite scores on the Iowa Test of Basic Skills by an average of 5 points between 1999 and 2000.
- Nearly 1/3 of the parish's adult residents are not high school graduates.
- Title I funding for technology in 1999−2000 totaled approximately $61,134.

All the planning in the world is useless without providing needed equipment and ensuring adequate access for all students. Funding can present the greatest challenge to technology implementation. Carencro Middle used Title I funds to purchase equipment and materials and to fund salaries for two computer lab managers and the curriculum coordinator. Title I funds also paid for three personnel to move, reconnect, and renetwork computers due to program reorganization. The school district covered the costs of wiring, building use, and staff salaries. Training by Southwest Educational Development Laboratory (SEDL) ensured that the use of new equipment supported instructional goals.

Research Summary

Technology Leadership Research Summary

> ***Where Are We Now? Where Do We Want to Go?***
> ***Universal Access***

The Digital Divide
Reducing the Divide
The School Infrastructure

To optimize the return on your technology investment, make sure all students and teachers have easy, reliable access to technology that supports learning goals. While some school districts work to improve access within the traditional school day and setting, many schools and their surrounding communities have acknowledged the importance of increased technological skill and access for all community members and are working to expand them beyond these traditional boundaries. Schools, libraries, and community centers are quickly becoming the frontline of technology access for all residents (Bagasao, Macias, Jones, &Pachon, 1999).

Rockman (1998) describes four barriers to learning that can be reduced or removed through increased access to telecommunications and technology. These include the barriers of geography, economic status, individual learning styles, and special needs. Thornburg (2000) describes how increased access to information transforms things we already know and requires lifelong learning. He comments that "one of the great promises of educational technology is that it makes available to all what was once only available to a few (p. 5)."

Jones, Valdez, Mowakowski, and Rasmussen (1995) help us understand access through four indicators. They say a technology−enhanced program has high access when it has connectivity, ubiquity, interconnectivity, and is used equitably. These authors define **connectivity** as the ability to access rich resources within and beyond the school. Technology is considered **ubiquitous** when hardware and software are readily available to students and teachers for problem solving, communication, collaboration, and data exchange. **Interconnectivity** occurs when students and teachers communicate and collaborate in diverse ways using technology. Finally, when technology gives everyone access to rich and challenging learning opportunities, its use is considered **equitable**.

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Where Are We Now?
Where Do We Want to Go?

Access to technology is often discussed as a ratio of students to computer. In **Getting America's Students Ready for the 21st Century**, the U.S. Department of Education (1996) stated that, to make technology a viable instructional tool, all students −− including students with disabilities −− must have easy access to modern multimedia computers. The Department's goal for the year 2000 was five students for every modern multimedia computer in every school. According to the National Center for Education Statistics (2000), we may have realized that goal. In a representative sample of 1,000 public schools, the national ratio of students to instructional computer was 6:1 in 1999, virtually the same as the previous year.

School access to the Internet continues to increase. The percentage of schools connected to the Internet has increased from 35 percent in 1994 to 95 percent in 1999. The percentage of instructional classrooms connected to the Internet increased from 3 percent to 63 percent in the same five−year period. The ratio of students to instructional computer connected to the Internet improved from 12:1 in 1998 to 9:1 in 1999. Demographic characteristics influenced variations with this national average. Medium−sized and large schools had more students per Internet computer (9:1) than small schools (6:1). Urban schools had more students per Internet computer (11:1) than rural schools (7:1). And, schools with the highest concentration of poverty had the greatest number of students per Internet computer (16:1) compared to schools with the lowest concentration of poverty (7:1) (National Center for Education Statistics, 2000).

In an effort to revise and update the National Technology Goals from 1996, the U.S. Department of Education convened the Forum on the Future of Technology in Education (http://www.air.org/forum/). Priorities emerging from this forum no longer discuss student to computer ratios but speak in terms of universal access: all students and teachers will have access to effective information technology in their classrooms, schools, communities, and homes (Levin &Darden, 1999). Additional priorities support:

- the effective use of technology by teachers,
- students being technologically literate and responsible,
- and emphasis on research, development, and evaluation as the breeding ground for the next generation of educational technology applications.

The goal of universal access incorporates more than students and teachers. Universal access holds that learning can and should be supported through the richness of networked technology not only in schools but wherever learning can take place −− libraries, museums, community centers, and the home.

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Universal Access

Support for universal access is widespread (Cartwright, 1996; Jones et al, 1995; Panel on Educational Technology, 1997; Thornburg, 2000). Many believe that universal access will provide equal learning opportunities for all students −− or at least equal access to learning resources. Indeed, some suggest that providing all students and teachers access to technology resources, perhaps through the use of low−cost portable computers, can support a paradigm shift in the way computers are used in schools, a shift described as early as 1980 by Seymour Papert (Robertson, Calder, Fung, Jones &O'Shea. 1997).

Included in the concept of universal access is access for learners with special needs. Planning for special needs students includes those with disabilities and gifted and talented students (Anderson, 1996a). Students with disabilities receive learning support from a variety of adaptive technologies. Such hardware and software tools may include speech synthesizers, larger monitors, touch screens, scanners with scan−reading software, voice recognition systems, speech output devices, keyboard of various sizes, trackballs, joysticks, and Morse Code sip and puff switches (Anderson, 1996a). The Center for Applied Special Technology (CAST) (http://www.cast.org/) promotes the concept of universal design, which endorses the creation of learning environments that provide alternatives for students, teachers, and parents with different backgrounds, learning styles, abilities, and disabilities. Universal design does not suggest that one solution will work for everyone, but that the learning environment must remain flexible to include as wide an audience as possible.

Dede (1998) reminds us that focusing on access and literacy alone won't take us to educational equity. He suggests the real issue in equity is empowerment. Information technology can empower dispossessed groups to achieve their goals. Dede also notes that, from a historical perspective, innovative information technologies often widen inequities when first introduced. The resulting segregation by commodity is reduced only after the technologies mature, drop in price, and are widely adopted. This segregation of the technology−rich and the technology−poor is often called the "digital divide."

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The Digital Divide

This term most often refers to access to the Internet and its origin is often attributed to the cost of technologies; however, the concept is much broader. While many communities are familiar with home computers, mobile phones, and Internet access, many low−income neighborhoods have had little exposure to devices now considered "low−tech," such as laser scanners at supermarkets and automatic teller machines (Benton Foundation, 1998). The divide can be deepest in low−income neighborhoods that do not have an adequate telecommunications infrastructure. The lack of Internet access and basic phone service leads to the greater problem of making an area less attractive for businesses that demand a robust telecommunications infrastructure (Benton Foundation, 1998).

The Department of Commerce (1995, 1998, 1999) has been tracking and reporting on the digital divide for several years. Its most recent (1999) report announced that access to computers and the Internet has increased dramatically in all demographic groups and geographic locations. At the end of 1998, more than 40 percent of all American households had a computer and 25 percent had access to the Internet. Phone penetration has increased, as well, especially among those who were less likely to have phones previously −− young and minority households in rural areas.

Whites are more likely to have access to the Internet from home than are Blacks and Hispanics from any location −− home, school, or community centers. Blacks and Hispanics are also less likely to have Internet access at home than are Americans of Asian/Pacific Islander descent.

Income and education levels also affect access. Regardless of income, rural Americans are less likely to have Internet access than urban dwellers. In households with incomes of $75,000 or more, the divide between Whites and Blacks actually decreased considerably between 1997 and 1998. If this continues to hold and the price of access decreases, the disparity between race and access to the Internet may lessen even more (Department of Commerce, 1999).

A recent survey by National Public Radio (NPR, 2000) provides similar findings concerning computer use and ownership. Income and education affect computer use. Americans under age 60 with annual incomes under $30,000 or with a high school education or less are least likely to use a computer at either home or work. There exists a 17 percent gap in home−computer ownership between low−income Blacks and low−income Whites; however, these differences virtually disappear in high−income households, much like the Internet access findings previously mentioned.

This poll also found some good news. Computer ownership is up among groups previously identified as less likely to be computer owners. First−time computer owners in the past two years under age 60 are more likely than long−term owners to be low−income and to have a high school education or less (NPR, 2000).

Schools are an important ingredient for improving access and reducing the digital divide for school−age children. Despite the disparity of access to computers at home, this survey found that 55 percent of White children, 60 percent of Black children, 56 percent of students from high−income households, and 59 percent of students from low−income households now use computers at school (NPR, 2000). This success in providing access to technology has prompted leaders to encourage schools, libraries, community organizations, and agencies to work together to ensure that entire families have access to technology.

As access to computers and the Internet increases, a different issue gains importance. The Children's

Partnership (2000) has expressed concerns that much Internet content has little value to many of the low−income and underserved populations that have recently gained access. Current barriers to use of content include:

- lack of available information specific to their communities,
- low literacy levels of 44 million American adults who do not have adequate reading and writing skills,
- language issues for non−English−speaking populations, as 87 percent of the documents on the Internet are in English,
- and a lack of support for content and interaction in culturally diverse venues.

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Reducing the Divide

Communities may choose from several strategies for reducing the digital divide. Schools, libraries, and community centers can serve as important community access points to computers and the Internet (Bagasao, Macia, Jones, &Pachon, 1999; Department of Commerce, 1999). Rockman (1998) further notes that some communities have after−school programs that provide instruction and support as well as access, and some schools provide children from disadvantaged families the opportunity to have a computer at home through loan, subsidized purchases, or low−cost computers that have been reconditioned.

To help address inequities of Internet content, the Children's Partnership (2000) suggests communities start to address their information concerns by exploring their own community values and developing their own content and community resources. More global strategies include supporting communities as they develop more effective on−line content through finding resources, marketing the content, and carrying out research and development.

Finally, technology itself may be used to address factors that have promoted the disparity of access. As part of an effort to address the problems of chronic poverty, technology may be used to facilitate the exchange of ideas vital to building community. Technology can help social service agencies reach a broader audience and can empower individuals and groups by supporting new venues of public discourse. New and emerging technologies could support communities in their endeavors to combat problems related to housing, crime, and health concerns, among others (Benton Foundation, 1998).

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The School Infrastructure

The school network can be a powerful agent in support of education reform (Carlitz &Hastings, 1995). A network that provides easy access to finding, creating, and storing information resources will allow students and teachers to produce materials, collaborate, and share resources. A network can help end the isolation of remote students and teachers and can promote equity of access to on−line resources. The success of such a network will depend upon ease of access, flexibility, and affordability (Carlitz &Hastings, 1995).

The school network should integrate data, voice, and video components and should extend to every school and library in the district (Anderson, 1996a). Such a network may also provide distance learning opportunities for students, as well as professional development opportunities for staff. After all, professional development will be required to achieve maximum benefit from the network investment (Honey &Hawkins, 1999).

Kozma and Schank (1998) suggest installing the highest speed Internet connection that can be afforded and investigating the possibility of a wireless network−at least a wireless local area network, which can integrate support services for hand−held, laptop, desktop, and even wearable technologies. Satellite and wireless broadband services (fast Internet connection) have potential for rural areas, as the distance has no affect on cost (National Telecommunications and Information Administration, 2000).

Connectivity to and between schools, libraries, and other education centers means little if there is no useful content. Unlike print resources, resources stored in digital archives offer opportunities for students and teachers to mold and even create content and to express understanding of content in multiple formats. Honey and Hawkins (1999) describe the potential of digital archives to achieve four goals:

- provide information any time in any place,
- provide multimedia information in a variety of visual and aural formats,
- allow students and teachers to personalize or customize how they access and represent information,
- and radically enhance collaborative activities by reducing the barriers of geography, organizational hierarchy, and time.

Honey and Hawkins (1999) further describe three key design considerations for digital archives. They suggest that the publishing industry is dominated by a mindset that discourages inventiveness in students and teachers and makes products that are "teacher proof." Digital content, however, allows experimentation in selection, format, and presentation. Teachers can use these resources in ways that make sense to them. This concept of teacher ownership is the first important design principle proposed by the authors.

In order to increase student engagement, the second design principle says that designers of digital archives must consider the cognitive, social, and emotional stages of development of the potential users. The authors suggest that the students and teachers themselves are the best sources for assessing these developmental levels. Finally, to make the best use of digital resources, teachers and students need to be able to build their own approaches to searching and organizing archived materials. Indexing schemes that work well for a scientist or researcher may not be useful in a classroom (Honey &Hawkins, 1999).

Choosing the most appropriate network connection may be difficult, and the options all bear different price tags. Kozma and Schank (1998) suggest installing the highest speed Internet connection that is affordable, but some options aren't available everywhere. Lower bandwidth connections cost less than faster, more powerful broadband options, but the lower bandwidth involves a tradeoff in terms of time required to access materials and the complexity of information that may be transmitted (Consortium for School Networking, 1999).

Rural areas lag behind urban areas in broadband availability. However, rural towns are more likely to have broadband connections than residents outside of towns. These "last mile" households pose a difficult problem for broadband deployment. Urban areas enjoy such broadband options as digital subscriber line (DSL) and cable modems, with cable modems the most widely deployed service. As mentioned, satellite and wireless access may be options for some rural areas. (National Telecommunications and Information Association, 2000).

The solution to the access puzzle is unique to each district. The well−defined technology plan will describe desired learning goals that will help you make decisions concerning options and funding to bring your vision to reality.

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Related Web Resources

Challenges to Bridging the Digital Divide: Building Better On Ramps to the Information Highway (64)
Critical Issue: Ensuring Equitable Use of Education Technology (48)
Critical Issue: Using Technology to Enhance Engaged Learning for At−Risk Students (79)
District Technology Planning for All Students: Helping to Meet the IDEA '97 Mandate (17)

Edtechnot.com (9)

Assessment and Evaluation − School leaders must utilize assessment and evaluation techniques to inform decision making and ensure continuous improvement in teaching and learning.

Assessment and evaluation are opportunities for growth. Innovative applications of technology can be used to create unique learning environments and processes that require nontraditional forms of assessment. School leaders must be willing to embrace new assessment strategies to obtain accurate and meaningful data, helping to ensure continuous improvement in teaching and learning.

Questions to Think About

- In this time of increased accountability for schools and pressure to perform on standardized tests, what other types of information can give a truer picture of the impact of technology? What rubrics, tools, forms, or procedures can be used to gather this data? (Check out what our panel has to say about this specific question.)
- What kinds of data might be useful in interpreting the effect technology has on a learning environment?
- How can technology itself be employed in assessment and evaluation?
- What do I do with the data? How do data drive further decision making and systemic reform?
- How can students be evaluated in distance−based or distributed education settings?

Story Summaries

Poquoson City Schools

- Every teacher outperformed the state−mandated requirement of technology standards by three−−meeting at least six of the eight standards
- Every teacher submitted performance−based portfolios
- Curriculum development mapped to state standards
- Assessment rubric

Faced with assessing and developing training opportunities for all teachers in the district, Poquoson City Schools supported program development from data gathered through a needs assessment survey. A time line was developed and the benchmark of having every teacher demonstrate at least three of the eight new state−mandated technology standards was established for the first year. Teachers developed a portfolio, either in print or electronic form, to demonstrate proficiency. All portfolios were assessed through a rubric developed by the school system. School−level administrators helped develop and revise standards and assess portfolios, which provided them with additional skills in evaluating the effectiveness of technology integration in their own schools.

Braxton and Gilmer County Public Schools

- Surveys by participating teachers and expert evaluation show teachers increased their technology skills by nearly 25%
- Third−year Stanford Achievement Test results higher than national average
- Increased technical assistance, and community support for technology

Coordinators of the Central West Virginia Technology Upgrade for Educators realized the importance of technology professional development, but knew that alternative forms of assessment would be required to demonstrate impact. While student test scores have improved over the past three years, the program sought alternative indicators. The program sought to increase technology skills by 25 percent and measured this impact through pre− and post−academy surveys. In addition, 90 percent of the participants were to review software to be applied in reading programs, 1,500 hours of technical service were provided, and a technology handbook was developed and delivered to all participating schools.

Bernice Hart Elementary School

- 13% of teachers had high experience with a particular technology at the start of the school year, compared to at least 54% at the end of the year.
- New school that opened August 1998
- Teacher Attitude Inventory
- Measure of Innovativeness
- Attitudes Towards Computer Technologies
- Texas Successful School Award

Before the doors opened at Hart a rigorous interview process was used to identify teachers with the aptitude and attitude needed. Administrators were looking for teachers who embraced creative approaches to learning as demonstrated by the Teacher Attitude Inventory, the Measure of Innovativeness, and the Attitudes Towards Computer Technologies assessments. Before the first professional development session, teachers completed a Technology Skills Self−Assessment. At the end of the first school year, all teacher participants completed a second Technology Skills Self−Assessment, and results indicated a significant increase in teachers' experience with particular technologies. Increases in achievement are not isolated to teachers. Students' scores on the Texas Assessment of Academic Skills (TAAS) were among the highest in the state within schools of similar demographics.

Research Summary

Technology Leadership Research Summary

The Need to Evaluate Technology
The need for new models
Demonstrated outcomes
Evaluating Technology
Variables
Strategies
Using technology for assessment
Realizing the potential

While many business leaders, community members, and policymakers support educational technology initiatives, these same stakeholders increasingly demand evidence of technology's impact on teaching and learning (Kozma &Quellmalz, 1995). Investors and supporters want to know what kind of return they are receiving on their investments. However, technology integration can foster learning environments and activities that help students attain skills not easily measured by traditional methods of assessment.

Program evaluation itself has changed over the past 30 years (Heinecke, Blasi, Milman &Washington, 1999). Key to this change is a new focus on multiplicity. Program evaluation now requires multiple methods, measures, criteria, and perspectives, and must satisfy multiple audiences with multiple interests. Learning environments are often part of larger, more complex systems, and evaluation models must reflect this complexity. Some researchers suggest that the components of complex systems −− including technologies, teachers, and social services −− cannot be isolated for study (Honey, Culp &Carrigg, 1999). The outcomes associated with teaching and learning in these systems are also complex and call for sophisticated research strategies. School leaders are faced with the task of measuring and demonstrating the effectiveness of technology with a variety of methods, rubrics, and tools (Bertram, 1999; Heinecke, Blasi, Milman &Washington, 1999; Honey, Culp &Carrigg, 1999).

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The Need to Evaluate Technology

The need for new models. "Evaluating the impact of technology must be based on an understanding of its role in the teaching and learning process" (Rockman, 1998, p. 3.). Kozma and Quellmalz (1995) agree that traditional forms of assessment often fall short when evaluating the impact of information technology. These researchers call for new criteria, measures, and methods of collecting data when the use of different technologies and pedagogies complicates assessment. Projects that attempt to address variables other than student learning, such as improving teacher knowledge and skills or including new classes of participants in the education process, tax traditional assessment even more. Consequently, no single evaluation design can be used in all situations.

While few educators are professional evaluators, they must still make decisions about technology use and methods. Bertram (1999) presents several factors that require new evaluation methods, which include:

- Users adopt technology at different rates. Early adopters tend to be more adventuresome and knowledgeable about the technology, but evaluations must reflect the whole community of users.
- New technologies are often not isolated entities and must be evaluated as components of larger, more complex systems.
- Technologies change rapidly, and standards and strategies for use may become outdated even as evaluation methods are being developed.

Additional factors include new roles teachers and students assume when using educational technology, scale effects, technical characteristics, and the limitations of access (Bertram, 1999).

In a review of district information technology plans, Mojkowski (1999) noted many that proposed evaluation indicators based on measuring student test results or related to the technology infrastructure, such as counting the number of computers and Internet connections. He suggests that more valuable indicators are changes in student learning opportunities, engagement in learning activities, and attention to higher order or complex thinking. He contends that districts should focus on developing a deeper understanding of the impact technology has on students' experiences.

Further reasons for new evaluation models include the need for administrators to use data−driven decision−making models to build support for their programs (Benson, Peltier, &Matranga, 1999), to evaluate how teachers are guiding student interactions in technology−based activities (Caverly, Peterson, &Mandeville, 1997), to combat high attrition rates in distance education settings

(Dominguez &Ridley, 1999), and to evaluate potential problems early and guide further evaluation efforts (Quinones &Kirshstein, 1998).

The National Forum on Assessment (1995) developed seven principles for student assessment systems. The primary purpose of assessment is to improve student learning, and assessment for other purposes should support student learning. Assessments should be fair to all students. Communications about assessment should be regular and clear, and assessment systems should be reviewed and improved regularly (National Forum on Assessment, 1995).

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Demonstrated outcomes. Some stakeholders still hold schools to more traditional measurements, such as standardized test scores, as indicators of impact. Many argue that measures such as standardized tests are not reliable indicators of the impact of technology (Coley, Cradler &Engel, 1997; Ellett, 1998; Heinecke et al, 1999; Kosakowski, 1998; Kozma &Quellmalz, 1995; Lanier, 1997; Mojkowski, 1999; Rockman, 1998; Wiggins, 1997). If you are faced with providing evidence that technology can impact student achievement positively, the literature does offer support.

Coley, Cradler, and Engel (1997) summarize findings from numerous studies on the impact of technology. Drill−and−practice and computer−assisted instruction (CAI) have demonstrated positive gains in student achievement, and there is evidence that a variety of specific applications lead to improvements in student performance, student motivation, and teacher satisfaction. At least a dozen meta−analyses involving over 500 studies have demonstrated positive impact of computer−based instruction.

Students in all subject areas and at all levels also usually learn more and at a more rapid pace using CAI (Kosakowski, 1998). CAI can be more cost effective in achieving equivalent gains from strategies, such as tutoring, reduced class size, or increased instruction time. Kosakowski also reports that students using CAI feel greater self−esteem and feel more successful, motivated to learn, and self−confident.

Mann and Shafer (1997) conducted one of the largest studies on the effects of educational technology. The preponderance of their data −− quantitative, qualitative, longitudinal, and anecdotal −− suggests that increased technology "supports, facilitates, and encourages student achievement" (1997, p.22). When they studied five counties in New York, they found that the percentage of high school students passing the math state Regents exam increased by an average of 7.5 percent, and those passing the English state Regents exam increased by an average of 8.8 percent. They also found that 42% of the variation in math scores and 12% of the variation in English scores could be explained by the addition of technology in the school.

Some researchers (Heinecke et al, 1999) suggest that analyses of the relationship between technology and student learning depend upon how both student learning and technology are defined. These researchers accept studies revealing a positive relationship between certain types of technology and increased student learning −− if student learning is defined as the retention of basic skills and content information as demonstrated through standardized tests. However, if student learning goes beyond the simple relationship between a student, a computer, and a test to include engaging in critical and higher−order thinking skills and problem−based inquiry then research has been less successful in demonstrating that technology can support these more advanced behaviors. Performance−based assessments supported by technology must be developed to measure the greater impact on student learning (Heinecke et al., 1999).

Grades and test scores are not the only measures of success. Improvement can take on many forms and can include performance of teachers, administrators and other staff; improvement of programs and services to students, parents, and the community; and improved ability of the school community to accomplish its mission (Stronge, 1997).

Teachers trained in the use of multimedia noted additional outcomes not necessarily tied to grades (Wise &Groom, 1996). These teachers noted that multimedia increased student interest more than lecture alone and resulted in greater student attention. While some students became excited by the multimedia, others were merely entertained. All were more alert and attentive, however. One surprising positive outcome was reported from observing teachers incorporating technology in their classroom. Teachers often encountered difficulties or frustrations during their daily use of technology, having to solve minor technical difficulties or resort to alternate plans. Observing their teachers facing and overcoming these difficulties, students learned lessons about problem solving and decision making and also learned that setbacks in technology are common (Wise &Groom, 1996).

Honey, Culp, and Carrigg (1999) believe that the impact of technology on teaching and learning must be understood in context. These researchers present several lessons learned, including the roles that specific technologies can play in the education process and technology's powerful ability to connect schools with the greater community. They suggest that research strategies and questions must be defined in terms of challenges in education rather than the capabilities of technologies. Most importantly, they note that research focused on change cannot be done at a distance, and that change must be understood within the context of each school community.

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Evaluating Technology

Variables. The unique influences of technology upon teaching and learning suggest that unique variables for study are needed. The U. S. Department of Education has developed a useful guide for educators faced with evaluating technology in their schools. **An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms** is available online (http://www.ed.gov/pubs/EdTechGuide/).

One important variable to consider is the stage of implementation of the technology initiative. Schools often go through stages of technology implementation that may limit the scope of effects to be found. Schools need time to purchase and install hardware and software, train teachers on technology−related skills, and help them integrate technology into the curriculum. Effects may not be apparent in the short run of six months to a year; evaluations over several years might better demonstrate impact (Candiotti &Clarke, 1999; Heinecke et al, 1999). Evaluation designs should be longitudinal and account for these stages.

Several researchers suggest observable variables for study such as changes in disciplinary referrals, homework assignment completion, college attendance rates, and increases in job offers (Heinecke et al, 1999). Similar variables related to networked technologies include the number and roles of people who become involved in the school system due to technology integration and changes in times and places of instructional activities (Kozma &Quellmalz, 1995). Other variables may be less tangible.

Ellett (1998) suggests a shift in focus from test scores as outcomes to the active process of student learning. This process involves interactions among students, and between students and teachers. The social process of learning requires looking at technology use in context and as influenced by the variables of classroom organization, the socio−cultural setting of the school, and pedagogical methods employed by teachers (Honey, Culp &Carrigg, 1999).

Sophisticated measures must be located or developed to evaluate outcomes such as changes in higher order thinking, communication, research, and social skills. Additional outcomes may include perceptions from teachers and students about the implementation and quality of a program as well as effects of the program on community and family participation (Heinecke et al, 1999).

Kozma and Quellmalz (1995) suggest that new distributed and distance−based educational settings will require teachers and students to demonstrate new skills and competencies that may be measured and studied. Due to the growing amount of information available, teachers may be assessed in terms of how well they help students find and evaluate this information and their facility with integrating technology into their teaching. Teachers must also be able to develop, monitor, and assess collaborative efforts among their students, as well as collaborate with colleagues. Student outcomes in network−based projects include in−depth knowledge of subject matter, demonstration of higher−order thinking skills, progress in self−monitoring strategies, and collaborative skills.

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Strategies. Developing new assessment measures is a daunting task for school leaders already faced with many commitments. Evaluation models exist that you may apply or adapt in your own school. Wiggins (1997) describes his vision of a school in which assessment is indistinguishable from the teaching and learning process. Common activities, such as note taking and dialogues between teachers and students, become opportunities for assessment, as do such alternate assessments as digital portfolios and simulations. Knowledge about these alternate forms of assessment can help you develop a truer picture of the impact of technology in your own school.

Honey, Culp, and Carrigg (1999) suggest that technology should not be viewed as a solution in isolation but rather as an integral part of curricular initiatives. Research with this systemic focus should be process−oriented and focused on change rather than just doing better within an older framework. Teachers must be partners in the process and must be able to exhibit a sense of ownership in both the innovation and the research process.

Kozma and Quellmalz (1995) describe **cluster evaluation** as a method to help researchers assess diverse network−based programs. Cluster evaluation groups projects with similar features in an effort to economize the use of instruments and measures. Significant characteristics that can be used to cluster projects are primary goals, major educational approaches, audience, contexts of use, technology used, linkages of schools to exterior resources, and the resources with which the project was developed.

Several other projects describe strategies to evaluate innovative technology programs. These include feedback in the form of daily class surveys or small group sessions (Shaeffer &Farr, 1993), a technology−based classroom observation instrument (Gearhart, Herman, Baker, Novak &Whittaker, 1990), and an instrument designed to measure the degree of constructivist orientation to classroom pedagogy based on available technology resources (Moersch, 1996−97).

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Using technology for assessment. Technology itself can create, store, analyze and support assessment. Bahr and Bahr (1997) present a long list of procedures and equipment that can facilitate educational assessment. These technologies can be utilized for student assessment and they also create artifacts that represent measures of impact. Procedures include:

- assessment for instructional planning, in which the level of achievement at which students perform supports the planning of instruction and the development of necessary interventions;
- dynamic assessment, in which a student's potential for learning is determined;
- progress monitoring, which addresses the rate of student learning, as well as level of student achievement;
- curriculum−based measurement, in which a group of procedures assesses basic skills by using the student's actual curriculum for the development of items;
- electronic portfololios.

Hardware and software that can be utilized for assessment include videoconferencing equipment (which can help with conducting screening interviews), computer−based scoring (which not only accelerates the scoring process, but reduces errors often associated with hand−scoring), expert diagnostic systems, and test development software (Bahr &Bahr, 1997).

Sophisticated applications that adapt to user responses can reflect not only current goals and achievement, but also data from past performances, which may be used as benchmarks for comparison. Student achievement can be compared against performance standards and benchmarks rather than the performance of others. Databases that track artifacts of student contact and achievement provide a trail of data to help school leaders make informed decisions not only about individual students but about global variables related to school programs as a whole (Wiggins, 1997).

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Realizing the potential. Kozma and Quellmalz (1995) perhaps describe the potential for data creation, storage, and analysis by networked technologies best. These technologies automatically gather and store data. You can use them to analyze this data by monitoring access, types of use, and user reactions, both to assess final impact and support formative changes in the program's design and features to better achieve desired goals.

Interactions between staff, professional development activities, and elements of the curriculum all leave artifacts on a digital network that can be described and analyzed. Interactions can be analyzed by the number of participants, frequency of interactions, composition of groups, and focus of discussion. Curriculum can be judged for quality, alignment with standards, and compared to student achievement data. Teachers can further benefit from networked technologies by utilizing templates for notebooks, journals, and lesson plans −− all of which can be captured in a standard form for ease of analysis by evaluators. Students, too, will leave artifacts on a digital network for possible analysis. Data can include frequency data on which resources students access and how often they are accessed. Logs of how students interact with each other, their teachers, and outside experts can be stored, and analyses of these interactions may provide insights into the depth of student reasoning, understanding of course content, and how well students collaborate with others (Kozma &Quellmalz, 1995).

The assessment puzzle is a convoluted one. As schools become better versed in the capabilities and practices supported by educational technologies, the technologies themselves can support school leaders as they evaluate the impact of technology, make better−informed decisions, and communicate this impact to stakeholders.

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Related Web Resources

Critical Issue: Using Technology to Improve Student Achievement (78)
Edtechnot.com (9)
ISTE Technology Foundation Standards for Students (19)
Level of Technology Implementation (21)
New Directions in the Evaluation of the Effectiveness of Educational Technology (62)
Plugging In: Choosing and Using Educational Technology (51)
Recent Research on the Effects of Technology on Teaching and Learning (33)
Taking A Good Look at Instructional Technology (TAGLIT) (68)
Technology's Impact (55)
Technology: How Do We Know It Works? (61)
The Secretary of Education's Conference on Educational Technology − Spotlight Schools (46)

Support − School leaders must ensure that a technical and pedagogical support system exists that facilitates the use and maintenance of technology in their schools.

Teachers must have access to appropriate software, reliable equipment, and continued technical and pedagogical support. School leaders must support teachers who are trying to incorporate technology, including those who are reluctant. Staff who receive inadequate training and support related to technology integration will continue to utilize more traditional teaching methods. Equipment maintenance is an equally important factor related to support. Unreliable equipment discourages teachers, making them less likely to view technology as essential to their daily practice. As technology becomes more reliable and access more convenient, teachers and students will be more willing to integrate it into their daily activities.

Questions to Think About

- How can school leaders ensure proper maintenance of equipment?
- Schools often lack adequate technical support. What strategies might be used to address this issue?
- To what extent should teachers be expected to maintain the equipment in their classrooms?
- What do teachers need to learn to be able to select appropriate software?

Story Summaries

Maine School Administrative District #11

- School district in rural Maine a model for educational uses of technology
- High−tech infrastructure developed and maintained by network of school and district personnel, students, and parent volunteers
- Heavy investment in high−quality, technology−infused professional development
- Technology embedded in school management and communication
- Pedagogical support accompanies district and school expectations for technology use

In the rural schools of Maine School Administrative District #11 (MSAD #11), teachers are expected to use technology regularly to enhance their students' learning. Many principals require weekly or monthly visits to the computer lab, and as part of their annual evaluation, district teachers must formulate a curriculum goal based on the "Good Models of Teaching with Technology," a set of educational technology principles developed by the Northeast and the islands Regional Technology in Education Consortium (NEIRTEC) that guide the district's technology integration process. These expectations are joined with a strong base of technical and pedagogical support. The district's technological infrastructure and equipment is maintained by a district technician, district technology director, middle school integration specialist, and high school video production teacher, as well as technologically proficient teachers, parent volunteers, and high school students. Support for technology−infused curriculum planning is provided through extensive professional development offerings as well as consultations with the technology director, middle school integration specialist, and teacher leaders.

Deer Park Elementary School

- Tech committee and Tech Resource Teacher provide pedagogical support to teachers
- Tech goals and standards are embedded in curriculum

Deer Park supports its teachers by providing age−appropriate software and human resources to help teachers develop lesson plans that effectively integrate technology. A Technology Resource Teacher and technology committee meet with grade−level teams to determine curricular goals. Students learn the functions and capabilities of databases and spreadsheets during activities that focus on meeting curricular goals. Teacher research projects document technology−supported teaching and learning strategies that help adapt and develop future projects.

Research Summary

Technology Leadership Research Summary

Costs
Maintenance and Replacement
Pedagogical Support
Support Strategies

"I need help." We've all said it when we started using a new piece of hardware or software. And, while we joke about not being able to program a home VCR, schools and districts that are integrating computer networks and the dizzying array of software and hardware can't laugh away technical problems. They need help, and the issue of support goes beyond keeping the "wires and boxes" up and running.

Lack of support presents many barriers to adopting emerging technologies into education (Rogers, 1999). These may include the scarcity of technical support in the form of user services and staff necessary to maintain components of the technology infrastructure. Something as minor as the lack of toner or ink cartridges for printers can have major impact on teachers who have planned activities dependent upon them. A lack of institutional support can also inhibit technology adoption. Attitudes towards technology and its uses also help determine what technologies and strategies are employed (Rogers, 1999). To be successful, school leaders must also provide pedagogical support to teachers faced with integrating technology into their classrooms.

Do not falsely assume that there will be few technology problems just because equipment is new (Fisher &Dove, 1999). Cartwright (1996) notes that early in the adoption of computers in schools, training and support needs were expected to be short−term problems that would go away as computers became widespread. Computers and their peripherals are much more sophisticated than their educational technology predecessors, such as record players and televisions, and teachers should not be expected to solve complicated equipment malfunctions or maintenance problems. Schools and/or districts must provide maintenance either in−house or through outside contracts (Fisher &Dove, 1999). Equipment downtime can result in frustration, leading some teachers to avoid technology use (Consortium for School Networking, 1999).

Knowing that they have support can encourage teachers to continue with their integration efforts despite their inability to solve all of their own technology troubles (Wolinsky, 1999). A good start is to incorporate support issues in planning. Anderson (1996) lists the following points to consider:

- Financial support to purchase hardware and software
- Financial support for the infrastructure
- Training for faculty and staff members
- Incentives for participation in training programs
- Elimination of teachers' routine tasks to make more time to help peers and students
- Technical support to maximize the use of the hardware and software
- Consultation and advice for safety and related legal issues

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Costs

Support and professional development will be your largest ongoing costs (Coley, Cradler, &Engel, 1997). These two components can reasonably be considered the most critical components in the effective infusion of technology, but they often receive less attention than hardware, software, and networking concerns (Baily &Pownell, 1998). The difficulty of anticipating the need for consumable technology supplies −− such as toner cartridges, paper, storage materials, and software upgrades −− makes it hard to project these costs at the beginning of new technology initiatives. Remember that, as new technologies are adopted, the quantity and variety of these supplies increases (Fisher &Dove, 1999).

Many schools and districts struggle with funding technology support personnel. Finding and retaining support personnel can be difficult. Teachers note that many support personnel are paid salaries much greater than instructional personnel. Some schools report difficulty finding support personnel who have the interpersonal skills to work in a school environment. The increasing demand for technology support personnel means there is also high turnover (Fisher &Dove, 1999). While you must consider these difficulties, once you find technology support personnel, they will be assets (Candiotti &Clarke, 1998).

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Maintenance and Replacement

Given the investment required to provide a significant number of computers for instructional purposes, it's unfortunate that their useful life is only three to five years (Consortium for School Networking, 1999). Total−cost−of−ownership models for businesses are usually calculated on a three−year cycle, but schools may be able to stretch this to five years. Some schools may be expected to etend the life of computers beyond five years, but this may actually negate an attempt at savings, as older machines often require greater maintenance and support costs.

Inadequate long−range planning can seriously compromise future equipment use (AEL, 2000). While a purchasing and replacement cycle of five years is recommended, schools traditionally use one−year funding cycles, not long−range budgets. Because schools or districts may not be able to make long−term budget commitments, many experts recommend that schools purchase computers with the most memory and processing power they can afford (Consortium for School Networking, 1999).

Older equipment may be designated to less intensive work. For example, computers that can still run word−processing software are useful for text−based projects. Older computers can also be used as "dumb" terminals for proprietary software (such as inventory and cataloging software used in libraries and media centers) or can be designated as single use machines for individual software titles (AEL, 2000). Older computers may actually need more support as they become less reliable. You may also be surprised by fees charged to dispose of computers (Consortium for School Networking, 1999).

Anderson (1996) lists considerations that may reduce maintenance costs in the long run. Routine monitoring of equipment and basic preventative maintenance can reduce many major equipment failures. When buying equipment, also consider purchasing common replacement parts at the same time. Maintenance contracts may give a false sense of security. Read contracts and warranties closely and know what is and is not covered. Make sure equipment is accessible in case repairs are necessary, and keep maintenance logs of all equipment. These logs can provide assessment data when further purchasing decisions are required. Outside maintenance services are an option, and some vendors now offer leasing of computers with maintenance support and replacement built into the contract. Include basic maintenance in training sessions −− for both staff and students −− and consider outside volunteers as a resource for low−cost or free service (Anderson, 1996).

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Pedagogical Support

Teachers who integrate technology are faced with several new challenges. They must be able to select appropriate software, develop strategies to integrate the technology into their activities, and assess students in new ways (Fulton, 1996; Panel on Educational Technology, 1997). Collaborative work supported by groupware, telecommunications software, and multimedia applications demands both new teaching and new assessment skills. Teachers need sustained pedagogical support in order to successfully integrate them.

Teachers may explore several avenues to find this support −− observing peers who are successful with new technology, consulting with experienced mentor teachers, and establishing a dialogue with other teachers faced with the same challenges. Estimates say that the typical teacher will take between three to six years to fully integrate educational technology into teaching and learning; ongoing changes and advancements in technology may ensure that this process is never fully complete (Panel on Educational Technology, 1997).

One distance education program incorporated pedagogical support by pairing instructional designers with teachers to help them match required course objectives and skills to appropriate software and teaching methods (Shaeffer &Farr, 1993). The instructional designers also monitored the course electronically and responded to teacher concerns as they arose. This coaching of teachers has made significant impact on retention and return rates for both instructors and students. Teachers appreciate this pedagogical support and report changes in their teaching. For many, this is their first opportunity they have had to discuss pedagogy with a colleague.

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Support Strategies

The most−often recommended support strategy is the designation of full−time support personnel. The number of support personnel varies widely, however, with schools reporting a ratio of support personnel to other staff as high as 1:500. This compares to reports from business of 1:50 (Consortium for School Networking, 1999). The number of support staff will depend on the actual number of workstations, as well as the variety of platforms, operating systems, and different software applications.

Observations from the Telecommunications and Information Infrastructure Assistance Program

(TIIAP), now called the Technology Opportunities Program (TOP), indicate that staff roles must be defined clearly in order to provide the best match between the support requirements of the school or district and the qualifications of candidates (Department of Commerce, 1996). These programs have indicated that potential support staff should be able to interact and communicate comfortably with both technical and non−technical staff and should be able to explain technical skills in plain English for staff members at the early adoption stages. As has been mentioned, support staff turnover should be expected but the effects from this turnover can be countered by training staff to understand several job functions so the school can continue to function without serious interruption. One school district provides important categories that should be addressed during the interviewing process of potential support personnel. These relate to the candidates' technical expertise, understanding of technology in an instructional environment, professional development, and Internet knowledge and experience (Smith, 1997).

When a designated support person cannot be hired, many districts rely on teachers with technological experience for technical support (Consortium for School Networking, 1999; Panel on Educational Technology, 1997; Smith, 1997). Unfortunately, this solution can create problems if such teachers are not provided sufficient time and supplies to complete both their teaching and support duties. Without training, these individuals may also have limited impact. This solution has been called by some teachers the "unenviable position of providing troubleshooting and stopgap maintenance" (Fisher &Dove, 1999, p. 5.).

Some schools capitalize on the interest and motivation of students or outside volunteers. In one example (Lowe &Vespestad, 1999), student interest at a middle school supported the formation of a computer club despite the limited technological proficiency by sponsoring teachers. Building from initial interest in basic programming, gaming, and troubleshooting, the program has blossomed, and members provide classroom technical support as well as some technology training of teachers during the day and community members in the evening. **Generation www.Y** (http://www.genyes.org/index.php) was originally a recipient of a Technology Innovation Challenge Grant Program from the U.S. Department of Education but has flourished to become a model program partnering students with teachers to provide technology support. Begun in Olympia, Washington, **Generation www.Y** now has partner schools all over the nation.

As with many of the challenges of technology integration, technology itself can offer some solutions to the support dilemma (Fulton, 1996; Panel on Educational Technology, 1997). Computer−mediated communication tools allow teachers to create, share, and evaluate materials online. Teachers can serve as mentors or simply share stories throughout their school, district, or across geographic boundaries. Videotapes and broadcast video options, such as teleconferencing and streaming video, allow teachers to observe successful peers who have faced integration challenges. One such Web−based program **classrooms@work/tools@hand**, gives teachers a way to hear, see and gain from others' experiences (http://www.netc.org/classrooms@work). Robust online environments can support professional development opportunities to help teachers develop basic maintenance and troubleshooting skills as well as advanced pedagogical strategies −− often with flexible scheduling opportunities and in the convenience of teachers' own homes.

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Related Web Resources

Building a Technology Library: The Experts' Choices (27)
Edtechnot.com (9)
Learning with Technology Course Resources (50)
Lessons Learned from the Telecommunications and Information Infrastructure Assistance Program (66)
Making Technology Happen (22)
National Center to Improve Practice in Special Education Video Series Through Technology, Media, Materials (31)
Taking TCO to the Classroom: A School Administrator's Guide to Planning for the Total Cost of New Technology (65)
Tech Corps (53)

Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Many technology budgets omit or fail to provide adequate support for professional development, but teachers, as well as administrators and other staff, need to be trained to use technology effectively. A comprehensive technology plan includes an adequate budget and ample time to train staff in basic technology skills as well as instructional strategies that encourage effective integration of technology. Frequent hands−on training, as opposed to one−time introductory sessions, is a more effective approach to professional development. Schools that fail to provide adequate training will likely find that the technology is not used consistently or effectively.

Questions to Think About

- What professional development activities or models are most productive for improving basic technology skills? for increasing technology integration?
- How can technology itself support professional development activities to reduce costs and improve return on investment −− in both dollars and student achievement?
- What training opportunities related to technology have you participated in this past year?
- How much of your technology budget is designated to professional development?

Story Summaries

Maine School Administrative District #11

- School district in rural Maine a model for educational uses of technology
- Offers ongoing, high−quality professional development on educational uses of technology
- Professional development activities united by common set of principles
- Professional development structured to encourage collaboration among teachers and administrators

At Maine School Administrative District #11 (MSAD #11), technology is a fundamental part of teaching and learning, but it hasn't always been. To help teachers and administrators develop the skills and knowledge they need to use technology effectively in the classroom, the district has invested in a high−quality, ongoing professional development program based on "Good Models of Teaching with Technology" (GMOTT), a set of principles developed by the Northeast and the Islands Regional Technology in Education Consortium (NEIRTEC). After participating in NEIRTEC workshops, the district's technology experts, administrators, and teacher leaders facilitate extensive district−wide training sessions and present demonstration lessons for other school faculty, as well as collaborating informally with them to develop technology−infused curricula.

Louisiana's America2000 Technology Innovation Program

- Online professional development project emphasizes the importance of integrating online work with ongoing local professional development efforts.
- The facilitating organization (Education Development Center) has helped staff determine ways to articulate long−term goals.

- The facilitating organization has also helped staff determine how they should select teams and ensure that team members are supported by their district's technology and professional development departments.

In 1998, EdTech Leaders Online ? (ETLO), a national program implemented by the Education Development Center (EDC) in Massachusetts, began its work with five rural districts in the Macon Ridge section of Louisiana. EDC and its partners−−TERC, Learning Innovations at WestEd, and the Education Alliance at Brown University−−comprise NEIRTEC, the Northeast &Islands Regional Technology in Education Consortium, a group funded by the U.S. Department of Education to help educational leaders at the state, district, and school levels address the many challenges involved in putting technology to effective use. ETLO prepares interdisciplinary teams of teachers and administrators to become online professional development specialists in educational technology. The teams participate in an intensive program that trains them to deliver online workshops to colleagues. Once trained, the teams go on to facilitate online courses selected from the ETLO course catalogue or custom−designed to meet their own local needs. As the district personnel run the workshops, they continue to receive support and mentoring from other online professional development teams and EDC staff and consultants.

The project emphasizes the importance of integrating online work with ongoing local professional development efforts. EDC encourages district teams to work face−to−face when necessary. The organization has also helped staff determine how they should select teams, how to ensure that team members are supported by their district's technology and professional development departments, and ways to articulate long−term goals.

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Mexico Academy and Central School District

- A cohort of second−, third−, and fourth−grade teachers learned how to integrate technology into standards−based lessons that had proven challenging for students in the past.
- The district's technology integration specialist modeled an appropriate grade−level lesson, using available technology, for participating teachers.
- The district's technology integration specialist team−taught the teachers' integrated lessons with them, and offered each teacher feedback immediately following presentation of his or her lesson.
- The professional development opportunity included the logistics of technology integration, differentiating instruction, incorporating the state standards, and assessment strategies.
- The technology integration specialist continued to support teachers after their initial presentation, via e−mail and in−school contact.

Amy Spath, the technology integration specialist for the Mexico Academy and Central School District in Mexico, New York and the district's director of technology were concerned that elementary teachers were not using technology to enhance learning in the classroom. Many teachers saw technology as an add−on, not an everyday tool for engaging their students. The teachers also had varying levels of expertise and experience with early childhood learning software. Although they had made several requests for more information on appropriate software and Web sites for their classes, the staff development opportunities offered to them had never included modeling of technology−enhanced, grade−level appropriate lessons.

To address this issue, Spath took an online technology integration course offered by TERC and the Northeast and Islands Regional Technology Education Consortium (NEIRTEC). Through the course, she designed a professional development opportunity for teachers in her district, in which they would learn how to integrate technology into their existing standards−based lessons. During the first session of the professional development opportunity, teachers participated in a model lesson, reviewed technology relevant to the model lesson and the New York State standards, worked in groups to determine which software or Web sites best fit their students and the topics of their own lessons, and discussed assessment strategies.

Once the teachers had participated in the model lesson and group discussions, they then used these tools and strategies to adapt their own lessons and team−teach them with Spath. The integrated lessons asked students to listen to the information given, map out the elements of the lesson and their own observations, and gather more information on the topic to aid their understanding. Students would then write or design a document that showed their comprehension of the lessons' concepts. Special education students were integrated in the classroom and were not separated out into separate groups during lessons.

This in−house professional development opportunity encouraged teachers to collaborate with their colleagues and reassess their own teaching practice on a consistent basis. It also empowered them to continue using technology as an everyday tool to enhance teaching and learning in their classrooms. Spath has provided feedback and additional support to teachers who have completed the initial staff development experience.

Braxton and Gilmer County Public Schools

- Since 1999 140 out of 300 teachers completed a three−day training program, compared to 40 unpaid teachers in 1996
- Participants were paid $300 plus benefits
- Received equipment for the classrooms
- Software Preview Center at Glenville State College
- Technical support from pre−service teacher candidates

In 1996, the first Summer Technology Academy featuring three days of hands−on technology training was offered to a small group of teachers in Braxton County, West Virginia. Teachers received no stipend, nor did they qualify for continuing or graduate credit. The early success of the program snowballed into increased funding and attendance, and partnerships were formed with a neighboring county and state college. Now, over the three−day workshops 75 teachers per summer receive $100 per day, free software, and hardware, such as digital cameras, scanners, and CD−rewriters. Pre−service teachers offer technical support and receive valuable insight into the teaching profession.

Bernice Hart Elementary School

- 13% of teachers had high experience with a particular technology at the start of the school year, compared to at least 54% at the end of the year.
- New school that opened August 1998
- Teacher selection based on commitment to technology and a constructivist approach to instruction
- Texas Successful School Award

Before the school opened, the principal selected administrators and teachers who showed a commitment to technology and a constructivist approach to instruction. A rigorous interview process helped staff the school with teachers who exhibited an aptitude for creative approaches to learning. Partnerships were established with university faculty members as well as staffers from Southwest Educational Development Lab (SEDL). A professional development program grew from the collaboration. The goals of The Future Is Now−−A Model for Creating Effective Learning Environments were to:

1. create competent educators committed to lifelong learning,
2. develop the use of technology to facilitate learning, and
3. create independent, self−motivated learners who can use a variety of resources to collaboratively solve problems.

Additionally, Hart was chosen to participate in Applying Technology to Restructuring and Learning, funded through the U.S. Department of Education and implemented by the Technology Assistance Program at SEDL. Formal sessions and individual assistance in planning, problem solving, and technology use were provided both on site and on−line by SEDL staff and Hart co−developers.

Mississippi Department of Education

- 95% of schools connected to the Internet offering teacher development courses on−line
- First state to adopt technology standards for administrators
- Statewide compressed video−teleconferencing network links 120+ school, university, community college sites upgraded to ATM backbone in 2000
- Approximately 31% of total population under age 18 live in poverty
- 1,012 public schools in 152 districts serving approximately 49,000 students

The statewide infrastructure −− built as a result of the 1995 master plan for educational technology −− provides a valuable means for professional development. Utilizing the statewide compressed video−teleconferencing network −− which links 120+ school, university, and community college sites −− countless professional development sessions are held each year. A task force convened to promote integration called attention to the lack of technology standards for administrators.

The group developed standards in seven areas that are congruent to Milken Seven Dimensions and NCATE Curriculum Guidelines. The standards provide a roadmap for future administrator training to be delivered through the Technology Academy for School Leaders (TASL). The academy's goal is to provide every administrator with access to quality leadership development focused on whole systems change and technology integration.

Columbia County Schools

- Now every school has teacher−mentors who completed three stages of professional development.
- Consortium of 12 rural school districts and 3 cooperating universities
- Professional development process encompasses three stages:
    - basic technological competence
    - classroom integration of technology
    - modeling

The Tech TEAMS program helps teachers become innovative users of technology and helps students become responsible for their own learning. The professional development process leads teachers through three stages: acquisition of basic technological competence, reform of classroom practices, and the sharing of knowledge with other teachers to model the integration of technology. Model technology classrooms at each target school and district demonstrate effective practices for integrating technology into teaching and learning. A cadre of teachers mentors others through the evolution of thought and practice in technology integration.

Carencro Middle School

- Since 2000 every teacher participates in professional development meetings once a week
- Every teacher's eight−hour day now has one planning and one team planning periods
- No more irregular teacher development meetings after school or during the summer.
- Nearly 1/3 of the parish's adult residents are not high school graduates.

Although funding for teacher training is commonly far less than equipment funds, teacher training is more likely to influence the success or failure of a school's technology program. In Carencro's case, teachers dedicate one team planning period each week to professional development. The Southwest Educational Development Laboratory (SEDL) provided initial training, which, as teachers soon realized, was more than basic technology skills. SEDL advised teachers how best to manage technology in the classroom and provided practical techniques that could be used easily and immediately. The incorporation of interdisciplinary and student−centered learning put the training in a purposeful context. Teachers have since attended additional technology workshops and continue to expand their levels of expertise.

Poquoson City Schools

- 80% of teachers met six of the eight state technology standards, 20% met all standards.
- Five staff members in each school serve as Technology Coaches for other teachers
- Teachers took a free three−college−credit course at the individual school sites
- 40 to 50 free mini technology courses offered to teachers
- All new teachers required to participate in two days of technology training
- Opened training to administrators, library media specialists, teaching assistants, and licensed personnel
- Opportunities for obtaining college credit and recertification points

When the state of Virginia mandated eight new "Technology Standards for Instructional Personnel," Poquoson City Schools mobilized a flexible professional development program with few dollars. Teachers receive free training, but are not compensated for their time. Teachers may also choose several options, such as college courses, short district−sponsored mini−courses, and conference and workshop attendance, as well as off−site workshops offered through public and private organizations. All teachers demonstrated proficiency on at least three of the eight standards during the program's first year.

Research Summary

Technology Leadership Research Summary

> ***Pay Now or Pay Later***
> *Elements of Successful Technology Professional Development*
> *Professional Development Models*

Development centers
Train−the−trainer and collaborative models
Using Technology to support professional development

Pay Now or Pay Later

A crucial element for guaranteeing a return on technology expenditures is professional development (Bailey &Pownell, 1998; Consortium for School Networking, 1999; Norman, 1999). Associated costs (trainers, materials, substitute teachers, etc.) can be high, but the costs of neglecting this critical step may be even higher. Failure to implement an effective, ongoing professional development initiative will severely limit a school's or district's ability to achieve its technology goals (Consortium for School Networking, 1999; Panel on Educational Technology, 1997). The U.S. Department of Education recommends that districts set aside 30 percent of their technology budgets for professional development; research indicates that expenditures are closer to 10 percent (Zeisler in AEL, 2000).

Without effective professional training and adequate support, teachers may not fully integrate technology into their teaching and learning activities (Bailey &Pownell, 1998). The amount of technology training teachers receive directly impacts how technology is used in the classroom and, consequently, how and what students learn (Norman, 1999). Those who provide such training have been called on to rethink methods and approaches commonly used in past efforts.

It is becoming clear that "one−size−fits−all" workshops in which teachers get a generic overview of concepts or skills are not sufficient. This approach fails to take into consideration different levels of proficiency, provides little opportunity for practice, and rarely includes any follow−up (Fulton, 1996; Hurst, 1994; Jackson, 1999; Tally &Grimaldi, 1995). One survey reports that 46 percent of courses designed to help teachers integrate technology are offered as half−day workshops, and 79 percent of these workshops focus on specific hardware, software, or Internet usage (Panel on Educational Technology, 1997). These approaches are inefficient and ineffective−−especially in regard to integrating technology into the curriculum (Fulton, 1996).

Teachers report that professional development offerings in technology have been positive but too short and infrequent (Hurst, 1994). In 1999, the U.S. Department of Education reported that only 20 percent of public school teachers felt "very well prepared" to integrate educational technology into the classroom (as cited in Norman, 1999.) The one−size−fits−all approach ignores both adult developmental processes (Tally &Grimaldi, 1995) and the well−documented stages of technology adoption through which most teachers progress (Dwyer, Ringstaff, &Sandholtz, 1991; Jackson, 1999). Caverly and Peterson (1997) suggest that a productive training model would focus on educating teachers and administrators on technology's potential uses so that they could later apply their training to new technologies.

In fact, there is widespread agreement that training should focus on integration rather than basic skills development (CEO Forum, 1999; Coley, Cradler &Engel, 1997; Kozma and Schank, 1998; Tally &Grimaldi, 1995; Thornburg, 2000). An integral component of such development is time. Teachers need time to build skills, to become familiar with software and content, and to practice integrating technology into their content area and learning activities. Teachers need the opportunity to discuss technology with their peers and may benefit from ongoing mentoring and consultative support. The commitment to this scope of professional development should be addressed early−−in the school or district's technology plan (Panel on Educational Technology, 1997).

In their 1999 report, the CEO Forum recommends that

1. schools of education should prepare teacher candidates to effectively integrate technology,
2. current teachers and administrators should be proficient in technology integration, and
3. systems should be developed to reward effective technology integration.

The Forum calls for standards that address continuing education, teacher and administrator proficiency that is supported by long−term professional development, and appropriate technology integration components. For the full report, visit http://www.ceoforum.org/reports.html.

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Elements of Successful Technology Professional Development

Successful professional development should focus on improving student achievement and should support the mission and goals set forth by the district or school (Norman, 1999). This focus emphasizes people, not technology. Professional development must be ongoing and designed to help teachers teach better, students to learn better, and communities to improve their public schools (CEO Forum, 1999). Effective school leaders engage in professional development alongside instructional staff.

Consideration should also be given to the characteristics of adult learners, who have a much more developed set of beliefs than do children. In particular, educators have often developed instructional strategies and methods that they feel work best for them and may be slow to change (Tally &Grimaldi, 1995). Educators weigh new methods, materials, and theories against personal experiences and their existing knowledge base. They evaluate the value of the new data in comparison to both their own and their student's learning needs. Programs that reflect this understanding offer educators the opportunity to experiment and reflect in a safe setting, as well as opportunities to collaborate and discuss ideas with their peers (Fulton, 1996).

Key elements for professional development include clear goals, time, communication, and collaboration. Trainers and presenters must understand the level of technology proficiency of their audience (Atkins &Vasu, 1998) and provide opportunities for teachers and administrators to link training to their individual needs as well as those of their students and the required curricula (CEO Forum, 1999; Coley, Cradler &Engel, 1997). New technologies and related strategies must be presented in the context of learning (Warner &Akins, 1999). Participants must experiment and practice to develop confidence with new technologies (Fulton, 1996).

Many researchers and practitioners agree that successful professional development gives participants opportunities to collaborate and communicate with their peers. Peer coaching is often more effective than the lecture format (Coley, Cradler &Engel, 1997). Collaboration, discussion, and mentoring can be supported on−line. Educators also need opportunities to reflect individually on the skills, practices, challenges, and opportunities afforded by continued technology application (Fulton, 1996; Warner &Akins, 1999).

Norman (1999, p. 19−20) provides eight components of effective professional development programs.

1. Involve all stakeholders and create a shared vision.
2. Set relevant and realistic goals.
3. Develop a strategic plan and budget.
4. Assess and capitalize on all resources. (Consider people a primary resource.)
5. Link professional development to teacher needs and learning objectives.
6. Model best practices.

7. Provide teachers with time, incentives, and ongoing support.
8. Establish a system for periodic review, assessment, and adjustment.

Skeele (1999) acknowledges that it is important to know the expertise and interest level of participants. Session topics should address participant needs−−especially daily classroom needs. Examples should be relevant to classroom teachers, and the introductory session should include an opportunity for teachers to apply their new knowledge. Helpful supporting materials include an agenda, a list of helpful tips, and complete price and product specifications that include hardware configurations (Skeele, 1999).

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Professional Development Models

Several trends observed among professional development models may be applied or adapted to help develop successful programs locally.

Development centers. Technology training centers are found both in K−12 settings and higher education (Candiotti &Clarke, 1998; Fons &Wyler, 1995; Hurst, 1995; Shapiro &Cartwright, 1998). They can offer a full spectrum of training opportunities, staff versed in technology integration and instructional design, and a plethora of hardware and software to introduce educators to new and emerging technologies with possible application in their classrooms.

Centers are used not only for structured training sessions but also to encourage experimentation in a safe, nurturing environment. Noting that teachers sometimes felt uncomfortable or intimidated demonstrating their emerging technology skills, one school dedicated a small room to continuous technology in−service (Hurst, 1994). This room was filled with all the hardware and software available throughout the school as well as accompanying peripherals, workbooks, and manuals. Another school established a demonstration and training site that doubles as a lending center for hardware and a preview center for software (Fons &Wyler, 1995). This center can support a variety of professional development presentation options, such as vendor−supplied training, train−the−trainer sessions, collaborative professional development, and interdisciplinary unit development.

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Train−the−trainer and collaborative models. The unifying factor of these models is the reliance on human resources to generate continued support. In one district (Schmidt, Sasser, Linduska, Murphy, &Grether, 1999), educators work with preservice and in−service teachers through mentoring programs, courses, and focus groups. To optimize training time, group in−service sessions are followed up by demonstration of software by trainers in actual classrooms. Preservice candidates are paired with in−service teachers two to four hours per week.

Described as using a "generational" model, another district (Caverly &Mandeville, 1997) grooms strong early adopters to help future generations of teachers effectively integrate technology. The early adopters attend a "technology boot camp" for three weeks during the summer, focusing on integration in interdisciplinary, thematic units. Throughout the following school year, first−generation integrators receive additional training as they create and share further interdisciplinary units. Peer support and evaluation help this group become experts in their own right. The following summer, the cycle continues: Each first−generation teacher returns to boot camp−−but this time as a mentor. As the number of participants grows, these teachers become valuable resources in their schools.

Modeling their projects after such successes as Generation www.Y, some schools have capitalized on one of their largest human resources, their students (Lowe &Vespestad, 1999). Technology often increases student interest and motivation, and some districts have found that young adopters can help teachers build basic technology skills and apply them to effective integration practices. Even elementary and middle school students can help with basic troubleshooting and routine maintenance. One school even reports using students teams to lead staff in−service sessions. These same students also help community members build their technology skills in the evenings (Lowe &Vespestad, 1999).

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Using technology to support professional development. Technology itself may be utilized to support successful professional development activities. Telecommunications applications allow teachers to interact, take courses, and access research across great distances (Coley, Cradler &Engel, 1997).

Web−based professional development offers greater flexibility in terms of scheduling as well as pacing. Costs associated with other types of training (i.e., substitute teachers, travel costs) may be avoided. Web−based professional development includes on−line lectures, opportunities for chat and threaded discussions, tutorials, resources cataloged in searchable databases, and video components for modeling (Jackson, 1999).

One Web−based model (Rodes, Knapczyk, Chapman &Haejin, 2000) supplements field−based activities in the participants' own classroom with distance−based elements. Technology is introduced slowly. The program has demonstrated success by beginning with technologies that teachers readily become accustomed to, such as fax machines and e−mail. Technology skills build to include web−based conferencing.

Telecommunications are not the only technical application of professional development, as some districts utilize technology to support local efforts. Electronic portfolios are a popular application of technology that helps demonstrate skill acquisition while allowing for individual creativity. Portfolios have been described as the most appropriate and authentic means to chronicle and demonstrate professional improvement over time (Wiedmer, 1998). Telecommunications tools, electronic portfolios, and other applications will undoubtedly find a greater foothold in professional development activities as teachers become more familiar with the possibilities of technology.

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Related Web Resources

ALA ICONnect Online Courses (125)
Apple Learning: Professional Development (58)
Computer Learning Foundation: Teachers Teaching Teachers (139)
Critical Issue: Providing Professional Development for Effective Technology Use (77)
Edtechnot.com (9)
Evolving with the Internet: Taking Technology for Granted−Finally (140)
Four Directions for Lifelong Learning (126)
From Generation X to Generation Y (8)
Generation www.Y (130)
Generation www.Y: Student Follow−Up (131)
Generation www.Y: Teacher Follow−Up (132)
Hooking Teachers on Technology: Finding the Right Bait (44)
In Praise of Enthrallment (128)
ISTE NETS Essentials Conditions for Teacher Preparation (134)
ISTE Standards for Teachers (133)
Lesley College Online Readiness Survey (7)
Lesley College School of Education: Technology in Education Programs (124)
Making Technology Happen (22)
NETS Documents (136)
Performance Profiles for Teacher Preparation (135)
Professional Development and Training (23)
QuickTime TV (142)
Teacher Education Mini−Cases (138)
Tech−Savvy: Educating Girls in the New Computer Age (2000) (143)
Technology and Math Scores: Do They Compute? (129)
The Algebra Connection (137)
The Connected Learning Community Technology Roadmap (141)
The Florida Educational Technology Corporation Conference (56)
webTeacher (127)

Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.

Community members and business leaders are partners critical to the success of schools, for they are dependent upon the school system to prepare a workforce for the ever−increasing technological demands of the workplace. Community support is needed to plan, fund, and generate systemic change in education, and school leaders must establish and facilitate communication between the school and the greater community. Community members must understand that technology changes the learning environment and may require new and alternative forms of measurement −− not just standardized tests.

- What kinds of people do you want to engage from your community to help in planning and supporting technology initiatives? Who would you include and how do you get them? (Check out what our panel has to say about this specific question.)
- What types of support can be provided by the community or businesses?
- Are school goals aligned with your community's goals for economic development?
- What information does your community need to sustain or increase support for your initiatives? How do you prove they'll work?
- Will facilities and equipment be available for community use outside of school time?
- How will teaching strategies and activities address the needs of adult learners?

Story Summaries

Maine School Administrative District #11

- School district in rural Maine a model for educational uses of technology
- Community support and input solicited throughout district technology initiative
- Parent volunteers assist elementary teachers and students with computer use
- Local business leaders sponsor high school "Career Essentials" course
- Partnerships with IT companies provide additional resources

At Maine School Administrative District #11 (MSAD #11), technology is a fundamental part of teaching and learning, but it hasn't always been. One key factor in transforming the district into a model for educational technology use was its active involvement with the local community. As their vision for technology integration was first taking shape, district leaders communicated frequently with parents, school board members, and local businesspeople to solicit their input and support. This communication has fostered active community involvement as the district?s technology initiative moves forward. Local business leaders have offered advice and funding for the design of a "Career Essentials" course at the high school, and parent volunteers regularly assist elementary students and teachers with computer use.

Beyond the local community, MSAD #11 has built partnerships with Bell Atlantic, Cisco Systems, and other information technology leaders that provide equipment, technical advice, and funds for the district; Cisco even offers a course that allows high school students to be certified as network associates.

Canfield Avenue School (Elementary)

- 100% of parents participate in some family programs
- Parent involvement key to community support for technology facility
- School provides programs and technology access for greater community, including senior citizens

A successful parental involvement program that reduced disciplinary referrals and raised student test scores served as a springboard for technology innovation at Canfield Avenue School. With a focus on curricular goals and successful programs that included technology training for students, parents leveraged support for a technology overhaul for the school. Community members served on a technology advisory committee to develop a multi−year technology plan and then built support throughout the community for the school's initiatives. All members of the community now use the new community access center on evenings and during the summer for access to and training with technology.

Roanoke City Public Schools

- The program grew from one course to 93, from a dozen participants to 1,116, from one school to 17
- 1,116 adults completed evening computer courses in school computer labs
- More seniors volunteer to tutor and read to children
- 500 participants annually and 500 names on a waiting list
- Numerous awards

Fixed incomes and limited personal involvement with public schools often cause senior citizens to question technology expenditures and the cost of public schooling. Their support is sometimes difficult to obtain. Opening computer labs after school hours to provide technology courses for senior citizens and parents invites active participation and encourages support. Knowledgeable Roanoke teachers and qualified support staff serve as program instructors and instructional aides. Courses include such topics as technological terminology, Windows, and word processing. The program advances community learning while stimulating fiscal support and individual involvement.

Idlewild Elementary School

- Local TV station personnel train children to report and use equipment in production of a school−wide TV program
- 4th grade writing scores went from 50% passing to 99% passing
- Community members provide "hands−on" as well as financial support
- The "Primetime" program provides means to share classroom curriculum projects

A valuable partnership between Idlewild Elementary School and WMC−TV5 led to the development of "Primetime"−−a program in which students act as reporters, news anchors, camera operators, editors, and producers. More than a frequent field−trip destination, many station personnel volunteer personal time to provide training on reporting as well as using and maintaining the equipment. Additionally, parents are also involved, as they volunteer, chaperone, co−sponsor, advise, and support personnel. Funding the program was collaborative as well. Goals 2000, a competitive grant program intended to raise student achievement, contributed $44,000. The matching money requirement was satisfied by in−kind contributions from several sources−−partners, supplemental grants, and school−community fund−raising initiatives.

Center for Applied Technology &Career Exploration (CATCE)

- Professionals are paired with master teachers in each career area
- The new $7 million building is used for community meetings, teleconferencing, and distance learning.
- Every 8th grader follows three of eight career tracks
- The program offers information technology skills unavailable in the major regional wood and textile manufacturing
- 6,900 students systemwide
- 350 students at CATCE at one time
- Corporate look and feel

The corporate look and feel of CATCE is intentional. Eighth grade students are immersed as in a unique work environment. During the required semester, students choose three of eight career areas to explore. Each career area combines a master teacher with a content expert who has worked in one of the eight fields. This approach requires that school leaders be open to nontraditional teacher roles as well as nontraditional learner roles. Additionally, the facility serves as a community resource adding availability for community meetings, teleconferencing, and distance learning.

Research Summary

Technology Leadership Research Summary

> ***Building Partnerships***
> *Using Technology to Extend the Learning Community*

A school exists within a larger community and the two should collaborate to reach their goals. A successful school system invigorates a community and a thriving community supports its schools. Savvy school leaders build and develop strong community relationships that can spell success for every technology initiative.

Unfortunately, the relationship between school and community is not always strong, and, as Dede (1998) notes, it seldom feels like a partnership. The school staff, working a difficult job with often inadequate resources, may feel isolated. Community members, looking for return on their investment, may appear to micro−manage school operations. A community may demonstrate lack of trust when parents choose to send their children to private schools or educate them at home, or when taxpayers fail to approve school bond issues (Haynes &Comer, 1997).

What can happen when school and community build a strong partnership? Kozma and Schank (1998) describe a vision of the future that implements constructivist teaching and learning strategies supported by networked technologies. This vision extends the learning community beyond the school and encourages researchers and members of the community to participate in the education of children. This vision requires that education be a central focus of the community.

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Building Partnerships

Many grant initiatives emphasize the formation of partnerships with other education institutions, business, and communities. U.S. Department of Education grant programs, such as Community Technology Centers, Learning Anytime Anywhere Partnerships, and Technology Innovation Challenge Grants all support partnerships. Partnerships have always been key for schools involved in the Telecommunications and Information Infrastructure Assistance Program (TIIAP), now called the Technology Opportunities Program (TOP), (Department of Commerce, 1996). Partners can provide expertise and advice on program implementation and help to develop support throughout the community. They can also offer financial support. One large district (Ingwerson, 1996) established a community awareness team of community, business, and education volunteers. This team was charged with creating an ongoing public awareness program to inform and build support for the district's major technology initiative.

Partners often come in during the planning of technology initiatives. Community partners can offer insights into community needs and can help align school goals with community economic development goals (Rockman, 1998). Partners from business can share information about how the world of work is changing and can help align school goals with needed skills (Costello, 1997). Established partnerships can support long−term technology initiatives by developing ways to sustain these efforts after initial funding has been spent.

One successful school project began by involving the greater community in a multiyear technology planning cycle (Palestis, 1997). Community members were valuable because they brought expertise that complemented staff skills. Not only was the community involved, but it became a direct beneficiary of the planning effort, which resulted in a school−based facility to provide technology training to students and community members. The community gained an appreciation for the academic goals of the school, as well as the costs of supporting those goals.

A significant factor for the success of any technology program is communication, and establishing strong external relationships can facilitate communication. Community members who participate in school−based planning and management teams have a better understanding of how our schools work and can reciprocate by providing insight into community needs (Haynes &Comer, 1997). Remember that community members may need to be informed about changes in education and how technology can help their children learn new skills necessary for work (Anderson, 1996).

The changes in education dictate changes in assessment. We need to help parents and other community members expand their knowledge of assessment. Periodic communication helps everyone understand that standardized test scores are not the only measure of academic achievement and that we need new ways to demonstrate student learning (Rockman, 1998). Key community and business leaders who support alternative evaluations of technology's effectiveness can be powerful banner carriers for school leaders.

Dede (1998) notes that research documents at least four improvements in educational outcomes from new, technology−based teaching and learning strategies. These include increased learner motivation, mastery of advanced topics, expert behavior by students, and better outcomes on standardized tests. Regardless of outcome, he suggests that the most effective means of convincing the community at large of the effectiveness of technology−based programs is to involve them in their students' education.

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Using Technology to Extend the Learning Community

Technology can support relationships between the school, home, and work arenas, especially through networked telecommunications (Haynes &Comer, 1997; Kozma &Schank, 1997; Rockman, 1998). As Internet access increases, communication barriers between schools and communities are lessened.

How do information technologies support greater connection between school and home? Students can do schoolwork at home. Supported by digital resources from the school and beyond, they can collaborate with peers and communicate with teachers. Parents can become more involved in their children's education and more knowledgeable about the needs of the school. Connections between the school and the rest of the community can coordinate learning goals with community goals and help to integrate education into daily life (Kozma &Schank, 1997). The Benton Foundation (1998) suggests that information technologies can help our communities work together to solve social problems relating to poverty, housing, crime, and health concerns.

Haynes and Comer (1997) add that networked technologies have encouraged schools to broaden their mission and begin providing services for the entire community. Some schools develop Technology Nights that encourage parents, community members, and business people to witness the results of technology programs first hand (Anderson, 1996). America Links Up is sponsored by a coalition of educators, non−profit organizations, and corporations and seeks to provide children with a safe and rewarding online experience through a campaign of public awareness (http://www.americalinksup.org/).

Many schools go beyond demonstration to provide technology instruction and access to members of the community through school−based facilities (Bouie, 1998; Palestis, 1997). School staff or technology−savvy students present lessons and offer technical support. Such Community Access Centers (CACs) are used most by people who lack access at home or work (Department of Commerce, 1999). CACs help community members build basic technology skills while getting a glimpse into the necessity of technology−based instruction for their children. Educating parents and other community members through CACs also opens lines of communication and helps schools develop a broader base of support.

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Related Web Resources

Edtechnot.com (9)
Lessons Learned from the Telecommunications and Information Infrastructure Assistance Program (66)
The Vermont MIDI Project (25)

Planning − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.

A technology plan, whether created on a districtwide or schoolwide level, must constantly be evaluated and revised to meet the changing demands of the school community and innovations in technology. A static plan will quickly become outdated and have little meaning. School leaders must ensure that technology planning is viewed as a dynamic process that is fundamental to the daily activities of the school.

Questions to Think About:

- How can you leverage your technology funds to find ways to cover more than initial hardware and software costs? (Check out what our panel has to say about this specific question.)
- How do school leaders determine the effectiveness of their technology plans?
- What are the key components of a technology plan?
- How do school leaders identify priorities that must be addressed in a technology plan?
- Where can you find support in understanding complex issues related to technology purchasing and funding? Whom can you ask?
- How do you sustain a technology initiative as well as necessary funding?

Story Summaries

Mississippi Department of Education

- Statewide Master Plan created in 1995 branched into technology plans for each individual district
- Yearly, principals use several assessment tools to review teachers' progress in technology use
- Superintendent and four principals from 70% of school districts attend summer academies
- Approximately 31% of total population under age 18 live in poverty
- Statewide compressed video−teleconferencing network links 120+ school, university, community college sites upgraded to ATM backbone in 2000
- 65% of classrooms connected to the Internet
- First state to adopt technology standards for administrators

Mississippi created a master plan for technology in 1995. The plan articulated a vision of commitment to "ensuring that all learners have equitable opportunities to employ a variety of technological tools to enhance the learning process −− to offer education anywhere, anytime for everyone." The technological infrastructure was built, including an ATM/frame relay backbone that currently connects 95% of the schools (and 100% of the districts, universities, and community colleges) to the Internet. Approximately 65% of the classrooms in Mississippi are connected to the Internet through funding assistance from the E−rate program, the state Technology in the Classroom Fund, and the federal Technology Literacy Challenge Fund Grants.

Carencro Middle School

- Since 1997 administrators and teachers meet several times a year to revise and implement the plan for effective integration of instructional technology
- The plan includes a timeline, allocated funds, and persons responsible
- 7th grade students increased their composite scores on the Iowa Test of Basic Skills by an average of 5 points between 1999 and 2000
- Nearly 1/3 of the parish's adult residents are not high school graduates

In an economically depressed area, school leaders recognize technology's potential to reach and motivate at−risk students. As such, effective integration of instructional technology has been a main focus of the schoolwide plan. The plan outlines general goals, specific strategies, and an action plan that designates a time line, allocates funds, and names persons responsible for various actions. A schoolwide team includes the principal, assistant principals, teachers of various grade levels and disciplines, the curriculum coordinator, the technology coordinator, the librarian, the parent facilitator, and a computer lab manager. The team plans, implements, and monitors the schoolwide plan.

Canfield Avenue School (Elementary)

- Technology plan involved entire community
- Community support raised $4 million for technology facility
- Family involvement has made Canfield a community center for technology access

Canfield Avenue School built upon a successful family involvement program to provide greater access to state−of−the art technology and training for all members of the community. A multi−year technology plan involved parents, teachers, administrators, and members of the community. A needs assessment helped establish goals and the technology advisory committee members served as educators and ambassadors throughout the district and to the board of education. Voters passed a $4 million referendum that resulted in a completely networked school that also provides access and training for community members.

Deer Park Elementary School

- Technology plan includes benchmarks for evaluation, beginning in kindergarten
- Technology integration is critical to preparing students for a technology−rich society

Deer Park Elementary School opened its doors in 1994 with the mission of effective integration of technology in teaching and learning throughout the school. Staff and community members developed the school's technology plan and sought to establish a "Total Technology School." Deer Park's technology plan is closely aligned with its computer/technology standards, as well as the Virginia Technology Standards of Learning. Each goal of the school's technology plan designates clearly defined benchmarks for evaluation.

Research Summary

Technology Leadership Research Summary

The Technology Planning Cycle

Building the technology plan
Obtaining resources
Implementing the plan

Evaluating the plan

With schools increasingly being held accountable for student achievement (Winter, 1998), parents, educators, and policymakers want to know if investments in technology are producing results. A school or district technology plan gives a voice to the vision of school leaders and the stakeholders they represent. Planning for technology has become more important now that many states and funding agents tie appropriations to the existence of a well−developed technology plan (Brush, 1998).

In a comparison of technology planning in five southeastern states, more than 90% of the respondents indicated their districts had written technology plans. This survey also demonstrated the importance of technology leadership. Georgia and Tennessee reported that 99% and 100% of districts, respectively, had technology leaders. The lowest percentage of districts with designated technology leaders reported in this five−state survey was 69% (Brush, 1998).

The technology plan document is the result of a technology planning cycle. Technology planning must become an integral part of annual budgeting, training, data gathering, and assessment of school performance (Cartwright, 1996; Department of Commerce, 1996; AEL, 2000). Results from implementation strategies spelled out in the plan create data that then feed the next round of planning and resource allocation. Although contrary to traditional budgeting practices in many school districts, a technology plan should span more than one year and have enough flexibility to accommodate new and emerging technologies, teaching strategies, and data from evaluations.

The business world, where multi−year budgeting and planning are more common, looks upon technology as a tool to increase productivity. Business models can calculate an approximate "total cost of ownership" for technology initiatives through formulas that incorporate not only expenditures on hardware and software but on increases in productivity and efficiency. These business models are difficult to adapt to school settings, however, for uses and outcomes are quite different.

A study by the International Data Corp. in 1997 (as reported in Consortium for School Networking, 1999) calculated the total cost of ownership for a school with 75 computers at $2,251 per year **per computer**, while costs for a comparably sized business were $4,517. Differences were attributed to less expensive hardware and software and less support personnel for schools, and a projected life span of five years for schools compared to three years for business. The factors that influence a district's cost calculations include support personnel, age and number of computers, number of platforms and software applications, as well as the type of network. No one formula will work for all schools.

Planning can be made less daunting by gathering proper resources −− both human and otherwise −− and working toward well−established goals that focus on improved teaching and learning. Keeping the learning process in mind will guide discussions, help set benchmarks, and define desired outcomes. Technology planning is more than buying "wires and boxes." Mojkowski (1999) reports that flawed planning, which focuses on installing equipment and networks and gives little attention to teaching and learning, results in problems with evaluation. This can lead to decreasing support from stakeholders. If your technology plan is faltering, try using the Technology Planning Cycle to get it back on track (AEL, 2000).

The Technology Planning Cycle

Whether embarking upon the initial stages of planning or revising an existing plan, the technology planning cycle, which is described below, can be broken down into four distinct phases with unique steps, players, and outcomes. This process is described in the Principal Connections CD−ROM (AEL, 2000) and consists of building the technology plan, obtaining resources, implementing the plan, and evaluating the plan.

A well−designed technology plan can provide a high return on investment. The process is time−consuming and involves many players, but a strong document that begins with a vision that impacts student learning, outlines clearly stated goals, dictates roles for key players, describes funding needs and sources, and weaves evaluation into the cycle will contribute to effective integration and improved teaching and learning. Too, a successful plan serves as a model for future iterations that can incorporate new and emerging technologies and build upon a strong foundation.

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Building the technology plan. In the "Guidebook for Developing an Effective Instructional Technology Plan," Dr. Larry Anderson (1996a) and his students at Mississippi State University distinguish a difference between the word "plan" as a noun and "plan" as a verb. **The** plan is a document that describes **a** plan to be put into action. This document will be the road map that guides implementation of your school or district vision of educational technology. Begin by gathering all key stakeholders in the planning process (Anderson, 1996a; Costello, 1997; Department of Commerce, 1996). Stakeholders at the school level include teachers, administrators, representatives of the professional staff, and students. Community and business leaders should also be included, for the success of the school system affects the economic viability of the community.

When appointing faculty members to a technology committee, remember this caveat from Geoghegan (Gilbert &Geoghegan, 1995). He notes that often these committees are made up of "early adopters" −− people who are ahead of the crowd in terms of skills −− and this can result in overlooking the needs and concerns of mainstream users.

Including community and business leaders in planning offers many benefits. These partners may leverage financial support, become powerful advocates for school projects (Department of Commerce, 1996), and communicate with the community at large (Mojkowski, 1999). Business leaders have insights into the world of work that can help shape the vision and guide outcomes expected of the district's graduates (Costello, 1997). Community and business leaders may also offer technical support and help translate the sometimes overwhelming technology jargon into educational goals.

At early meetings, create a mission statement that incorporates data from known infrastructure and technology use and sets goals toward the unified vision of the committee (Anderson, 1996a; Costello, 1997; AEL, 2000). This statement should clearly state goals and objectives for the plan (Department of Commerce, 1996). A realistic time line should designate personnel, desired actions, and projected outcomes (Anderson, 1996b, Department of Commerce, 1996).

Again, the focus of the technology plan should be teaching and learning (Rogers, 1999). Rogers (1999) describes three types of goals for technology use. Technology can be used as a tool to assist learning −− specifically to meet curricular requirements and content standards. Technology can also address new goals that could not be met any other way, such as creating simulations or supporting collaboration across temporal or geographic separation. These new goals may also include new learning environments and pedagogy. Technology can also assist teachers in various aspects of classroom management.

The technology plan document must also address the costs of purchasing equipment and software; developing a network infrastructure; constructing and/or retrofitting facilities; professional development sessions, materials, and substitute teachers; maintenance, technical support; and replacement of old, broken, or obsolete equipment and software (Anderson, 1996a; Coley, Cradler &Engel, 1997; Consortium for School Networking, 1999; Costello, 1997; Zeisler, 1997, 1999). Networking and hardware costs will be greatest at the beginning of an initiative (Coley, Cradler, &Engel, 1997); however, costs will shift over time (Zeisler, 1997, 1999).

Many plans neglect hidden costs when planning for technology. Rooms may require retrofitting to accept network infrastructure, or they may become hotter with many computers running, which can impact HVAC (heating, ventilation, and air conditioning) costs. New technology may require new classroom fixtures such as ergonomically adjusted desks and chairs, additional outlets, and storage for portable equipment. To avoid the safety hazard of cables on floors, you may need to raise flooring or purchase wireless hardware (Zeisler, 1997, 1999).

After the initial investments in hardware, software, and networking, expenses shift toward personnel and include professional development to address both basic skills and effective integration strategies, as well as maintenance and support staff (Consortium for School Networking, 1990), which can be the largest ongoing financial burden (Coley, Cradler, &Engel, 1997). These shifts, combined with the need to collect impact data and revise the technology plan, require more than a one−time budget expenditure and should be incorporated into your annual budget. While a major technology effort may develop out of a one−time bond issue or major grant, the technology plan should address sustainability from the beginning (Costello, 1997; Department of Commerce, 1996; Panel on Educational Technology, 1997; Zeisler, 1999).

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Obtaining resources. The planning document outlines required resources in terms of equipment, funding, and personnel. It may also visualize a new approach to teaching and learning within your school community and require educating or informing key personnel about the expected benefits of your plan.

School board members must understand that technology is not a one−time expenditure but requires a line item in each year's budget (AEL, 2000). Board members must report back to the community at large and, as Mojkowski (1999) points out, stakeholders outside the school expect education technology to significantly −− and quickly −− impact student test scores. A well−crafted technology plan should use information gathered during the needs assessment phase to outline expected returns and describe alternative indicators of success.

A strong technology plan addresses purchasing and sustainability costs, how matching money will be sought, how the finances will be managed, and ways to address shortfalls and obsolescence (Anderson, 1996b). If your needs exceed your budget, you may seek funding from federal agencies or private foundations. The U.S. Department of Education's Office of Educational Technology and other federal and state agencies offer several long−term initiatives, such as the Technology Literacy Challenge Fund, Technology Innovation Challenge Grants, Community Technology Centers, Next Generation Technology Innovation program, and Learning Anytime Anywhere Partnerships (http://www.ed.gov/about/offices/list/os/technology/edgrants.html). Many funding opportunities from private foundations are cataloged on−line by organizations such as The Foundation Center (http://www.foundationcenter.org) and Philanthropic Research, Inc. (http://www.guidestar.org).

Volunteers from the local community and businesses can be important to bringing your plan to fruition. Besides helping to develop the technology plan, local people may offer expertise as well as financial support. Local support at the beginning of an initiative can grow into long−term funding if your project serves community and business members, in such ways as providing space for distance learning or technology training or offering access to infrastructure or digital reference services. Some schools involved in the Telecommunications and Information Infrastructure Assistance Program (TIIAP), now called the Technology Opportunities Program (TOP), turned potential partners into sustaining partners by offering essential (Department of Commerce, 1996). Many of the TIIAP schools also found that attention generated by the projects brought in new partners, building greater sustainability.

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Implementing the plan. A key aspect to every technology plan is professional development (Anderson, 1996a; Consortium for School Networking, 1999; Meyer, Steuck, Miller, Pesthy, &Redmon, 1999). Ineffective or nonexistent technology training reduces the possibility of benefits from the program and can also result in a loss of investment due to equipment sitting idle. Technology instruction should encompass basic technology skills and address strategies for integration (Consortium for School Networking, 1999; Meyer, Steuck, Miller, Pesthy, &Redmon, 1999; Wolinsky, 1999).

Even though the bulk of first−year technology costs relate to building and equipment, you should set aside some funds for professional development so that new equipment may be utilized right away. After year one, professional development and technical support will take larger portions of the budget pie (Zeisler in AEL, 2000). The U.S. Department of Education recommends that school districts allot 30 percent of their technology budgets to professional development (Department of Education, 1996); however, observations of school districts indicate 10 percent is more common (Zeisler in AEL, 2000) and many schools do not include this essential budget item at all (Panel on Educational Technology, 1997).

The infrastructure is perhaps most often conceived as the greatest need, for it involves making decisions about equipment and network access −− the "wires and boxes." Again, the vision described in the planning document that has been crafted to meet the needs of the curriculum should guide network and equipment choices.

Decisions about room or building use should be made before purchasing equipment. Room configuration is based on the intended purpose, whether it is to be used as a lab, classroom, lecture hall, or even distance−delivery facility. This purpose guides networking options, variations in flooring, wall color, furniture, placement and type of equipment, as well as lighting and HVAC systems (Carter, 1997). As few as two or three computers in a classroom can have a significant impact on spatial needs (North Carolina State Department of Public Instruction, 1995).

Networking decisions may be difficult for schools to make alone, but are an essential part of technology plans. Equipment vendors and technical consultants can be helpful, but working with these outside sources will be more productive if you have a plan that clearly defines educational outcomes, a realistic budget, and expectations regarding timelines. Do your research. Know what services you need and understand some equipment options to make these relationships more positive (Anderson, 1996a; Department of Commerce, 1996).

Your technology plan should encompass networking within buildings as well as connections across the district and beyond. While most districts are aware of the push for Internet connectivity, especially through programs such as the Universal Service Program for Schools and Libraries, commonly called the E−rate program, connectivity may also include phone, television, and satellite services. Wireless options, too, may be an option for network connections within a school or to the World Wide Web.

Retrofitting existing facilities is a cost that many school districts face but often fail to budget for. Retrofitting costs include wiring, asbestos and/or lead removal, new lighting, and modifications to meet the requirements of the Americans with Disabilities Act (Consortium for School Networking, 1999). Zeisler (1997, 1999) adds that many schools neglect ergonomic considerations necessary for the proper use of equipment, such as keyboard trays and appropriate seating. They may also forget the need (and the cost) for additional outlets and storage space for peripherals, notebook computers, carts, and even student backpacks that may not fit under computer desks (Fisher &Dove, 1999; Zeisler 1997). Security concerns, both on−site and on the network, increase as technology is integrated into the program.

Despite perceived needs, make software decisions only after reviewing your curricular goals and matching software appropriately. Software selection should drive hardware choice (Anderson, 1996a; Meyer et al, 1999; AEL, 2000). Bouie (1998) lists software options for teachers and other instructional staff that include communications tools, network management, information management, curriculum management, classroom administration, and productivity tools.

In a review of studies on school technology expenditures, the Consortium for School Networking (1999) reported that software costs consumed 4 to 10 percent of technology budgets, with 8 percent being average across schools. Suggestions for reducing software expenditures include limiting the diversity of titles across a district to reduce support and training costs, upgrading software packages across the district at the same time, controlling the installation and upgrading of software over a central network, and encouraging staff to use the same software at home as they do at school (Consortium for School Networking, 1999).

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Evaluating the plan. Remember that the planning cycle is continuous and each stage feeds and progresses into the next. Although evaluations come fourth in the cycle, they must be planned from the very beginning and take place periodically throughout (Anderson, 1996a; Baker, 1999; Department of Commerce, 1996; Mojkowski, 1999; AEL, 2000). In truth, the needs assessment you do during the initial building of your technology plan is an evaluative step. In successive iterations of the planning cycle you should gather data that will serve a similar purpose when the plan must be revised.

What information is important? While schools are often judged by results on standardized tests (Mojkowski, 1999), the impact of technology may not be measured so easily. Your evaluation plan should be oriented to the goals and objectives developed in the planning process and should provide means to determine whether and how well these goals and objectives are being met (Anderson, 1996b; Baker, 1999; Department of Commerce, 1996; Mojkowski, 1999). Measurements can include the cost of providing a service, its frequency of use, attitudes or satisfaction levels, and measures of impact such as grades and attendance records (Department of Commerce, 1996). Baker (1999) emphasizes that evaluations are planning tools that first and foremost should focus on student learning.

Most schools involved in the TIIAP program (now the TOP program), utilized two or more of the following methods to gather data: interviews, focus groups, telephone surveys, brainstorming sessions, a review of research data about the community from census records and other sources, a review of relevant state or community planning documents, or an inventory of existing technology and technological resources (Department of Commerce, 1996).

Not only should your evaluation plan outline who is responsible for completing evaluative measures throughout the cycle (Baker, 1999), it should provide for feedback to all stakeholders (Anderson, 1996b; Mojkowski, 1999). Community members and business leaders may be looking for a return on their technology investment. Mojkowski (1999) suggests that rich descriptions of what is happening in classrooms and with learning opportunities are needed and can combat the call for rapid improvement on student test scores. Information about the complexity of measuring the impact of technology and descriptions of expected outcomes −− besides test scores −− might be necessary to help stakeholders see and understand results.

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Related Web Resources

Becoming a Technologically Savvy Administrator (74)
Critical Issue: Developing a School or District Technology Plan (47)

Edtechnot.com (9)
Learning with Technology Profile Tool (49)
Level of Technology Implementation (21)
Making Technology Happen (22)
National Center for Technology Planning (52)
Planning for Technology Implementation (97)
Plugging In: Choosing and Using Educational Technology (51)
Technology Planning: The Good, The Bad, and The Ugly (26)
The Six Commandments of Technology Implementation (12)

Integration − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.

The way school leaders incorporate technology on a daily basis can set a precedent for how technology will be used throughout a school. Just as technology should be incorporated as an integral element of daily instruction −− rather than an add−on −− school leaders must reflect the appropriate use of technology in their own daily work. School leaders will make better−informed decisions by understanding how technology can improve instruction, management, and personal productivity.

Questions to Think About

- How do you support and help teachers grow in their integration of technology? What specific strategies can help school leaders determine the technology proficiency level of their teachers and the appropriateness of technology−based activities? (Check out what our panel has to say about this specific question.)
- What are some ways school leaders can use technology in their daily activities?
- How often do you use technology and **how** do you use it? Are you comfortable talking about it? If your teachers have questions about technology in their classrooms, can they come to you for answers?
- Is technology used across the curricula to support learning goals?
- What alternative scheduling models can increase communication between staff and support peer mediation?

Story Summaries

Whitney Young Elementary School

- 12 teachers and 200 students completed projects using the Internet
- Each teacher chose a project, submitted a project proposal to the principal, and implemented it in the classrom
- After completion and recognition of the first projects, classes went on to work on new ones
- Recognition for all participants who created a project
- Project specific funding totaled only $1,000

Inspired by a graduate course, Whitney Young's technology coordinator initiated a school−wide training program aimed to help integrate the Internet into classroom teaching and everyday school life. She and the school principal sought financial support from a private, local education foundation and received a $1,000 grant. Using WebQuests (inquiry−oriented activities that require learners to use information found on the Internet and encourage analysis, synthesis, and evaluation) and Online Projects (activities designed to enrich lessons or provide interaction with others via the Internet, such as e−mail, e−pals, or chat rooms), teachers and other school personnel developed self−confidence and created valuable, purposeful lessons for their students. Every participant who created a project was honored during a special luncheon on the last day of school and again the next fall when the projects were unveiled on the school Web site.

Maryville Middle School

- Technology used to answer specific "real world" questions and to present findings clearly, in a visually stimulating format
- Each student spends at least 50 minutes every other day in a computer lab
- Students average 55.9% above the national norm on the Value Added Assessment that measures reading, language arts, math, science, and social studies performance.
- Students work in teams and teachers act as coaches
- Interdisciplinary nature encourages cross−subject learning

Middle−schoolers at Maryville do more than learn technology skills. They use them! Technology is integrated throughout the STARS program. Using the problem−solving paradigm, students learn to focus topics, assign tasks, share accountability, collect information, and use software successfully. As they seek answers to "real world" questions, they develop skills using word processing, spreadsheets, databases, desktop publishing, and animation. Taking the project one step further, students prepare and present a multimedia presentation for parents and community members during an open house each spring. Teachers coach students throughout the process and provide direct instruction when needed. They, too, work in teams to support the interdisciplinary nature of the program. Students are encouraged to make natural connections across subjects.

Idlewild Elementary School

- 4th grade writing scores went from 50% passing to 99% passing
- While producing their own TV program, students use communication skills of writing, reading, speaking, and listening

The "Primetime" is a project−based program at Idlewild Elementary School that demonstrates that there is more to technology than a computer. Students act as reporters, news anchors, camera operators, editors, and producers to broadcast school−related news and feature stories throughout Idlewild using a video network. The network links all classrooms to a central "studio," which houses equipment used to produce and edit videotapes. The program features interviews, documentaries, plays, reenactments, debates, displays, critiques, and panel discussions on a broad range of topics. Students use computers to collect information, analyze and evaluate data, prepare stories for broadcast, and develop on−screen graphics. The process is a learning experience, but the result is a well−informed school community.

Bastrop Independent School District

- Participants scored 22% higher than students in the old program
- Student absenteeism, tardies, and discipline problems decreased by 43%
- One seventh−grade course in 1993 developed into a required ninth−grade course throughout the district and many electives in grades 6−12
- Students form competing five−member "advertising agencies" and use computers to solve company problems
- Rejuvenated the old course that made students work in isolation on word−processing, spreadsheet, and database units

WOW is right! In a middle school that reported high absenteeism among students and teachers in its required seventh−grade computer literacy skills class and where 50% of the students who took the course failed it, dramatic changes have been documented. A switch to a student−centered, problem−based class that provides real−world experience and cooperative learning opportunities improved teacher morale and community satisfaction in addition to student achievement. Students establish companies of five individuals, each forming an "advertising agency" in competition with each other. Each of the five students assumes one primary job responsibility that he or she is required to teach to the rest of the company. The setting is modified to resemble an office −− cubicles and updated technology. The new teaching model is now used for required ninth−grade computer courses as well as for elective computer classes offered in grades 6−12. This district is no longer concerned about absenteeism, because the elective classes are always full. Team teaching methods and project−based learning have crossed subject boundaries. Teachers in language arts, math, science, and social studies have adopted this approach as well.

Research Summary

Technology Leadership Research Summary

- *Technology and Education*
  - The impact of technology
  - Stages of integration
- *New Roles*
  - Students
  - Teachers
  - Administrators
- *Overcoming Barriers to Integration*
  - Purpose
  - Training
  - Support
  - Time
  - Funding

As the ratio of students to instructional computers drops and access to the Internet increases in the nation's classrooms (National Center for Educational Statistics, 2000), it is unlikely that either teachers or students will be able to continue to work and learn without integrating technology to some degree into their daily activities. Unfortunately, when computer technologies are adopted, the learning about technologies often supplants learning content with the help of technology (Goldman, Cole, &Syer, 1999). Integration is not simply buying a computer or connecting to the Internet −− supplying the "wires and boxes." Integration demands the incorporation of technology as an integral tool in the learning environment that seamlessly supports teaching and learning.

In its report to the President, the Panel on Educational Technology (1997) made two high−level strategic recommendations that it believed to be of utmost importance. The first is that the nation's schools focus on learning **with** technology, not **about** technology. This recommendation enforces the concept of technology as an important tool and that simply acquiring technology−related knowledge and skills is not enough. The second recommendation is that schools emphasize content and pedagogy, not just hardware. This may require some schools to rethink the role and use of technology in their schools and focus attention on the potential of technology to help achieve goals pertaining to education reform efforts. New teaching and learning strategies may be necessary to promote the development of higher−order reasoning and problem−solving skills (Panel on Educational Technology, 1997; Schmidt, Sasser, Linduska, Murphy, &Grether, 1999).

Dockstader (1999) described the many facets of technology integration when writing about the teachers of the 21st Century. She notes that integration can include learning about technology, but that students should do this by applying computer skills in meaningful ways. Software should allow students to use computers flexibly, purposefully, and creatively. Integration also requires having the curriculum drive technology use, not vice versa. She summarizes integration by stating that it is organizing the goals of the curriculum and technology use into a "coordinated, harmonious whole."

Further emphasis on the learning environment finds support from Lewis (1999), who writes that considering the needs of the learner is one way of addressing the role of technology. Some of these learner needs include explicit information, recognition of achievement, flexible access to resources and support, opportunities to practice skills and apply knowledge, feedback on performance, and choices in their learning.

School leaders play a prominent role in promoting the effective integration of technology in their schools. While some leaders come to accept that some of their teachers may have greater technology expertise, they can continue to learn and use these teachers as resources (Caverly, Peterson, &Mandeville, 1997). School building administrators are faced with many other issues beyond technology integration, however, and find themselves ever more accountable to taxpayers, boards of trustees, central office administration, and parents; and there is a great need to increase the efficiency and productivity of these administrators (Benson, Peltier, &Matranga, 1999). Understanding how technology can impact teaching and learning is an important step for school leaders faced with such issues of productivity and accountability.

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Technology and Education

The impact of technology. "Potentially, technology has the ability to change the way teachers teach and students learn" (Schmidt et al., 1999, p. 2). Technologies can open up the more traditional classroom and provide the opportunity for students and teachers to share, discuss, and exchange ideas with larger communities of learners (Honey &Hawkins, 1999). Technology can enhance and invigorate education and make schools more exciting and richer learning environments (CEO Forum, 1999). How does this expanded opportunity translate into improved student achievement? The answers may not be as concrete as a score on a multiple−choice test, but evidence does exist to indicate that technology positively impacts teaching and learning.

Research documents that effective technology−enhanced pedagogical strategies can result in at least four kinds of improvements in education outcomes: increased learner motivation, mastery of advanced topics, students acting as experts do, and better results on standardized tests (Dede, 1998). While student scores may rise on conventional achievement tests, these results do not occur immediately, and both teachers and students must move beyond learning about technology to effectively integrating technology into the learning environment. Also, conventional achievement tests do not measure the full impact of technology (Dede, 1998).

In reviewing benefits culled from the Apple Classrooms of Tomorrow? studies, Kosakowski (1998) reports that students explored and represented information dynamically and in many forms −− communicating effectively about complex processes. Students were more confident and became more socially aware. They worked well together but were also independent learners and self−starters. Students involved in this long−term, technology−intensive program used technology routinely and appropriately. These students also demonstrated increased writing skills, a better understanding and broader view of math, the ability to teach others, and greater problem−solving and critical−thinking skills.

Peck and Dorricott (1994) give a "top 10" list of reasons to use technology. A few examples from this list include that students learn and develop at different rates, and technology can address some of these differences. Technology can foster an increase in the quantity and quality of students' thinking and writing skills, and it can create opportunities for students to do meaningful work. It can also nurture artistic expression.

Technology can help teachers and students explore content in greater depth−−moving beyond knowledge and comprehension to application and analysis of information. Finding, synthesizing, and creating information are important skills for the current information−rich world. Technology skills, too, are important and the development of these skills should not take place in isolation, but applied throughout the learning process (Dockstader, 1999).

Teachers who have faced the integration hurdle may have to reconsider some of their underlying philosophies about teaching. These changes could manifest themselves outwardly in the form of new teaching strategies, activities, and forms of assessment, but this may take some time (Bruce, 1999). In their efforts to help teachers enrich classrooms through the incorporation of multimedia, Wise and Groom (1996) found that teachers felt multimedia had the biggest impact on the teachers themselves. They found the material visually stimulating, that it could present more detail about subjects, and that it actually simulated bringing the real subject into the classroom.

Mann and Shafer (1997) found that the success of technology is strongly related to teacher enthusiasm, initiative, and sense of improvement. Teacher interest in technology was highest when they had access to enough hardware, used applications teachers cared about, and received relevant training. These researchers found that high school teachers were often the most positive about technology's ability to contribute to both school reform and their own work, but that some of the strongest supporters of technology were teachers involved in special education, career education, and adult education.

It is important to stress that the mere presence of wires and boxes is not enough to obtain the potential rewards of technology. Bouie (1998) lists several factors that must be present before technology can have a positive impact. These include providing students with significant access to technology and resources on a regular basis, providing teachers with professional development activities that include effective integration and communication training, and having education leaders who propagate an environment that integrates technology as a valued component of learning.

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Stages of integration. Teachers follow similar stages of technology adoption as they first learn about the technology and then begin to incorporate it into their teaching and learning. Early activities tend to mirror current teaching activities with which the teachers feel comfortable (Sheingold &Hadley, 1991). As comfort and proficiency improve, teachers may begin to use technology for instruction in novel ways or create activities that better capitalize on the capabilities of the technology.

The pivotal, longitudinal project, the Apple Classrooms of Tomorrow (ACOT) began in 1985 and has provided a wealth of information regarding teacher attitudes, practices, and integration behaviors when using technology. Early reports from this project identified a five−stage continuum of technology integration that evolved at all of the project's sites (Dwyer, Ringstaff, &Sandholtz, 1991). This evolutionary process consists of five stages:

- entry
- adoption
- adaptation
- appropriation
- invention

Whether or not broken into distinct stages, a similar evolution of teaching and learning with technology is found in several sources, such as Sheingold and Hadley's (1991) finding that teachers begin with technology that replicates familiar activities. Similar findings are reported in a later evaluation of the ACOT project (Baker, Gearhart &Herman, 1993) in which teachers immersed in technology chose resources and based pedagogical decisions upon subject area rather than the technological resources that were available.

ACOT Continuum of Technology Integration

> **Entry.** Teachers typically learn the fundamental aspects of using new technology, including the basics of configuring hardware and software.
>
> **Adoption.** Teachers concern themselves with ways to use the technology to support traditional instruction.
>
> **Adaptation.** Teachers integrate technology into existing classroom activities. The emphasis is productivity. Students use word processors, databases, and some graphics programs to create familiar products of instruction.
>
> **Appropriation.** Teachers begin to develop new approaches to teaching and learning that make the most of the technology available to them. A teacher's mastery and skill level has developed to allow the creation of new learning activities not possible without the technology.
>
> **Innovation.** Teachers no longer try to adapt instruction to technology but adjust their fundamental perceptions of instruction. Teachers who reach this stage reflect on the actual craft of teaching, and their fundamental teaching approach may shift. (Dwyer, Ringstaff, and Sandholtz, 1991)

Word processing, problem−solving, and drill−and−practice applications are often a first step in incorporating software into the instructional process because these applications replicate common seat−based classroom activities, reinforce material already being taught, or provide special opportunities for particular groups of students. However, the lower−order thinking skills addressed by these software applications have garnished negative connotations for instruction, with drill−and−practice software specifically demonstrating little (Haugland, 1997) or even a negative relationship to academic achievement (Wenglinsky, 1998).

As technology experiences grow, teachers are able to incorporate a wider variety of software applications and approaches that provide richer learning opportunities for the larger population of students. These new approaches often shift toward learner−centered rather than content−centered lessons, which replace the traditional classroom activities of lecture−based presentation and seatwork with more project−based and collaborative activities. The more familiar types of activities, which may be addressed by simple word−processing and drill−and−practice applications, give way to the need for curriculum−based software and research tools, which often allow for greater individualized, creative, and interdisciplinary activities.

Sheingold and Hadley (1990) summarize that teachers appear to master many practices and approaches within five to six years of teaching with computers. Dwyer, Ringstaff, and Sandholtz (1991) noted that some of the teachers in the ACOT project moved into the fourth phase of appropriation−−incorporating student−centered, project−based instruction−−in their second year. While no fixed schedule of development may be applicable to every instructional setting, there is strong research base to support an evolutionary process of teaching and learning with instructional technology. This evolution of practices carries with it the adoption of software types.

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New Roles

Students. School leaders, teachers, and students alike are being exposed to new ways of teaching and learning supported by technology, which require rethinking approaches to education and the roles members of these groups play. Students are the key to any educational model and student learning should be the focus of any change efforts (Lewis, 1999). Through technology, students are performing work that is much closer in scope and quality to that of more advanced scholars, such as conducting sophisticated analyses, syntheses, and simulations (McClintock, 1996).

The digital tools students use require new skills and forms of literacy. Morris and Naughton (1999) state that it is too easy to assume that digital tools are merely an extension or modification of more traditional forms of student interaction. Some new problems are the lack of more traditional cues when utilizing computer−mediated communication as well as problems developing standard protocols and norms of behavior for this type of communication. The amount and accessibility of data now available to students brings up questions of plagiarism and originality and whether students are actually engaged when wading through this material or are participating in what the authors describe as an "advanced form of photocopying." Soloway and Wallace (1997) describe a related problem in which students using the Internet for research often assume "the answer" is available in the ether somewhere and that student engagement requires an infrastructure to support re−search and not just searching.

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Teachers. Teachers are on the frontline of technology efforts and are essential elements effecting the successful implementation of any systemic reform (Bertram, 1999; Fulton, 1996; Lewis, 1999). In discussing teacher concerns regarding technological change, Fisher and Dove (1999) acknowledge that many teachers and administrators feel threatened because the change effort represents a journey into the unknown and may not feel adequately prepared to face these challenges.

Training is key to successful technology efforts (Costello, 1997; Fisher &Dove, 1999; Lewis, 1999) and should address more than the acquisition of basic technology skills. Teachers also need training in effective integration strategies, for the potential benefits of technology use go beyond the simple replication of existing activities and strategies and may require teachers to rethink their own underlying philosophies about teaching and how their roles may change. It should be clear that teachers also need time to reflect and adjust their teaching practices (Bertram, 1999).

The Panel on Educational Technology (1997) lists the following ways teachers may use computers and computer networks to support teaching and learning.

1. Teachers can monitor, guide, and assess the progress of their students; they can maintain portfolios of student work and prepare materials for their classroom.

2. Teachers can use computer−mediated communication tools to exchange ideas, experiences, and curricular materials; consult with experts in a variety of fields; and facilitate dialogue with students, parents, and administrators.
3. Teachers may further their own knowledge and professional capabilities and can use the Internet to access remote databases and acquire educational software.

In institutions that have embraced technology, Lewis (1999) comments that evidence supports that the teacher's importance has not lessened but that systematic use of technology actually upgrades and enhances the teacher's role. Technology supports teamwork, curriculum development, adaptation and development of materials, action−research and evaluation, and more creative management of learning environments. It can also change the nature of relationships with students by providing closer contact with individuals and small groups.

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Administrators. The importance of the role of school leaders in the success of technology integration cannot be understated (Coley, Cradler, &Engel, 1997; Costello, 1997; Fisher &Dove, 1999). Superintendents and principals must be involved in and support technology initiatives. Coley, Cradler, and Engel (1997) note that research has consistently found that, when these school leaders are informed about and comfortable with technology, they become key players in leading and supporting technology integration activities. Costello (1997) supports these important roles and emphasizes that leaders need to model the use of technology. Leaders must become users and must be involved in planning and implementing technology in their own school buildings.

Fisher and Dove (1999) acknowledge that serving as a technology leader may be a difficult position, especially for administrators who may be embarking into areas where they have little expertise and much apprehension. However, these authors suggest that since technology initiatives depend upon human dynamics, school leaders may find support by listening and responding to their teachers' concerns about technology.

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Overcoming Barriers to Integration

Schools may face many barriers prohibiting the effective integration of technology. Fortunately, whether these barriers are physical, such as lack of hardware and software, or less tangible, such as attitudes and perceptions, many schools and districts have already faced some of these problems, and their experiences can suggest strategies for overcoming these barriers. Following are five major barriers many schools have faced and some strategies that may help overcome them.

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Purpose. One of the most significant barriers to effective integration of technology is the perception that in many schools technology is still seen as an "add on" rather than an integral part of the curriculum (Charp, 1997; Rockman, 1998). Some teachers may use computer work as a reward for students who have finished other work or for good behavior. Others may view time in the computer lab as release time or neglect to coordinate technology skill development with curricular goals.

The purpose of technology use should be clearly defined in the school or district's technology plan (Anderson, 1996b, Department of Commerce, 1996; Kozma &Schank, 1998). A well−developed plan will outline concrete, time−based goals and outline strategies for achieving these goals, including funding, training, and benchmarks for ascertaining whether the goals were achieved. Overcoming the view of technology as a frill can be achieved through clear communication of the vision presented in the plan by key school leaders. School leaders should demonstrate the value of technology in their own daily work and ascertain the needs of their staff through a variety of data−gathering methods, including but not limited to classroom observation.

Dockstader (1999) describes how teachers in the Jerome School District successfully approached technology integration through a seven−step process. Teachers began with a single core area, then decided what technology skills were most appropriate for this area. Teachers selected a single lesson or unit that could be enhanced by technology, often choosing easier projects at the beginning. Teachers developed that lesson or unit using a software package or other appliance until they were comfortable with it, then taught the lesson. Teachers evaluated the lesson, focusing on what went well and what went wrong, and then refined the lesson for the next time they taught it or applyied those skills to a new lesson or unit. A similar method of piloting lessons and developing prototypes of best practices has been successful elsewhere (Lowe &Vespestad, 1999).

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Training. Lack of professional development is often cited as the most common barrier to effective technology integration (Charp, 1997). Training that develops basic technology skills may be important but is not enough. Teachers must also receive training focused on effective integration techniques that support the goals of their curriculum (Charp, 1997; Kozma &Schank, 1998). This need for training is not limited to in−service teachers, as many pre−service teacher candidates leave teacher training programs with insufficient technology skills (Schmidt et al, 1999). Additional factors that impact training decisions include finding release time and substitutes, both of which also carry a cost burden. Another barrier is the lack of training geared to the unique demands of school leaders.

Reflecting 20 years worth of lessons learned in professional development, the National Staff Development Center (NSDC) developed guidelines that relate to the appropriate application and integration of educational technology. These guidelines propose a constructivist approach to professional development and suggest that teachers and administrators collaborate in such activities as action research, conversations with peers about the basic nature of instruction, journal development, and projects that involve family and community members in student learning (as cited in Coley, Cradler, &Engel, 1997). Improving opportunities for training of administrators is addressed by the Apple Classrooms of Tomorrow Teacher Development Center Project. Administrators are encouraged to attend the program with a teacher team, and they must commit to providing release time and daily planning time for teachers as well as time for teachers to reflect on their work. Administrators also increase staff awareness through public acknowledgment of their teachers' efforts (as cited in Coley, Cradler, &Engel, 1997).

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Support. Many teachers are still at the early stages of the integration continuum. These stages require support in terms of both pedagogical and mechanical help. Many teachers rely on more advanced or experienced peers −− early adopters who have worked through some common problems. Easy−to−read, print documentation is another need (Charp, 1997) that may be harder to come by as software and hardware publishers continue the trend of on−line help. Novice users may prefer more traditional print to the new industry preference for on−line help. As schools continue to develop Web−based components for teachers, students, and the greater education community, the need for round−the−clock support becomes greater. Cartwright (1996) notes that while many thought the problems associated with technology would dissipate as more teachers became fluent users, these problems have not gone away. Schools must pay attention to continuous training and support for faculty, staff, and students.

A variety of support strategies are presented by Coley, Cradler, and Engel (1997). The advanced or experienced teachers mentioned earlier may actually serve as a valuable resource for other teachers. These master teachers could be trained specifically for the purpose of acting as resources or mentors to colleagues. One school (Lowe &Vespestad, 1999) found the structure of teams to be a successful peer resource model. Expert personnel from libraries or volunteers from business, parent, and student groups may also be available to support teachers. Teacher resource centers can provide both pedagogical and technical help and, as teachers become more familiar with logging on to the Internet, they can reap the benefits of on−line tutorials and telementoring. One school district (Hurst, 1994) found that dedicating one room to continuous inservice helped boost teacher confidence and positively impacted integration. This quiet room was loaded with equipment, software, and manuals and afforded teachers the opportunity to experiment in a private setting.

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Time. Time places finite barriers on technology integration because teachers may already feel their time has been maximized without trying to learn new teaching strategies or new software. Time cannot be created and, when having to juggle schedules, teachers may resort to tried and tested methods and materials. Training takes time and, if training is going to be supported beyond a few one−day sessions, release time may be required. Time can also be wasted by inefficient technology use−−either by teachers or students.

New adopters may also need additional planning time not only to build and practice technology skills but to develop effective strategies to incorporate their new skills (Fisher &Dove, 1999). Inexperienced teachers often underestimate the time and complexity of integrating technology. Novice users may be excited to try new technology−supported lessons, but early efforts usually result in an emphasis on the technology and little on content learning. Many teachers already feel the pressure of too little time to cover the required curriculum. This is what Goldman, Cole, and Syer (1999) refer to as the "technology/content dilemma."

From their experiences helping and observing teachers integrate technology, these researchers found structuring the technology−supported activities to be key in promoting content over technology. In a technology−supported math activity, they helped the teacher structure an activity that encouraged students to notice, name, and reflect on math concepts encountered in their lessons. These researchers also helped teachers structure informal conversations with students during activities by slowing down and spending a few minutes with student groups. Students not only demonstrated desired content outcomes but felt they did so during an engaging activity that had real−world applications due to the technology use.

Supporting teachers with increased planning time or release time is encouraged (Coley, Cradler, &Engel, 1997; Lowe &Vespestad, 1999) but may require educators and policymakers to reconsider some of the traditional constraints of the school structure, such as the bell schedule, the school year, or the requirements of contact time. While new models may not work in all settings, the most successful programs are often those that have developed effective technology plans (Gustaferro in Norman, 1999; Hurst, 1994). Finally, once having reached a certain level of proficiency, technology can help solve rather than create the time problem by helping teachers and staff perform their duties more efficiently and by freeing up time for instruction or professional development (Kosakowski, 1998).

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Funding. Insufficient funds affect not only hardware and software purchases but can impact staffing as well. The shortage of teachers proficient in technology may make it difficult for some districts to attract such teachers (Schmidt et al, 1999). The draw for technology workers may also draw the most qualified teachers away from a school district or from teaching altogether.

The cost of technology is often attributed to hardware and networking costs, but too often schools do not budget sufficiently for hidden costs that may compound their problems, such as retrofitting buildings, replacing obsolete or broken hardware and software, professional development, and maintenance and support personnel (Consortium for School networking, 1990; Zeisler, 1997, 1999). Computer prices are dropping, but few schools have yet to reach the recommended ratio of five students per computer or the optimal ratio of one student per computer (Graham, 1997). Schools also face many decisions regarding network configuration. While broadband access requires substantial funding, many schools do not have the infrastructure to support connections through phone lines.

While there is no one answer to the funding question, the best strategy is planning (Anderson, 1996a; Coley, Cradler &Engel, 1997; Consortium for School Networking, 1999; Costello, 1997; Zeisler, 1997, 1999). A well−designed planning document created by key stakeholders not only describes desired learning outcomes but also designates components (e.g., hardware, software, training, and support needs) and suggests methods for funding these components. The planning document does not actually guarantee procurement of funds, but it can suggest steps that must be taken to guarantee sustained funds throughout the program's initiative, whether those steps require a major bond issue or funding through outside sources.

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Related Web Resources

Computer Supported Intentional Learning Environments (11)
Edtechnot.com (9)
Integrating Technology into the Instructional Process: Good Practice Guides the Way (32)
No Risk Internet Course (42)
School Case Studies (Technology &School Reform) (34)
Social Studies Teachers and Technology (28)
Students Teaching Students with Technology (40)
SWAT Savvy: A Model for Effective Classroom Technology Using Student Experts (41)
The BEST Model: Looking Back and Looking Ahead (43)
The Secretary of Education's Conference on Educational Technology − Spotlight Schools (46)
Using Technology to Motivate Students (36)

Ethical and Legal Issues − School leaders must model and promote an understanding of ethical and legal issues related to the use of technology.

Networked technologies have changed the way in which information is created, collected, and shared. New methods of communication and information gathering are growing rapidly and require new protocols and safeguards to ensure their appropriate and effective use. School leaders must help members of the school community adapt to changes concerning intellectual property rights, fair use, and acceptable use of digital materials and technology.

Questions to Think About

- What guidelines should teachers and students have regarding copyright and plagiarism?
- What kinds of documentation should be kept to verify rights?
- What is an acceptable use policy? What should it address?
- What is "fair use" and where can I find more information about it?
- What implications does recent legislation, such as the Digital Millennium Copyright Act, have for my school? What additional legal concerns are being discussed that may impact my school?
- Who owns multimedia course content developed by teachers? How can it be used?

Story Summaries

The Nueva School (Elementary)

- Extensive use of Web−based resources instead of textbooks
- Parents trained to make "techno−parenting" decisions
- Portfolios, performances, and products replace grades
- Student learning judged by quality of work

The Nueva School, 15 miles south of San Francisco, does not use textbooks. Instead, the school provides extensive Web−based applications and resources to faculty, students, and parents. A Board−approved Acceptable Use Policy committed to open, unfiltered Internet use is supported by workshops that expose parents to Web−based resources and their educational applications. The school's "Parent Internet Driving School" hones information literacy skills, and creates momentum that involves parents both at the school and through a telecommunications network called NuevaNet.

Research Summary

Technology Leadership Research Summary

Using the Internet
Responsibilities of online service providers
Strategies to educate and inform
Acceptable use of policies

Technology to support acceptable Internet use

Copyright and Intellectual Property

Copyright Legislation

Fair use

Distance learning and intellectual property

Networked technologies can support teaching and learning in several ways. Teachers can communicate with peers and share lesson ideas, activities, and materials. Students, too, have greater flexibility in working collaboratively and can consult primary resources previously unattainable within the school, such as data from research facilities, government agencies, libraries, and museums. The ease with which data can be created and shared also poses problems. It is not only easier to obtain and reuse materials found on the Internet or in digital resources, it is also easier to misuse them and to find inappropriate or even harmful material.

A recent survey (NPR, 2000) indicated that many Americans have concerns over use of the Internet. Eighty−five percent of respondents worry about the possibility of dangerous strangers contacting children, and 84 percent have concerns about the availability of pornography on the Internet. This last fear may be justified, as the survey reports that 24 percent of children between the ages of 10 and 17 say they have seen a pornographic Web site.

These are not the only ethical and legal issues facing educators in a digital age, however. Educators must be mindful of security and privacy to prevent unauthorized individuals from obtaining student data (Owens &Cohen, 1998; Olivia, 1999). Administrators and teachers must be aware of how students are using the school's technology and must monitor what students publish (Burke, 2000). Schools must also:

- respond to policies and legislation that dictate requirements to maintain accreditation (Anderson, 1996);
- provide access to all students by following requirements of the Americans with Disabilities Act (Consortium for School Networking, 1999);
- and uphold copyright and intellectual property rights of content creators, which are outlined in the copyright Act of 1976 and the Digital Millennium Copyright Act of 1998.

You should keep track of changes in these laws and new laws that impact the use of educational technology, such as the proposed Internet School Filtering Act, which may link universal access (E−rate) funds to the use of filtering software (Pownell &Bailey, 1999).

The following provides an overview of a few key issues, such as acceptable use of digital materials, copyright and fair use issues, as well as concerns for distance education. Legal requirements for schools shift often and are impacted by local and state policy. Consult with your district and state technology leaders to stay current with policy and regulations.

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Using the Internet

Many proponents of Internet use in the classroom view the seemingly unlimited amount of information and the ease of communicating with people all over the world as benefits. These same characteristics may dissuade some educators from including Internet−based instruction due to the possibility of contact between students and undesirable Web sites or individuals. Make decisions about Internet use based on your experiences and policies with existing instructional tools and on research about strategies and tools that increase the Internet's potential to support teaching and learning.

Internet use decisions must reflect local policy and community needs, but completely ignoring the Internet inhibits the school's ability to prepare students to work and live in a knowledge age. Many schools have harnessed the Internet to support instruction and help their students practice acceptable and responsible use; your school can do the same. A variety of strategies, policies, and tools can support responsible Internet use. The most popular include teaching and monitoring strategies, Acceptable Use Policies (AUPs), and filtering software (Burke, 2000; Mason, 1997; Pownell &Bailey, 1999).

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Responsibilities of online service providers. Schools and libraries often serve as Community Access Centers and even Online Service Providers (OSPs). Districts that serve as OSPs must be aware of the Digital Millennium Copyright Act (DMCA) (Lutzker, 1999; Samuelson, 1999). The DMCA considers educational institutions that offer Internet service to students, staff, and faculty to be OSPs, much like America Online (AOL) and other major service providers (Salomon, 1999).

The DMCA outlines compliance practices and actions that must occur when users of the system participate in activities that infringe on the rights of copyright holders. The DMCA provides exemptions for OSPs if they act in accordance with the law, such as terminating service to repeat offenders and removing material from the system upon receiving notice of copyright infringement. The DMCA is available online at http://lcweb.loc.gov/copyright/legislation/hr2281.pdf.

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Strategies to educate and inform. Educators and parents should help students develop responsible and appropriate Internet use habits. Burke (2000) provides several methods teachers can use to supervise student use of the Internet. Place computers where they are easily visible by teachers, librarians, or aides. Limit online time to encourage students to stick closely to learning goals. Group students at the computer to discourage inappropriate use. Teachers must also help students learn how to validate the accuracy and evaluate the usefulness of Internet sources.

Before beginning an Internet−based project, teachers should demonstrate successful search strategies and review responsible use practices. Students should be familiar with citation strategies for both digital and print materials to avoid plagiarism and copyright infringement. Students should know the consequences of illegal use of digital materials (Burke, 2000).

Additional tips for responsible, proactive use of the Internet include:

- Be sure the curriculum objectives and goals for Internet use are clearly delineated.
- Get to know your students' online haunts and 'friends.'
- Never allow unsupervised surfing of the Internet.
- Teach students Internet safety.
- Teach youngsters that there are laws against harassment, and if they feel seriously threatened, they should report this to an adult immediately. (Truett, Scherlen, Tashner &Lowe, 1997, p. 52−53.).

Acceptable use policies. An acceptable use policy (AUP) is a set of guidelines governing use of the

Internet for school activities (Anderson, 1996; Rockman, 1998; Truett et al, 1997). AUPs are often district initiatives and may require students and their parents or guardians to sign letters of agreement. Internet AUPs vary greatly, but most districts agree the primary purpose of the policy is to support research and instruction. Most policies stem from existing policies regarding codes of behavior and use of traditional resources, such as books, magazines, television, and radio (AEL, 2000).

The following list (AEL, 2000) provides a variety of acceptable uses that may be addressed in an AUP:

- Being polite and using appropriate language
- Enforcing appropriate use and reporting misuse or security issues
- Using the Internet ethically and legally
- Respecting copyright and license agreements and citing material
- Deleting unwanted messages or old data from computers
- Using on−line time efficiently
- Running virus software on downloaded files or inserted disks
- Acknowledging the receipt of documents or files
- Signing correspondence
- Abiding by the policies and procedures of other networks that are accessed

The following list (AEL, 2000) provides a variety of unacceptable use that may be addressed in an AUP:

- Giving out private information, such as address, phone, or password of yourself or others
- Assuming the identity or using the passwords or material of another
- Transmitting material that violates any U.S. or state regulation, such as copyrighted, threatening, or obscene material, or material protected by trade secret
- Downloading text, graphics, or software, or engaging in behavior that may be considered obscene, abusive, libelous, indecent, vulgar, profane, or lewd
- Altering software by deleting files, downloading programs, or copying or installing commercial programs
- Plagiarizing someone else's work
- Harassing an individual using the Internet
- Vandalizing equipment or electronic material
- Conducting commercial activities
- Advertising products or services
- Taking part in political lobbying
- Disrupting the Internet use of others
- Spreading computer viruses willfully
- Gaining access to any pay−for−view site

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Technology to support acceptable Internet use. A variety of tools support acceptable Internet use. These include using approved digital resources and services, providing access to materials on an intranet or through a proxy server, and several filtering−type software applications. Of these, filtering software promotes the most heated discussion. Opponents feel that filtering software is a form of censorship, while proponents feel that it allows students to safely search the Internet, avoiding contact with undesirable Web sites or individuals.

Teacher concerns about the potential for inappropriate use has greatly reduced classroom use of the

Internet in many instances (Schofield &Davidson, 1997). However, officials in Tennessee note that Internet use has increased since filtering software was installed on the statewide network, ConnecTEN, in November 1998 (Burke, 2000).

People who believe that information can change the way a person thinks and believes often support the use of filtering software (Pownell &Bailey, 1999). The increasing amount of information available on the Internet and the unlimited topics it covers also lead proponents to encourage the use of filtering software. The growth rate of information is so quick that filtering software offers one solution to providing a supportive environment for teaching and learning (Bruce, 1999). Filtering software is also less expensive than evaluating or previewing individual sites (Bruce, 1999).

Unfortunately, filtering software is not always effective (Pownell &Bailey, 1999). The rapid growth that may encourage filtering software use also limits its effectiveness. Filters can block desirable sites and they must be updated often to keep pace with the growth of material on the Internet. Filtering software does not take into account the varying ages, levels of maturity, and individual needs of users. Keywords used to ban sites are often derived subjectively and most filtering services do not publish their lists (Bruce, 1999). Schools that use filtering software without knowing what sites are being blocked and why may unintentionally censor materials that are constitutionally protected. Schools or filtering software developers that claim they prevent students from viewing objectionable material may also open themselves up to litigation if the software is not completely effective (Pownell &Bailey, 1999).

No one strategy can solve all unacceptable use problems and you should not rely solely on a technological tool. Training for parents, teachers, and students will help reduce the number and severity of problems you encounter (Burke, 2000).

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Copyright and Intellectual Property

Copyright legislation. Copyright law is complex and changes with each session of Congress. The current law is the Copyright Act of 1976 with amendments and is available online at http://www.loc.gov/copyright/title17/. Recent legislation such as the Digital Millennium Copyright Act of 1998 begins to address the complications of digital material. Copyright legislation will continue to evolve in an attempt to keep abreast of technological changes. Consult your district and state legal services on specific questions and visit the Web site for the U.S. Copyright Office at the Library of Congress for more information (http://lcweb.loc.gov/copyright).

Copyright (Copyright Law of 1976) grants the holder the five rights to:

1. to reproduce the copyrighted work in copies or phonorecords;
2. to prepare derivative works based upon the copyrighted work;
3. to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;
4. in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to perform the copyrighted work publicly;
5. in the case of literary, musical, dramatic, and choreographic works, pantomimes, and pictorial, graphic, or sculptural works, including the individual images of a motion picture or other audiovisual work, to display the copyrighted work publicly; and
6. in the case of sound recordings, to perform the copyrighted work publicly by means of a digital audio transmission.

Material does not have to be registered or display a copyright statement, but it must be original and be in a fixed, tangible medium. E−mail, listserv messages, threaded discussions, and Web pages meet these two important criteria and they should be considered copyrighted material (Baird &Hallett, 1999; Rothman, 1995). Warn teachers and students against the illegal practice of copying and using digital material without permission from the copyright holder, whether this material is text, pictures, graphics, or other multimedia elements.

Software is copyrighted and is usually licensed. Pay strict attention to licensing agreements for software. Use cloning software on a lab or network server to periodically check the network for appropriate software and remove non−licensed software (AEL, 2000). Many digital materials are now protected by technological protective measures (TPMs), and the DMCA assigns stiff penalties to anyone found guilty of bypassing TPMs to obtain copyrighted material (Lutzker, 1999).

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Fair use. Fair use guidelines establish criteria for the use of copyrighted materials in educational settings. Many educators falsely assume that copyrighted material may be used for instruction with little or no restriction. Copyright infringement may still occur even if a work does not display copyright notice or if only a small portion of the material is used (Salomon, 1999). The following four criteria (U.S. Copyright Office, 1998, p. 6.) have evolved to help the courts determine whether material falls within fair use:

1. the purpose and character of the use, including whether such use is of a commercial nature or is for non−profit educational purposes;
2. the nature of the copyrighted work;
3. the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
4. the effect of the use upon the potential market for or value of the copyrighted.

Educators may incorporate multimedia for classroom instruction or projects under the Fair Use Guidelines for Nonprint Works if the portion used does not exceed 10 percent of the original copyrighted work. It can be used for up to two years and no more than three copies can be made; two for class use and one for preservation. (Baird &Hallet, 1999).

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Distance learning and intellectual property. The growth of distributed and distance−based learning courses has further complicated the issues of fair use and intellectual property. While distance−based courses may cover curricula identical to traditional face−to−face counterparts, copyright restrictions are more stringent for distributed delivery.

Distance educators should not only seek rights to use materials in a course but to transmit materials over a network. Works that may be transmitted over a network are limited to nondramatic literary or musical works, which excludes motion pictures, videos, or any audiovisual format. This means that while a videotape may be shown in a face−to−face classroom, a distance−based instructor must have permission to transmit the same videotape over a network every time the videotape is shown (Baird &Hallett, 1999).

Many educators think the current laws are too restrictive and call for expanding the fair use policies enjoyed by face−to−face instructors to include distributed and distance−based learning environments. Lutzker (1999) points out the more stringent policies for distance learning, such as the near impossible tasks of identifying copyright holders on items such as photographs and obtaining clearances for spontaneous use of copyrighted works. Licensing copyrighted materials for each access in distributed and distance−based learning courses can be prohibitively time−consuming and expensive.

Distance−based learning environments have forced many instructors to assume the role of course developer. Ownership of the course itself and of digital course materials −− such as Web pages, graphics, and Java applets −− is hotly debated. In the world of higher education, a scholarly work created on condition of employment, such as lecture notes or a course syllabus, is owned by the employing institution, but most institutions will confer ownership to the faculty member. Patents created by faculty, staff, and students traditionally remain the property of the institution. Policies differ, but many institutions are opting to treat digital material created for distributed and distance−based courses as they do patents and are retaining ownership. (Salomon, 1999). As more opportunities for distributed and distance−based learning develop in the K−12 setting, school districts will face the same copyright and intellectual property issues.

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Related Web Resources

Becoming a Technologically Savvy Administrator (74)
Copyright and K−12: Who Pays in the Network Era? (59)
Edtechnot.com (9)
In the Curl of the Wave: What the Digital Millennium Copyright Act and Term Extension Act mean for the library and education community (67)
Justice for Kids &Youth (60)

Stories

This section presents Knowledge Loom stories about classrooms, schools, or districts that exemplify one or more of the practices in the spotlight.

Each story contains a full feature article and a set of facts about how the practice was put into action. Each story lists the practices it exemplifies and the name of the content provider.

For an overview of additional content presented on The Knowledge Loom Web site that may not have been selected for this print document, see the Spotlight Map located earlier in the documentt.

Braxton and Gilmer County Public Schools

Braxton and Gilmer County Public Schools

Burnsville, WV

School Type: Public **School Setting:** Rural
Level: K−12 **School Design:** Traditional
Content Presented By:
Edvantia

Located in the heart of West Virginia, rural Braxton and Gilmer counties cope with high unemployment and challenging socioeconomic factors. Yet their students succeed! In 1998 students in both counties scored higher than the national average on the Stanford Achievement Test and ranked in the top 20 among the state's 55 counties. Both school systems maintain attendance rates of 93 percent or better. These alone are great accomplishments, but the success doesn't stop there.

The Central West Virginia Technology Upgrade for Educators program began with a three−day summer technology academy at Glenville State College in 1999. This professional development program involved all K−12 teachers, one teacher aide, and a few administrators from Braxton and Gilmer counties. Project coordinator Brenda Bleigh, a Title I teacher and Christa McAuliffe Teaching Fellow at Burnsville Elementary School, and her colleague Dr. Paula Nelson, a faculty member at Glenville State College, collaborated to create an accessible and relevant professional development program. Brenda says, "It's difficult for students to advance their technology skills, if teachers are not equipped to provide the training."

First, the coordinators scheduled the academy during the summer to minimize competing demands during the school year. Second, they invited teachers to make recommendations and express their vision for the academy. As a result, 68 participants attended instructional programs that demonstrated effective uses of certain software packages (Microsoft Word, Print Shop, PowerPoint, Front Page, and Excel) and the Internet (creating Web pages, using listservs, and setting up Hotmail accounts). Other sessions included software selection and classroom integration of the Internet.

Since the summer academy, several follow−up teacher activities have supported the initial training. Teacher preparation students at Glenville State College have been providing regular on−site technical support to teachers in the two counties and are compensated for their work. Schools represented by two teachers at a half−day workshop on digital cameras received a Sony Mavica Digital Camera. Furthermore, academy attendees may visit and borrow software from the Software Preview Center at Glenville State College.

Recognizing the costs associated with technology training, project coordinator Brenda Bleigh tapped both state and federal initiatives for additional funds. Teachers received a small stipend and free software for their classrooms just for participating. Additionally, local merchants contributed small gifts and door prizes, conveying their appreciation for the teachers' good work and willingness to devote personal time to the training.

Traditional measures of effectiveness, such as improved scores on standardized tests, can seldom be attributed directly to teacher participation in training programs, discouraging many from trying to evaluate impact at all. However, these program leaders set a specific objective of increasing participants' technology skills by 25 percent. Pre− and post−academy surveys and expert appraisal of projects completed by the teachers demonstrate gains.

The program established a number of other measurable objectives:

- 90 percent of the participants will review software packages for five reading programs;
- 1,500 hours of technical service will be provided;
- a technology handbook will be developed and distributed to all schools, libraries, and parent centers in the two counties.

The undergraduate students from Glenville State College developed the technology handbook and have made technology presentations at PTA meetings throughout the coming school year. These attempts to measure impact are significant. Although the evidence may not relate directly to gains in student achievement, it documents the progress and completion of proposed activities.

The biggest challenge, according to Brenda, is finding the time to implement the project, while teaching full time. She says, "I'm not sure people realize the amount of time required to prepare a grant proposal, submit budgets and budget transfer documents for approval, type purchase orders, communicate with presenters, food service directors, workshop participants, college students, equipment vendors, etc. Except for an occasional telephone call received at school, the work is all completed at home −− evenings, weekends, and summer vacation."

Program attendance has been impressive.Close to one half of all teachers in the two counties have participated in the few short years of the program's existence. The advantages for local schools include increased teacher competence, additional technical assistance, improved community support for technology, and amplified public support for teachers.

Demographics

Located in the heart of West Virginia are two small rural counties characterized by high unemployment. Over two−thirds of students who attend schools in this area qualify for free or reduced lunch. Despite these challenging socio−economic factors, students are achieving success. Third−year Stanford Achievement Test results were encouraging, as students in both Braxton and Gilmer Counties scored higher than the national average. Both school systems have had consistent attendance rates of 93% or greater.

Student Racial/Ethnic Composition:

100% White (not of Hispanic origin)

LEP Students: 0%
Number of Languages: 1
Qualify for Free/Reduced Price Meals: 58%
Receive Special Education Services: 11%

Background

Two small rural counties are home to nearly 4000 students and 300 teachers in 13 schools (2 high schools, 1 middle school and 10 elementary schools). The past 10 years has brought an increase in the use of technology within these schools as a result of these statewide initiatives:

1. The Basic Skills/Computer Education (BS/CE) program provides elementary classrooms in the state with hardware and software to improve the basic skills for using technology. In 1989 the West Virginia Legislature passed a proposal to fund a statewide basic skills development project using personal computers in West Virginia schools. Implementation of computers and curriculum began in 1990. Currently all K−6 classrooms participate in this program (http://access.k12.wv.us/).
2. As a component of school reform in the Jobs Through Education Legislation, the WV Legislature funded the WV SUCCESS Initiative. SUCCESS, Student Utilization of Computers in Curriculum for the Enhancement of Scholastic Skills, provides the technology tools to prepare students, grades 7−12, to succeed in college, other post−secondary education or gainful employment. The funding level is approximately $8 million per year, which is allocated to the counties on a per pupil basis (http://access.k12.wv.us/).
3. All schools in the area have Internet access through the Bell Atlantic (Verizon) World School project (http://www.wvaworldschool.org/).
4. Technology Goals and Objectives (based on ISTE Standards) are incorporated into the West Virginia Instructional Goals and Objectives (http://wvde.state.wv.us/igos/).

Design &Implementation

Philosophy

The Central West Virginia Technology Upgrade for Educators project is designed to ensure that all students are prepared for higher education and the workforce. The purpose is to transform teaching and learning in all schools in central West Virginia by providing educational opportunities in instructional technology for students, parents and teachers. The program is designed to offer technology training to K−12 teachers during the summer when they are not faced with the demands of the classroom.

Planning

The Central West Virginia Technology Upgrade for Educators project addresses the need for on−going staff development for teachers in the area of instructional technology. According to a recent report (Compaq Educational Resources−online),

> In spite of the tremendous influence technology has had in our workplace and in our homes, the impact on our classrooms has moved at a much slower pace. The mere presence of technologies in schools has not always motivated teachers to use computers, video cameras or the Internet. However, strong staff development programs will help teachers take advantage of these resources.

A second report released by the CEO Forum, a national group of business leaders, states that schools are spending less than $6 per student on the computer training of teachers contrasted with more than $88 per student on computers, software, and connections.

The Central West Virginia Technology Upgrade for Educators project assists teachers in learning to use and become more comfortable with instructional technology and its applications. Through our Summer Technology Academy, Software Preview Center at Glenville State College, and Technical Support from Preservice GSC students, we accomplish our goal of making technology as basic to classroom life as the pencil and the chalkboard.

The Summer Technology Academy originated in 1996 in Braxton County for a small group (40) of teachers and middle school students. Teachers volunteered to attend 3 days of hands−on technology training. (No graduate credit, stipend or continuing education credit was offered.) Lunch was provided by MacDonald's restaurant and a small grant from Weyerhaueser allowed for the purchase of a digital camera and a scanner which was used during the academy.

In 1997 and 1998, Braxton County teachers who participated in the Summer Technology Academy received small stipends funded through Education First and Technology Literacy Challenge Fund grants. In 1999, a partnership was formed with the Superintendent of neighboring Gilmer County and the Assistant Professor of Instructional Technology at Glenville State College. Funding was obtained for the Central West Virginia Technology Upgrade for Educators through an Education First Professional Development Grant totalling $74,500. Teachers who attend the academy currently receive $100 per day ($300 for 3 days, plus benefits: Social Security, Workers Compensation, Retirement Contribution). In addition to hands−on technology training, teachers are provided software to use in their classrooms and the 13 schools involved are given equipment, such as digital cameras, scanners, and CD−ReWriters, on the condition that at least 2 teachers from each school participate in the fall follow−up workshop.

Students at Glenville State College visit the schools and assist teachers in using technology. This is accomplished during the teachers' daily planning time. Students are paid for their services through the Education First grant.

Program Components

1. **Summer Technology Academy.**
   75 teachers from Gilmer and Braxton counties participate in 3 days of intensive hands−on technology training at Glenville State College. A 1−day follow−up Saturday session is conducted to provide additional instruction in the use of digital cameras and scanners for classroom projects.
2. **Enhance Student Achievement in Reading and Mathematics Through Instructional Technology.**
   Participants of the Summer Technology Academy become aware of new programs which utilize technology to increase student achievement in reading and mathematics. Hands−on instruction and opportunities to preview new software encourage teachers to become more confident users of technology.
3. **Technical Assistance Provided by Glenville State College Preservice Teachers.**
   A cadre of 12 Glenville State College students is employed to make regular visits to 13 schools to assist teachers in implementing the state technology initiative.
4. **Technical Assistance Provided to Local Community/Parents.**
   GSC students will continue to develop and update the Technology Handbook for parents to assist them in purchasing hardware and accessing the Internet. Additionally, students will be available for P.T.A. presentations on the use of technology.

Results

Since 1999, over 140 K−12 teachers in Gilmer and Braxton Counties have participated in the 3−day Summer Technology Academy at Glenville State College. Surveys from teachers were used to develop a technology training programs based on needs. Sessions have been offered on the following topics:

1. Microsoft Word

2. Microsoft PowerPoint
3. Microsoft FrontPage
4. Broderbund Print Shop
5. Microsoft Excel (for gradebook)

In October, 1999, 27 teachers from 12 schools attended a follow−up workshop and returned to their schools with a Sony Mavica Digital Camera.

Glenville State College students assisted teachers in local schools in using technology in their classrooms.

Replication Details

Because the Project Coordinator is a full−time elementary school teacher and voluntary grant writer, finding the time to coordinate the program is a major challenge. Much of the Summer Technology Academy planning takes place in June, after the end of the school year. However, writing and submitting the grant proposal takes place in the spring. Budget documents must be prepared and approved by the local board of education before funds can be expended.

Using technology tools, such as e−mail, can make the job less difficult. Workshop presenters are contacted through e−mail. Word Processing software aids in the creation of session sign−in sheets, notebook covers, name badge inserts and purchase order forms. Many documents can be saved and reused the following year.

The project's second year saw major changes in personnel. Gilmer County's superintendent, who suggested the counties team up as partners, is no longer working in that position. The Assistant Professor of Instructional Technology at Glenville State College has moved on as well. Despite these changes, the workshop was held in August with 72 teachers participating.

It is important to note that the hands−on workshop for teachers is planned during the summer with compensation given for the teachers' time. Meals and refreshments are a nice way to say "We appreciate you" to the group. Providing software, digital cameras, and scanners sends the message that teachers have the tools and support necessary to successfully integrate technology into the curriculum.

Costs and Funding

Costs:

1. Supplemental pay and benfits:
   75 teachers x $372 = $27,900
2. Software: $6000
3. 1999−Sony Mavica Digital Cameras: 13 x $500 = $6500
   2000−HP Flatbed Scanners: 13 x $400 = $5200
4. Technology Trainers:
   $400 per day x 12 sessions = $4800
5. Glenville State College Student Technology Assistants:
   $6.50 per hour x 600 hours = $3900
6. Meals, Refreshments:
   1999 − $2000

2000 − $3000
7. Workshop Supplies (Notebooks, Disks, etc.): $1000

Funding:

- 1998 Technology Literacy Challenge Fund − $190,285
- 1999 Education First Professional Development Grant − $74,500
- 2000 Education First Professional Development Grant − $53,000
- In−kind Support
    - ♦ 1996, 1997 Braxton County Board of Education Staff Development Funds
    - ♦ Weyerhaeuser Foundation − $2500

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The Central West Virginia Technology Upgrade for Educators program in Braxton and Gilmer County Public Schools was selected as a winner in this competition.

This story exemplifies the following practices:
Assessment and Evaluation − School leaders must utilize assessment and evaluation techniques to inform decision making and ensure continuous improvement in teaching and learning.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Carencro Middle School

Carencro Middle School

Carencro, LA

School Type: Public **School Setting:** Rural
Level: Middle **School Design:** Traditional
Content Presented By:
Edvantia

Demographics

Carencro Middle is located at 4301 North University in Carencro, Louisiana, and has an enrollment of 924 students drawn from the town of Carencro, the surrounding countryside, and north Lafayette. It is considered to be a rural school. The student population is approximately 49% white, 51% black, and .5% Asian. Students come from a variety of socioeconomic backgrounds, but most of them are from families whose income is in the low socioeconomic range. Approximately 70% of the students qualify for free or reduced meals.

Student Racial/Ethnic Composition:

51% African American
49% White (not Hispanic)
0% Hispanic
.5%% Asian or Pacific Islander
0% Native American or Native Alaskan

Limited English Proficient Students: 0%
Number of Languages: 2
Qualify for free/reduced lunch: 70%
Receive special education services: 14%

Background

Carencro Middle School is a part of the Lafayette Parish School System. The school system is presently under a desegregation order as a result of a lawsuit filed against it. Prior to the 2000−2001 school year, the district was ordered to balance the schools racially. As a result, the system underwent rezoning. Approximately 900 students were moved to different schools. In addition, five white and five black principals were moved. Over the next several years, the district must achieve a racial balance among the vaious school faculties. Two predominately black schools were closed, and the district must build a new elementary school with an equal racial balance within the next few years. Since Carencro Middle was already balanced, this did not affect the school to a great degree. About 100 students that were rezoned one year ago were zoned back into the Carencro school zone.

Design &Implementation

A schoolwide team comprised of the principal, assistant principals, teachers of different grade levels and disciplines, the curriculum coordinator, technology coordinator, librarian, parent facilitator, and computer lab manager meet several times a year to plan, implement, and monitor the schoolwide plan.

The plan includes general goals, specific strategies, and an action plan which includes a timeline, allocated funds, and persons responsible. Effective integration of instructional technology has been one of the main focuses of the schoolwide plan in the last three years.

The goal of the process is to involve the staff and other stakeholders in developing and implementing the plan. The overriding philosophy is that the faculty and staff will take ownership of the plan if they are a part of the team. A collaborative effort by all parties is emphasized.

Professional development in technology implementation and integration is an important part of the schoolwide plan. It is carried out in several ways:

1. Approximately twenty−five teachers volunteered to participate in a two−year program sponsored by the Southwest Educational Development Laboratory (SEDL). Teachers received extensive training in technology and learned constructivist techniques designed to foster student participation. At the end of each year, each participant produced an interdisciplinary lesson incorporating technology and constructivist learning.
2. The Lafayette Parish Technology Center offers ongoing workshops in technology for teachers and administrators. A majority of the staff at Carencro Middle have participated in and continued to take advantage of these workshops.
3. Carencro Middle has had an on−site technology coordinator for the past two years who has coordinated and presented numerous technology workshops for administrators, teachers, parents, and students at Carencro Middle.
4. One teacher participated in a year−long technology inservice entitled Louisiana INTECH.
5. Several teachers attended state and national conferences on integrating technology in the classroom. Information gained was disseminated among the faculty.
6. Monies from grants and Title I were used to provide each teacher with modules of three or four computers each along with a printer. In addition, each classroom is equipped with a mounted 27" television, VCR, and a computer screen projection device. Most classrooms teachers also have scanners.
7. The school has a digital camera and a video camera for classroom use.
8. The language arts department uses the Accelerated Reader Program, a computer−based management tool, as an integral part of its reading program.
9. The school has two computer labs consisting of thirty computers each. It has recently purchased Compass Learning, a computer software program aligned with the Louisiana standards and the LEAP and ITBS tests.
10. A third computer lab is used in the Alternative classes and to produce the school newsletter and yearbook.
11. Carencro Middle offers Computer Literacy as an exploratory class.
12. All classrooms are wired for the Internet.

Results

As a result of the extensive inservices, workshops, and monies provided to support integrating technology effectively in the classroom, the teachers at Carencro Middle School now employ more student−centered activities within the classroom. Interdisciplinary lessons incorporating programs such as Excel and Powerpoint are effectively used in lessons.

Students have become adept at using the computer and designing classroom presentations via the computer. The language arts classes use Accelerated Reader extensively, and students publish original works on the computer. Math students play the Stock Market Game, graph information on Excel, and utilize several software programs. Science, social studies, and language arts classes use the Internet for current research. Currently, the eighth grade classes are researching Democratic and Republican philosophies, as well as the issues in the presidential race as part of an interdisciplinary unit.

Replication Details

Carencro Middle began teaming in the 2000−2001 school year. An eight−hour day was implemented allowing for each teacher to have a separate planning period and a team planning period. Once a week, the team planning period is dedicated to professional development. During this time, teachers can share ideas on effective technology implementation as well as inservice other team members on new technology. Without this design, teachers would have to meet after school, in the summer, or on scheduled district inservice days for training.

The Computer Labs are scheduled out of an extended academics class offered to each student. Grades 7 and 8 are targeted since the LEAP test is given in the eighth grade. Each class is given 45 minutes of computer time three times a week. Fifth grade, alternative, and resource classes are also scheduled three times a week. Additional classes are scheduled wherever possible.

The schoolwide committee continues to meet periodically to monitor and implement new strategies.

Costs and Funding

The majority of funding for technology implementation comes from Title I. Approximately $61,134 was spent on equipment and materials for technology in the 1999−2000 school year. In addition, Title I provided funding for the salaries of the two computer lab managers and the curriculum coordinator. Funds from Title I were also used to pay three personnel to move, reconnect, and renetwork computers due to reorganization brought about by teaming.

Costs borne by the school district included wiring for Internet, building use, and staff salaries. SEDL provided training personnel and materials.

Several teachers attended technology training workshops in the past three years and were given four computers, software, a television, and a VCR to set up "model classrooms." Special education teachers were each given a computer. A grant provided $3,000 to purchase computer tables for one of the labs. One teacher from each discipline was awarded a Learn Grant to purchase AlphaSmarts to be used in connection with classroom projects.

Monies spent on technology in 1999−2000 were:

	$43,350
1. Computers	4,403
2. Printers	3,124
3. Averkeys, monitors	1,055
4. VCR/TV	2,577

5. Software	5,587
6. Computer tables	1,473
7. Wiring	2,355
8. Supplies (ink cartridges, headphones, etc.)	210
9. NT licenses	

Contact Information

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Rating Criteria

Carencro Middle School was nominated by the Southwest Educational Development Laboratory (SEDL), as a school that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Access − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.
Planning − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.

Roanoke City Public Schools

Roanoke City Public Schools

Roanoke, VA

School Type: Public	**School Setting:** Urban
Level: K−12	**School Design:** Traditional
Content Presented By: Edvantia	

Demographics

Roanoke City Public Schools, in Roanoke, Virginia, is an urban school district of approximately 14,000 students. Roanoke is located in central southwest Virginia. It is situated 189 miles south−southwest of Richmond and approximately 148 miles north of the Tennessee border. The population of Roanoke is approximately 100,000 (including the surrounding county). The majority of the students come from blue collar lower socioeconomic families.

Student Racial/Ethnic Composition:

44% African American
53% White (not Hispanic)
1% Hispanic
1% Asian or Pacific Islander
1% Native American or Native Alaskan

Background

Roanoke City Public Schools operates 29 site−based schools. During the early part of the 1990s the district met strong resistance from the community when trying to consolidate smaller elementary schools. Since that time the community or "neighborhood" school concept has grown stronger.

By 1994, the school district established an "Office of Technology" and developed a $21 million dollar, ten−year budget to infuse technology into every school in the district and make technology an integral part the curriculum.

A by−product of this effort was the acknowledgment that technology could be used to improve communication with and training of the citizens of these community schools. With this idea in mind the Computing Seniors/Computing Parents Program was developed.

Design &Implementation

The Computing Seniors Program is a project of the Roanoke City Public Schools. The goal of the program is to introduce senior adults (ages 55 and older), as well as other interested adults, to computer technology and computer literacy skills in an informal and enjoyable manner. The program provides valuable training on such topics as the Internet and World Wide Web to the community's seniors. It also provides an additional social outlet and allows for demonstration of some of the advanced technology that our younger citizens enjoy on a daily basis.

A coordinator and a planning team of three to five program trainers developed the initial curriculum for the program, which runs three hours per week for 10−12 weeks. Once the basic curriculum was developed, interested teachers were selected. Since the program is largely site−based, given the community schools focus, most of the details in implementing the actual program are left to the participating schools. However, each school is given a copy of the model curriculum, an evaluation for the program, and a mailing list of individuals that expressed interest in attending one of the sessions. These materials are provided by the Office of Technology at the school district's Central Office. It is here that interested callers are placed on a mailing list. Each year a brochure indicating the participating sites and a contact's name and phone are mailed to individuals on the list.

Classroom teachers receive a stipend to serve as instructors for Computing Seniors/Computing Parents. Courses run from 10 to 12 weeks and cover a variety of topics. Early courses focused on improving basic operating skills in common applications, such as word processing and the operating software. As the program developed, courses around more sophisticated software and Internet use became popular. There is an enrollment fee of $10 for participants, but this can be waived for those demonstrating financial need.

Those individuals who successfully complete the program receive a certificate and become eligible for additional courses. Some help is offered in matching senior citizens and parents with potential courses. The few course offerings begun with a mini−grant of $500 in 1996 have blossomed into a city−wide initiative with courses offered at 17 different sites.

Results

Some of the numerous benefits that have been a result of the Computing Seniors / Computing Parents Program include:

1. Provides an opportunity for outreach to seniors in the area;
2. Helps senior volunteers speak the language of technology when working with students;
3. Increases family support and opens new channels of communication by allowing grandparents to know what students are doing in class;
4. Provides positive publicity for the school and the Division;
5. Opens up lines of communication within the community;
6. Provides students opportunities to work with older adults;
7. Increases opportunities for the schools to work with business partners;
8. Provides a potential pool of new volunteers;
9. Provides teachers first−hand information on how students and older adults learn about technology;
10. Provides opportunities for collaboration with other Computing Seniors Program schools; and
11. Provides social outlets for the community's senior citizens.

Over the past five years, we have offered 93 classes of ten to twelve sessions each. We have worked with 1,116 people. That is over a thousand people who are better acquainted with our schools and district.

Replication Details

The primary organizational concern when dealing with the Computing Seniors / Computing Parents project is ensuring that each of the sites provide consistent training. Additionally, ongoing coordination throughout the school year is vital. A single central point of contact is necessary for communication with citizens interested in participating in the program in order to link them to the site nearest them.

Costs and Funding

The Computing Seniors/Computing Parents Program is funded through the district's Adult Basic Education Program. These funds cover the cost of trainers and assistants only. Total cost of the program per year is $19,000.

Each site may charge participants up to $10.00 for the 10−12 week session to cover the cost of materials only.

The trainers are classroom teachers that are given $18.00 per hour as a stipend for extra pay for extra duty. Assistants are usually hourly workers that are paid $12.00 per hour to assist during the training sessions. Trainers are also allowed one hour of paid preparation time for every 2 hours in actual training sessions.

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The Computing Seniors/Computing Parents program in Roanoke City Public Schools was selected as a winner in this competition.

This story exemplifies the following practices:
Access − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.
Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.

Idlewild Elementary School

Idlewild Elementary School

Memphis, TN

School Type: **School Setting:** Urban
Level: Elementary **School Design:** Magnet
Content Presented By:
Edvantia

Demographics

Built in 1903, Idlewild is the oldest elementary school still in use in Memphis. It is located in a residential part of the city called Midtown. This urban school has a minority enrollment of 65 percent, and 53 percent of students qualify for free or reduced lunches. As a science and technology optional, or magnet school, it receives roughly 40 percent of its students from across the city on a first−come, first−served basis.

Student Racial/Ethnic Composition:

65% African American
33% White (not Hispanic)
1% Hispanic
1% Asian or Pacific Islander
0% Native American or Native Alaskan

Qualify for free/reduced lunch: 53%
Receive special education services: 10%

Background

Idlewild has been involved with the Co−NECT school reform model for five years. Co−NECT has a project−based, technology focus. As such, Idlewild has had as one of its main goals to upgrade and provide computer and technology assistance to every room in the school. Over a five−year period, Idlewild has been able to provide a minimum of 3−4 Internet−connected computers in each classroom.

Idlewild has built its infrastructure over time by piecing together funds from various sources. Federal and state grants, as well as local school funds from carnivals and other fund−raising activities, have been used for technology. Every classroom now has four computers, as well as 32−inch video monitors and an assortment of camcorders, videocassette recorders, laser disc players, printers, and digital camera.

Design &Implementation

Primetime's basic philosophy is to provide hands−on, student−centered instruction where students address the Memphis City School curriculum standards in English/Language Arts. Students apply various communication skills −− especially writing, reading, speaking, and listening −− while learning and practicing decision making, problem solving, creativity and flexibility. Technology is used to support learning, not as an end in itself.

The Primetime program was conceived primarily based on its technology background and its association with one of its adopters, WMC−TV5, a local television affiliate. The TV news anchor had two children attending the school. Over discussion with him and the staff, a vision began to develop around the idea of a school−based television reporting program. Teachers, the technology coordinator, and the principal met over a two−month period to work out a grant application with the state department of education for a Goals 2000 grant. WMC−TV5 was a co−sponsor of the grant and provided some of the funding, as well as promised technical assistance in training the teacher and students how to operate a TV station.

Primetime uses students in grades five and six to act as employees of the program, performing all tasks related to producing and presenting regular video broadcasts. Students serve as reporters, news anchors, camera operators, editors, producers, and viewers. A teacher coordinates the program and oversees tasks associated with the broadcasts, including care and maintenance of the equipment. Students and teacher plan, shoot, and edit broadcasts that might include classroom news, messages from the principal, school safety tips, information about school events, student features, descriptions of other events taking place on the school grounds, recent field trips, PTO information, interviews, and especially, curriculum−related projects that students have done in their classrooms. The program is then aired over the broadcast technology to every room and viewed on the classroom's video monitors. Programs are usually broadcast several times a day, so they will not interfere with classroom plans. Tapes are also available for checkout to parents or interested community members so they can view the broadcasts at home.

Results

By the end of the second year of implementing Primetime, Idlewild received the district's highest award, the "Gerry House Performance Award," for meeting or increasing the student achievement goal. It also received the Tennessee State Department of Education's "Eagle Award" for raising student achievement. Another indicator was the school's 4th grade writing scores went from 50 percent passing to last year's 99 percent passing.

Replication Details

Team development is critical in implementing this program. A facilitator who is knowledgeable about computer technology, especially with digital camera and software applications, must be in the school. Alliances with local news services add a level of knowledge and application that is invaluable to the project.

Teachers must be flexible with their schedules and be able to work with the facilitator and the students in providing extra assistance, since students must be out of the classroom for significant time periods in order to be trained in the technology and then to plan, shoot, direct and edit the film product. The facilitator must have significant time during the day to coordinate all of these activities since they are time−consuming.

Costs and Funding

Total costs for the Primetime program run approximately $100,000. This cost includes $25,000 for wiring the classroom with computer drops to receive transmission of the video programs. (Idlewild received these drops from its Board of Education through the adoption of the Co−NECT model). Other costs include:

- monitors for each room (approximately $25,000)
- monitor stands ($9,800)
- editing computer ($3,500)
- software ($1,000)
- professional videorecorder and eight track mixer ($10,000)
- several video cam recorders ($10,000)
- spotlights, microphones professional VCR player ($3,000)
- the video transmitter and classroom receivers ($10,000)

Another $30,000 came from in−kind contributions via 21st Century (State Department) grants, WMC−TV5 ($10,000) as our school adopter, and another $10,000 from school funds.

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program at Idlewild Elementary Schhol was selected as a winner in this competition.

This story exemplifies the following practices:
Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.
Integration − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.

Whitney Young Elementary School

Whitney Young Elementary School

Louisville, KY

School Type: Public
School Setting: Urban
Level: Elementary
School Design: Magnet
Content Presented By:
Edvantia

Demographics

Whitney Young is a K−5 urban school in the west end of downtown Louisville. The 524 students include a high percentage of children who do not speak English as their native tongue. In addition, 83 percent of the students qualify for free or reduced−price lunch. To respond to its diverse student population, Whitney Young has developed a number of programs. It is a magnet school in Math, Science, and Technology. It offers ESL (English as a Second Language), early childhood (3−to−4−year−olds), and functionally mentally delayed programs. It also maintains a Family Resource Center.

Student Racial/Ethnic Composition:

50% African American
28.5% White (not Hispanic)
10.4% Hispanic
3.6% Asian or Pacific Islander
0% Native American or Native Alaskan
7.5% Other

Limited English Proficient Students: 13.8%
Number of Languages: 6
Qualify for free/reduced lunch: 83%
Receive special education services: 8.2%

Background

In the spring of 1996, Whitney Young became the first school in the Jefferson County Public School District to have access to email and the Internet. Although staff members soon demonstrated a confidence in their telecommunication skills, there was still a need to improve methods for using the Internet to enhance student learning. Mary Robertson, the computer teacher and Technology Coordinator at Whitney Young, and the school principal, Rothel Farris, believed something was needed to move technology usage at Whitney Young to the next level.

Mary became acquainted with the WebQuest and Online Project teaching models through a graduate course at the University of Louisville's Technology Leadership Institute. Mary's graduate course experience convinced her that challenging her colleagues to participate in their own WebQuests or Online Projects would help them more deeply understand how to integrate the Internet into their classroom teaching. As a result, Mary and Rothel sought financial support from Gheens Academy, a private local educational foundation, for a unique professional development activity called WebQuests and Online Projects. Their goal was to offer support and assistance that would encourage active use of the World Wide Web as a natural part of classroom learning activities.

Design &Implementation

Three factors were key elements in the planning process of this project: mastery of the WebQuest and Online Project activity structure, the design of a professional development opportunity that would benefit Whitney Young's staff, and funding.

The course of Mary's study in her graduate class at the University of Louisville's Technology Leadership Institute provided the experience and support that helped her master the concept of WebQuests and Online Projects and design the professional development model for the staff. In an effort to seek financial support, Mary applied for and received a $1,000 Vision 2000 Innovative Grant from the Gheens Academy of Jefferson County Public Schools, a private local educational foundation.

One of the primary goals of the program was to increase staff members' self−esteem and confidence while enhancing the academic and technology skills of students. Mary's graduate course experience convinced her that challenging her colleagues to participate in their own WebQuests or Online Projects would help them more deeply understand how to integrate the Internet into their classroom teaching. It was believed that by offering support and assistance that would encourage active use of the World Wide Web as a natural part of classroom learning activities, technology usage at Whitney Young would move to the next level.

The key ingredients in the WebQuest and Online Projects program were:

- Training provided by someone knowledgeable in technology
- Community spirit
- Immediate application in the classroom
- Incentives for participation
- Public recognition for the accomplishments of the participants
- A supportive environment for trying something new
- Readily available technical support

All certified and classified staff members were invited to attend an inservice on WebQuests and Online Projects. Either professional development credit or a stipend could be earned for attending.

As a follow up to the concepts presented in the training session, staff members were then provided with an opportunity to receive additional professional development credit (or a stipend) to implement a Web Quest, an Online Project, or a Telecommunication Project with their students. It was not enough simply to use the Internet. To be funded, proposals had to explain how the planned activity would involve a WebQuest or an Online Project.

Interested participants:

- Chose a project that was directly related to classroom instruction with technology skills that were developmentally appropriate for each staff member

- Submitted a project proposal to the principal for approval
- Implemented the project in the classroom with students
- Documented all activities, collected samples of student work, and recorded personal reflections

To celebrate the projects success and the efforts of the participants:

- Staff members were recognized and projects were highlighted at the school's staff luncheon at the end of the year.
- All project materials (documented activities, samples of student work, and recorded personal reflections) were compiled into a web site that could be shared with fellow educators.
- On the first day of school of the following year, the web site was officially unveiled and projects were discussed once again at a special gathering for the entire staff.

Significant URLs:

- WebQuests and Online Projects Web Site: Teachers' Projects at http://www.jefferson.k12.ky.us/Schools/Elementary/Young/wqstaff.html
- WebQuests and Online Projects Inservice Web Site: Training Materials at http://www.jefferson.k12.ky.us/Schools/Elementary/Young/webquest.html

Results

By providing a non−threatening, supportive environment to practice and experiment with new methods of teaching, both teachers and students were able to reap the benefits. A total of 12 staff members implemented projects that impacted over 200 students! Staff members not only advanced their own technology skills, but also became more confident with its integration into the curriculum.

Projects were implemented in a wide range of content areas by regular classroom teachers, teacher's assistants, and teachers of our special children in the Functionally Mentally Delayed units. This opportunity provided a medium for all of our staff members to enhance their own technology skills, as well as those of their students. Progress was not only made in the quest to master the Technology Standards for Beginning and Experienced Teachers mandated by the Kentucky Department of Education, but also toward the mastery of technology skills for students outlined in the "Computer Skills Continuum" for Jefferson County Public Schools.

Significant URLs:

- JCPC Skills Continuum for Students at http://web2.jefferson.k12.ky.us/continuum/continuum.html
- New Teacher Technology Standards at http://www.kde.state.ky.us/otec/epsb/standards/new_teach_stds.asp#std.9
- Experienced Teacher Technology Standards at http://www.kde.state.ky.us/otec/epsb/standards/exp_teach_stds.asp#std.10

As a result of the project, staff members demonstrated a newfound independence and continued to integrate technology into the curriculum, as if they had been doing it for years! They were no longer just "participants" in online projects. They were attempting to create their own projects and finding ways to become more involved. Some examples include:

- Two staff members enrolled in the University of Louisville's Technology Leadership

Institute.
- One staff member accepted a position at the state level as an Instructional Technology Leader.
- Two teachers were accepted into the district's Teacher Technology Standards Cohort to assist in the design of professional development for teachers throughout Jefferson County.
- One staff member made a presentation with Mary at National Educational Computing Conference (NECC) in Atlanta, Georgia on the implementation of our WebQuest and Online Projects program.
- Six staff members are currently participating in the district's Student Email Pilot Project.

The skills and confidence of Whitney Young's staff has grown to a level that has now reached beyond that of the classroom. It has been extremely gratifying to see that so much has been accomplished...together.

Replication Details

Obtaining funding to support this project would be an important factor for replication. However, at Whitney Young, time proved to be the essential element that determined the degree of this project's success.

The initial inservice was held after school. However, the bulk of the work took place during the school day, as teachers attempted to integrate WebQuests and Online Projects into their daily activities with students. As a full−time Computer Teacher and Technology Coordinator, Mary's schedule also provided resource time during the day to support staff members on an as−needed basis. Compiling all of the documentation that was submitted and designing the culminating web site also took a great deal of time. With the project's completion taking place in May, the summer months were used to finalize the web site.

All of the resources and guidelines that were used to implement this project are posted on the web. The web site highlights the projects implemented by staff members and provides links to all of the training materials.

Significant URLs:

- WebQuests and Online Projects Web Site: Teachers' Projects at http://www.jefferson.k12.ky.us/Schools/Elementary/Young/wqstaff.html
- WebQuests and Online Projects Inservice Web Site: Training Materials at http://www.jefferson.k12.ky.us/Schools/Elementary/Young/webquest.html

Costs and Funding

The only project−specific funding was a Vision 2000 Innovative Grant for $1,000 from the Gheens Academy of Jefferson County Public Schools. Jefferson County schools were invited to submit proposals for innovative projects in three categories: leadership, knowledge work, and professional development. These areas correspond to priorities established by the Jefferson County Public Schools.

The school's technology infrastructure was made possible by funds from the Kentucky Education Reform Act of 1990 and a special technology initiative known as Kentucky Education Technology Systems, a $553 million initiative to provide networked computers and other electronic tools to support teaching and learning in Kentucky public schools.

Primary costs were for stipends and staff recognition.

- Stipends: $870.00

  Staff members received a stipend for:

  - Attending the initial training session on WebQuests and Online Projects
  - Submitting required documentation on a completed project
- Recognition: $130.00

  Each participating staff member received a certificate, a Technology Leader pen, a document holder in the shape of a computer, and a font package for their classroom computer.

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program at Whitney Young Elementary School was selected as a winner in this competition.

This story exemplifies the following practices:
Integration − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.

Bernice Hart Elementary School

Bernice Hart Elementary School

Austin, TX

School Type: Public **School Setting:** Suburban
Level: Elementary **School Design:** Traditional
Content Presented By:
Edvantia

Located in a light industrial area on the northeast side of Austin, Texas, Bernice Hart Elementary School opened in August 1998 with 510 students. By August 2000 the school enrollment had increased to 650 students, 84% of whom qualify for free or reduced−price meals. The majority of Hart students are bussed in from a trailer park or from subsidized apartment complexes that are not within walking distance of the school. The student mobility rate is a staggering 40%.

When Claudia Tousek took on the job of principal for the new school, she was well aware of these challenges. But she believed that high expectations coupled with structural supports and staff development could enable both students and teachers to succeed. Early results indicate she was right. Of the 15 schools in northeast Austin with similar demographics, Hart had the highest percentage of students passing a combined math, reading, and writing assessment in the 1998−99 school year. Hart was selected for a Texas Successful School Award for having some of the highest scores in the state, compared to schools with similar demographics.

How was such success achieved? First, because Hart was a new school, the principal was able to select administrators and teachers who were committed to using technology and a constructivist approach to instruction. Among those joining Tousek were two former colleagues−−projects coordinator Gayle Gaston, a U.S. Department of Education Christa McAuliffe Fellow, and technology coordinator Steve Banks, an Apple Distinguished Educator. Their expertise provided the Hart staff with ongoing support as they learned new administrative and instructional uses for technology. A rigorous interview process helped staff the school with teachers who exhibited an aptitude for creative approaches to learning, as measured by the Teacher Attitude Inventory, the Measure of Innovativeness, and the Attitudes Towards Computer Technologies assessments.

Second, months before Hart opened its doors to students, its core group of administrators convened a planning team to develop a vision for the school and to design a learning environment to support the vision. Included were University of Texas at Austin (UT) faculty member, Dr. Judi Harris, and two staff members of the Southwest Educational Development Lab (SEDL). This collaboration yielded a comprehensive program for professional development called The Future Is Now−−A Model for Creating Effective Learning Environments. The goals of the program were to:

1. create competent educators committed to lifelong learning,
2. develop the use of technology to facilitate learning; and
3. create independent, self−motivated learners who can use a variety of resources to collaboratively solve problems.

Third, the school was organized into four "halls" of approximately 160 Pre−K through 5th grade students and teachers to counter the alienation often felt by children who change schools frequently. Each classroom was then equipped with at least two networked workstations with direct connection to the Internet and e−mail. This equipment was part of a state−of−the−art technology infrastructure that included various software programs, CD−ROMs, VCR's, laser printers, televisions, camcorders, scanners, LCD projectors, digital and 35mm cameras, cable TV, classroom telephones with voice mail, and a radio station broadcasting to the neighborhood.

Once the school year started, all teachers participated in weekly vertical team/grade−level meetings. Strategies and ideas were shared at campus professional development sessions. Constant communication was maintained via hundreds of e−mail messages among Hart staff, technology trainers at SEDL, and the UT Cohort and their professors.

Dr. Harris served as a liaison between university faculty and staff interested in conducting research studies that arose out of the needs of the Hart staff. Dr. Paul Resta, Director of UT's Learning Technology Center, sought Hart School for a field placement site for interns/student teachers in the College of Education Literacy and Technology cohort.

Hart was one of six schools selected to participate in an initiative funded through the U.S. Department of Education and implemented by the Technology Assistance Program at SEDL. Called Applying Technology to Restructuring and Learning, it supported teachers as they moved away from traditional modes of instruction. Formal professional development sessions and individual assistance in planning, problem solving, and technology use were provided both on site and on−line by SEDL staff and the Hart co−developers. In addition, team teaching with a teacher and a co−developer or SEDL staff was conducted.

Over the course of two years, 72 hours of professional development were designed and conducted by SEDL staff and codevelopers Gayle Gaston and Steve Banks. Hart principal Claudia Tousek demonstrated her commitment to this program by attending all professional development sessions, where teachers participated in a model constructivist learning experience supported by technology, guided reflection, and the development of classroom activities. Teachers also presented lessons or units they had developed over the school year. A Technology Skills Self−Assessment administered to all teacher participants prior to the first SEDL training session, and again at the end of the 1998−1999 school year, showed a marked increase in teachers' experience with particular technologies.

Hart has also explored the use of technology to assist in administrative decision making. Relational database applications developed by Banks and Gaston allow teachers, administrators, and support staff access to several networked databases:

- a student database
- a staff database
- a system of recording Texas Assessment of Academic Skills (TAAS) practice test data that can be used to target individual student needs for re−teaching or tutoring
- a system for implementing the state standards, Texas Essential Knowledge and Skills

According to the 1998−99 TAAS, schools with a passing rate below 45% were rated as Low Performing, those from 45% to 79% as Acceptable, those from 80% to 89% as Recognized, and those 90% and above as Exemplary. Hart's passing rates for the 1999−2000 year fell in the top two categories: reading 80.3%, math 86.4%, and writing 95.9%. Critical factors in this success include the strong instructional leadership of the principal and the support provided by the technology and projects coordinators at the school.

Demographics

Located in a light industrial area on the northeast side of Austin, Texas, Bernice Hart Elementary School opened in August 1998 with 510 students. By August 2000 the school enrollment had increased to 650 students, 84% of whom come from economically disadvantaged homes.

Approximately 80% of Hart students are bussed in from a trailer park or from apartment complexes that are not within walking distance of the school. Many of the apartment complexes constitute subsidized housing, creating a situation of less permanent households and a significant turnover of students. The resulting 40% mobility rate at Hart provides a greater barrier to student success than that found in other low income Austin ISD schools which are surrounded by permanent single−family houses.

Because it is easy for a child who frequently changes schools to feel alienated, Hart School is organized into four "Halls" of approximately 160 Pre−K through 5th grade students and their teachers, thus creating smaller "schools−within−a−school". Children who live in the Hart School attendance zone throughout their elementary years will probably stay in the same Hall with the same group of teachers for 6 to 7 years, creating a sense of security and continuity. Since groupings during the school day and the school year can be multi−aged and flexible, children should be able to establish long term relationships with their peers and their team of teachers.

Student Racial/Ethnic Composition:

36% African American
10% White (not Hispanic)
53% Hispanic
1% Asian or Pacific Islander
0% Native American or Native Alaskan

Limited English Proficient Students: 29%
Number of Languages: 2
Qualify for free/reduced lunch: 84%
Receive special education services: 8%

Background

Leadership. Hart Elementary School is fortunate to have an exceptional leadership team that is highly respected in the education community. Principal Claudia Tousek was honored for outstanding technology efforts in 1992 as one of three educators in the nation selected for recognition by the National Association of Partners in Education. Projects Coordinator Gayle Gaston is a U. S. Department of Education Christa McAuliffe Fellow, and Technology Coordinator Steve Banks is an Apple Distinguished Educator.

Before coming to Hart Elementary, these three educators worked together for over 10 years at Highland Park Elementary School, a U. S. Department of Education National Blue Ribbon School, and were responsible for its becoming one of the first schools in the country to be connected to the Internet via a schoolwide network. When Ms. Tousek left the much higher socio−economic environment of Highland Park to open the new Hart Elementary School, Ms. Gaston and Mr. Banks joined her as part of the Hart administrative team.

Technology. Each Hart classroom has at least two networked workstations with direct connection to the Internet and global email. Various software programs, CD−ROMs, VCR's, laser printers, televisions, camcorders, scanners, LCD projectors, digital and 35mm cameras, cable TV, classroom telephones with voice mail, and a radio station broadcasting to the neighborhood are also available for learner and teacher use. This state−of−the−art technology infrastructure is designed to support both individual and collaborative learning activities and to enable students and staff to use technology as a convenient and readily available productivity tool and a powerful means of accessing rich information resources.

Design &Implementation

Philosophy

Successful learners in the 21st Century will be flexible, self−motivated problem solvers who are comfortable dealing with the complexities of the real world. They will be able to use any and all tools available in order to creatively and collaboratively accommodate to rapid change. Their teachers must, therefore, be both conceptually and operationally adept in what has come to be known as "constructivist" ways of teaching and learning, interacting with their students as both mentors and co−learners. It is especially critical that 21st Century teachers be comfortable and competent with curriculum−based use of computer−mediated tools for learning and teaching.

Overview

In January 1998, prior to the opening of Hart School in August, a Planning Team was created to begin developing a vision for the school and to design a learning environment to support this vision. The team included:

- Principal Claudia Tousek
- Projects Coordinator Gayle Gaston
- Technology Coordinator Steve Banks
- Dr. Judi Harris, a faculty member in Curriculum and Instruction at the University of Texas at Austin, who teaches graduate−level courses in both instructional technology and nonpositivistic research methods
- Two staff members of Southwest Educational Development Lab (SEDL)
    - K. Victoria Dimock, Program Manager of the Technology Assistance Program
    - Jackie Burniske, Program Specialist

The result of the collaborative effort between Hart, UT, and SEDL was The Future Is Now, a comprehensive program for professional development involving the learning community of Hart inservice and preservice educators.

Program Goals

To address these educational issues, Bernice Hart Elementary School in Austin, Texas, has implemented a program titled The Future Is Now − A Model for Creating Effective Learning Environments. The goals of the program are to:

- Create competent educators who are committed to lifelong learning
- Develop the use of technology to facilitate learning
- Create independent, self−motivated learners who can use a variety of resources to collaboratively solve problems

Although the focus of this program is professional development, the end goal is, of course, student achievement. At the outset of the school year and as a constant reminder, the principal reiterated her belief and expectation that all students would achieve at a high level and that they would become competent problem solvers and critical thinkers.

To support accomplishment of these goals, teachers at Hart are required to incorporate technology in a variety of administrative and instructional uses. These include using email as the major vehicle for communicating with other staff, using database applications to easily access and share student information and to facilitate curriculum planning, accessing templates on the file server for standardization of schoolwide documents, and sending documents as email attachments to be read on the computer rather than being distributed and printed on paper. In addition, all instructional staff are expected to pass the Austin ISD Technology Competencies and to implement the instructional strategies and models presented in SEDL training.

Preservice Teachers/University Researchers

We were fortunate in the relationship that developed between Hart and the College of Education at the University of Texas. Dr. Harris has served as a liaison between university faculty and staff who are interested in conducting research studies that arise out of the needs of the Hart staff. In addition, at about the time the school opened, Dr. Paul Resta, Director of UT's Learning Technology Center, sought Hart School for a field placement site for interns/student teachers in the College of Education Literacy and Technology cohort (Cohort I). Supervised by university professors, this cohort of 16 to 25 students, each equipped with a Macintosh PowerBook G3, serve as interns in Hart classrooms during each spring semester and return the following fall semester as student teachers.

Instructional Uses of Technology

Another element of The Future Is Now came as a result of Hart's being one of six schools selected to participate in Applying Technology to Restructuring and Learning (ATRL), an initiative funded through the U. S. Department of Education and implemented by the Technology Assistance Program at the Southwest Educational Development Laboratory (SEDL).

The SEDL project, Applying Technology to Restructuring and Learning, was an ideal vehicle for providing teachers support as they move away from traditional modes of instruction. In addition to formal professional development sessions, assistance was provided throughout the year to individual teachers both onsite and on−line, by the SEDL staff and the co−developers (Hart technology and projects coordinators.) This assistance included discussion of teachers' progress in creating constructivist learning environments supported by technology, their plans for future projects, and issues and challenges they faced with changes in their instructional practice, software and hardware. In addition, team teaching with a teacher and a co−developer or SEDL staff was conducted.

Over the course of two years, 72 hours of professional development were designed and conducted by SEDL staff and co−developers, Gayle Gaston and Steve Banks. Hart principal, Claudia Tousek, demonstrated her commitment to this program by attending and participating in all professional development sessions. These sessions introduced participants to the conceptual framework of constructivist learning theory and how the infusion of technology can support teaching and learning. Each session provide an opportunity for Hart educators to participate in a model constructivist learning experience supported by particular technology.

Learning about technology was embedded in curriculum−based activities to model practices that teachers would use in creating constructivist learning environments in their classrooms. Guided reflection on these learning experiences was used to scaffold teachers' construction of knowledge about new roles and practices. Part of each session was allocated for teacher development of classroom activities facilitated by SEDL staff and co−developers to support teachers as they began the process of applying these ideas in the classroom. All Hart teachers participated in the 72 hours of training.

The final six hours of SEDL professional development in each of the past two years required teachers to present or demonstrate lessons or units they had developed over the school year as a result of participation in the project. Activities reflected teachers' understanding, acquisition, and adoption of constructivist teaching approaches supported by technology. In addition to the presentations to their peers, teachers wrote their lesson plans in a standardized format, and reflected upon the changes they had made in their classroom practice.

Administrative and Systemic Uses of Technology

Over the course of two years, Mr. Banks and Ms. Gaston have developed a number of relational database applications based on needs identified by principal Claudia Tousek. During the 1999−2000 school year Hart School began to be viewed by the district as a model for implementing school improvement systems, of which the database applications are an integral part.

The Hart databases are developed in FileMakerPro and are hosted on the LAN file server. Teachers, administrators, and support staff all have access to the databases via the network:

- a student database that provides demographic and emergency information, class rosters, special area grades, and grade level and other sub−group lists, and is used in registering students and assigning them to classes
- a staff database that includes emergency information, class schedules, and a staff directory
- a system of recording Texas Assessment of Academic Skills (TAAS) practice test data that can be reported by whole school, grade level, or teacher, can provide an individual profile for each student that shows which specific TAAS objectives were failed or passed, and will show the percentage gain between tests; this information is used to target individual student needs for re−teaching or tutoring
- a system for implementing the state standards, Texas Essential Knowledge and Skills (TEKS):
    1. a relational database that allows grade level teams to devise an annual timeline for teaching TEKS objectives
    2. a relational database that includes a weekly planning form which automatically inserts the TEKS for that week as designated in the timeline; grade level teams are required to meet weekly to plan and enter into the form instructional strategies, materials, assessments, etc., and submit the plan to the principal.

As both administrators and staff have recognized the power of shared information through networked databases, frequent requests are made for the development of applications that meet specific needs. Simple databases are also being created by teachers and students for their own purposes.

Results

Bernice Hart Elementary School was nominated by the Southwest Educational Development Laboratory (SEDL), as a school that demonstrates excellence in technology leadership for K−12 education.

Quantitative Data for Students

In Texas both district and campus "report cards" are based on student performance on a standardized test, the Texas Assessment of Academic Skills (TAAS). In 1998−99 schools with a passing rate below 45% are rated as Low Performing, those from 45% to 79% as Acceptable, those from 80% to 89% as Recognized, and those 90% and above as Exemplary.

We at Hart have high expectations for all of our students, even though our population is overwhelming minority and economically disadvantaged. In the 1998−99 school year Hart had the highest combined math, reading, and writing percentage of passing students of the 15 schools in Northeast Austin with similar demographics. Hart was selected for a Texas Successful School Award for having some of the highest scores in the state for schools with similar demographics. Hart's passing rates for the 1999−2000 year were Reading 80.3%, Math 86.4%, and Writing 95.9%. Comparison data for other schools is not yet available.

Quantitative Data for Staff

A Technology Skills Self−Assessment was administered to all teacher participants prior to the first SEDL training session. At the end of the 1998−1999 school year the assessment was administered for the second time.

At the initial completion of the Technology Skills Self−Assessment, 0% − 48% of the teachers had no experience with a particular technology. After one school year, 0% to 3% had no experience with a particular technology. In addition, on the initial assessment 13% to 94% of the teachers had moderate to high experience with a particular technology. After one school year, 54% to 100% had moderate to high experience with a particular technology.

Qualitative Data

There was extensive collaboration with SEDL and the University of Texas. Teachers successfully implemented constructivist learning environments supported by technology and including balanced literacy and new district−adopted math and science curricula. An example, "Giving Students Ownership", can be viewed through streaming video at http://www.sedl.org/tap/danny/menu2.html.

All teachers participated in weekly vertical team/grade level meetings. Strategies and ideas were shared at campus professional development sessions. Constant communication was maintained via hundreds of email messages among Hart staff, SEDL, and the UT Cohort and their professors.

A good example of the changes brought about by this program came during a schoolwide thematic study of oceans. The MA*RE (Marine Activities, Resources and Education from the Lawrence Hall of Science, University of California at Berkeley) multi−disciplinary package provided the basic material for the study, but Hart's implementation of it was more constructivist and supported by technology. Eighteen members of our staff spent a weekend at the University of Texas Marine Science Institute in Port Aransas studying ocean habitats. The workshop included an open ocean research cruise, a jetty lab, a wetlands and sea grass field trip, and a sandy beach field trip.

We collected a large number of specimens that included fish, jelly fish, eels, crabs, sand, seaweed, barnacles, rocks, and examples of trash found on the beach. Many of the specimens were frozen or preserved in alcohol. We took 35mm, digital, and video cameras to record every aspect of this field study.

At the next SEDL training session, teachers scanned photographs and pictures from library books and searched for web sites to use as instructional resources. All of the digital camera photos had been placed on the file server for easy access. Groups of teachers then used these resources to create web pages to be placed on the campus Intranet web server, allowing students to use them from any computer. These pages included photos and QuickTime movies, descriptions of the ocean habitats, and links to web sites.

The oceans study lasted for nine weeks and was woven through all curriculum areas. Students collaborated to create HyperStudio stacks to make meaningful links and demonstrate their understanding of the topic. They used ClarisWorks for writing assignments and simple databases and spreadsheets. On a scheduled day, the librarian and the projects coordinator loaded all of the frozen specimens on a large cart, which traveled to each Hall for student hands−on examination.

Since most of our students have never been to the seashore, this study, which was enriched by their access to technology resources and tools, provided for them a truly authentic and complex learning experience.

Replication Details

Knowing that organizational change may not come easily to many teachers, a rigorous interview process was established for staffing Hart School. Those accepted had to express a strong interest in educational technology and a student−centered approach to teaching. They had to be willing to participate in extensive staff development and to exhibit an aptitude for creative approaches to learning as measured by standard assessments: the Teacher Attitude Inventory, the Measure of Innovativeness, and the Attitudes Towards Computer Technologies.

Applicants were informed that the ideal teacher at Hart School should:

- Be flexible
- Embrace a student−centered approach to teaching
- Enjoy challenge and change; be willing to risk within reason
- Be visionary, innovative
- Willingly participate in extensive staff development; see active learning as an integral part of teaching
- Be a "Team Player," planning and coordinating with others on a regular basis
- Embrace technology, seeking out ways to use new tools effectively in instruction
- Be committed to and knowledgeable about the constructivist approach

The professional development provided by SEDL was spread throughout the school year, providing for continuous improvement. The design of the professional development sessions was customizable, based upon the needs of the school and the teachers. In between the whole−group professional development sessions, onsite and online follow up assistance was provided to individual teachers or small groups of teachers. Evaluations were regularly conducted, to gain feedback to best serve the needs of the participants.

For the professional development sessions presented by SEDL and other providers, teachers were sometimes paid stipends. In other cases, the training occurred after school or on student release days, and in some cases substitutes were provided to release teachers during the school day.

The most critical factors in the successful implementation of this project included the strong instructional leadership of the principal and the support provided by the technology and projects coordinators for school staff.

Costs and Funding

The projects coordinator position has been funded for three years through a grant from the RGK Foundation. Because the SEDL project required each participating school to have a technology support person on campus, the district provided funding for the technology coordinator for two years. SEDL paid teacher stipends for 6 days of training, and local funds or staff development days were used for the matching 6 days. Sources of funding also included other local funds and Title I.

- In−kind Consultant Services from Judi Harris @ $1,000 a day plus expenses for two days per month for three years; Ongoing research and summary report
- Apple Computer: Use of facilities for training/classes
- Donation of 16 computers (University of Texas)
- Donation of 12 computers (Apple Computer)

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Rating Criteria

Bernice Hart Elementary School was nominated by the Southwest Educational Development Laboratory (SEDL), as a school that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Access − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.
Assessment and Evaluation − School leaders must utilize assessment and evaluation techniques to inform decision making and ensure continuous improvement in teaching and learning.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Center for Applied Technology &Career Exploration (CATCE)

Center for Applied Technology &Career Exploration

Rocky Mount, VA

School Type: Public	**School Setting:** Rural
Level: Middle	**School Design:** CSRD/Other Non−Traditional
Content Presented By: Edvantia	EDVANTIA

Demographics

Franklin County is nestled just south of the Blue Ridge Mountains in rural southwest Virginia. The main industries in the area include timber production and wood and textile manufacturing. The school system consists of approximately 6,997 students housed in eleven elementary schools, one middle school, one high school, and the Center for Applied Technology and Career Exploration, otherwise known as CATCE. Approximately 350 eighth and ninth grade students attend programs at CATCE.

Background

An increasing student population in Franklin County and an industry base that did not support new information based technologies prompted school leaders to react. Instead of simply adding on or building a new school building, Franklin County assessed the changes in work skills necessary for the current work force and designed a unique solution that is a model for success.

The Center for Applied Technology and Career Exploration (CATCE) houses approximately 350 eighth grade and returning ninth grade students. The students attend CATCE for a semester with an option to return their ninth grade year. While in attendance, students investigate 3 of 8 career tracks projected to have the greatest need and growth when they enter the workforce. Students do this immersed in technology and led by both teaching experts and experienced content experts.

Leonard Gereau, superintendent of schools, helped to articulate the vision of stakeholders interested in seeing the experiment succeed. The early success began with the passing of a bond issue by taxpayers as well as procuring federal grant money to build this modern facility that has already demonstrated impact on student achievement and will help students in Franklin County compete for rewarding future careers.

Design &Implementation

Once the initial concept of a program for all eight graders and up to half of the ninth grade enrollment was established, district and building level administrators began meeting to discuss possible curriculum options. With a primary goal of preparing students for the workforce of the 21st Century, administrators first looked at research and studies to determine appropriate curriculum areas. Once these areas were established, a steering committee consisting of administrators and master teachers was forged. This group then established committees of teachers, parents, and business/industry representatives to guide the curriculum and facility development for each of the eight selected curriculum/module topics.

The Center for Applied Technology and Career Exploration was conceived and developed around three primary goals:

1. To prepare students for the workforce of the 21st Century
2. To motivate and inspire students
3. To address the issue of overcrowding at the secondary level

All eighth grade students and ninth grade students who have elected to return for a semester attend CATCE. This student level was strategically targeted, because it is at this time that decisions and actions in school make the greatest impact upon post−secondary schooling options and career choice.

Students attend for a semester and explore three of eight career areas. These areas were selected based upon their potential for future growth and consist of:

- environmental/natural sciences
- finance
- manufacturing
- engineering/architectural design
- health and human services
- media design
- legal science, and
- arts

Each career area is taught by both a master teacher who facilities the design of learning activities and an experienced content expert who has spent time in their chosen field and brings a unique perspective to the instructional setting. CATCE is committed to hands−on discovery learning and students are immersed in a wide array of problem−based activities that require students to seek answers to real−world problems. One project included an impact study on a proposed Interstate extension that was supposed to come through the county. Another activity required students to assess the status of the local Pigg River, to test the water for chemicals, sample invertebrate species, prepare reports, and to present their findings as if they were reporting at a scientific symposium.

Curriculum units cross traditional subject lines and emphasize the application of knowledge within the scope of problem solving. While students focus upon a career area, the core areas of math, social studies, language arts, and science are woven throughout the disciplines and resulting activities.

Technology is central to all of the units, and at any one time students may be found using digital video editing tools, MIDI keyboards and notation software, broadcast quality videocameras and audio recorders, as well as a plethora of computers, printers, and scanners. Teachers received a stipend for training in a variety of teaching methods but all training occurred outside of their regular teaching hours.

The unique facility also serves as a community resource and parts of the building are available for community meetings, teleconferencing, and distance learning. CATCE truly increases opportunity for continued learning for people throughout the community and across all age groups.

Results

Results will be posted soon.

Replication Details

The basic concepts of CATCE are fully replicable. Teachers are fluent in a variety of teaching methods that emphasize hands−on discovery learning, collaborative learning, and real−world problem solving. Teachers also received training in effective integration of technology and the selection of experienced master teachers helped provide an increased return on the training investment. In addition to master teachers, each module also consists of an expert from industry for that specific field. For example, in the legal module one teacher is a former attorney. Additionally, in the media module there is a former anchor of the local news.

Unique to the situation is the pairing of professionals−−engineers, news anchors, artists−−with the master teachers. This pairing takes a commitment from school leaders to investigate this nontraditional approach to instruction as well as financial support, since student to teacher ratio is often as low as 15:1.

The elaborate facility and intense immersion of technology also requires substantial funding. While CATCE found support both locally and through major federal grants, it is important to remember that the emphasis of the program is on student learning and that the technology is a tool that has been appropriated for this purpose.

Costs and Funding

The scope of this project required a major financial investment. However, taxpayers in Franklin County either understood this need or benefited from a well−communicated vision from school leaders, for they approved a $14.6 million bond issue by a 20 percent margin. School leaders also won additional external support exceeding $1.6 million in the forms of grants, detailed below.

Other resources:

- U.S. Department of Education's Technology Innovation Challenge Grant program: $1.4 million
- Telecommunications and Information Infrastructure Assistance Program (TIIAP) sponsored by the U.S. Department of Commerce: $225,000
- Virginia Economic Bridge Initiative: $17,000
- Virginia Technology Literacy Challenge Fund: $50,000

Itemized costs:

- Hardware and software: $750,000
- Training: $71,370
- Facilities: $7 million

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program at the Center for Applied Technology &Career Exploration in Rocky Mount, VA, was selected as a winner in this competition.

This story exemplifies the following practices:
Vision − School leaders must articulate a shared vision of how technology will be effectively used to support teaching, learning, and school management.
Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.

Poquoson City Schools

Poquoson City Schools

Poquoson, VA

School Type: Public	**School Setting:** Suburban
Level: K−12	**School Design:** Traditional
Content Presented By:	
Edvantia	EDVANTIA

Demographics

Poquoson City Schools is in Eastern Virginia between Hampton and York County. It is a system of four schools with a population of under 2,500 students.

The City of Poquoson, with a population of approximately 12,000 is located adjacent to Langley Air Force Base and NASA and with easy access to all major Tidewater cities. It has become one of the most desirable residential localities in the Tidewater area. Many of the newer residents of the city specifically selected Poquoson as their home because of the reputation for excellence enjoyed by its school system. Poquoson combines the benefits of small town friendliness and pride with the cultural, professional and educational advantages of a major metropolitan area.

Poquoson, an Indian word for either flat land or 'great marsh,' is believed to be one of the oldest English−speaking communities in America that still bears its original name. The city, with 60 miles of shorelines, encompasses 14.7 square miles of land of which 4,398 acres are salt marsh wetlands. Plum Tree Island National Wildlife Refuge, together with privately owned salt marsh lands, make up the largest saline marsh in the lower Chesapeake Bay.

Student Racial/Ethnic Composition:

.003% American Indian or Alaska Native
.02% Asian
.01% Black or African−American
.01% Hispanic or Latino
98% White

LEP Students: .001%
Number of Languages: 1
Qualify for Free/Reduced Price Meals: 6%
Receive Special Education Services: 11%

Background

Poquoson City Schools subscribes to the philosophy that computers and other related technologies should be used as educational tools to enhance the achievement of students. In addition, the Virginia Department of Education has mandated that teachers and students acquire technology skills to make them more competent in our technological society. Poquoson enacted a three−phase program intended to help school personnel acquire the necessary knowledge and skills to satisfy the eight state technology standards for teachers.

During the 1998−99 school year, Poquoson began a Teacher Technology Competency Program, which required all professional staff members to attain and demonstrate a certain level of technology skill in the standards specified by the Board of Education's "Technology Standards for Instructional Personnel." Opportunities were provided for all teachers, library media specialists, teaching assistants, and administrators in the school division to receive training in the use and application of these technologies, in order that they may prepare our students to meet the technological demands of the future.

Based on a Spring 1999 Needs Assessment Survey of all staff. we found that some of the staff was comfortable with using technology for administrative and instructional purposes and could meet the Board of Education's "Standards." These individuals were ready to expand their expertise to serve as mentors, curriculum developers, and technology integrators. Others still needed to develop some of those basic skills, as well as learn how to incorporate technologies into their lessons and classroom activities. All professional personnel are expected to meet the criteria established by Poquoson's Teacher Technology Competency Program.

Poquoson Schools' faculty and staff were provided learning opportunities based on those areas found by the Needs Assessment Survey to be especially deficient and on four focus areas of the Standard of Learning that had less than 70% pass rates. Instruction was provided through the Poquoson Technology Academy, developed in 1997 to sponsor and coordinate workshops, mini−courses, college classes, and conferences to assure that our staff developed a proficient level of technology skills and used those skills to improve instruction and student learning.

Design &Implementation

The Virginia Department of Education designed eight teacher technology standards. In order to be recertified after the year 2002, Virginia school divisions must show that their personnel have met the technology standards.

Our project intent was to offer all faculty and staff a friendly, flexible and adaptive vehicle by which to address the state technology standards. We developed a program of training that assures that professional staff acquire a high level of competency in the use of existing and emerging technologies.

Goals and Objectives

Goal 1. Develop a program of training that assures that professional staff acquire a high level of competency in the use of existing and emerging technologies.

Objectives:

1. Develop a calendar of workshops, peer "Technology Coaching" opportunities, "tech days," and other staff development opportunities to address the weaknesses found in staff competency levels through the Needs Assessment Survey, to include especially multimedia development, curriculum integration strategies, and SOL correlations.
2. Provide additional opportunities such as conference attendance and college courses for staff members who have gained the minimal competencies to continue to increase their knowledge

and hone their skills.

3. Monitor staff progress in reaching at least three of the Virginia Technology Standards for Instructional Personnel during the 1999−2000 school year through review of submitted materials by administrative staff at each school.
4. Provide training and time for teachers to review software and locate curricular sources on the Web and plan appropriate classroom use of these sources through the use of released−time, in school "Tech Days."

Goal 2. Expand the cadre of division "experts" who serve as "Technology Coaches."

Objectives:

1. Identify at least 5 staff members in each school to serve as "Technology Coaches" for their peers.
2. Provide vendor sponsored training, conference attendance, college courses and other advanced levels of training for the "Technology Coaches" to advance their training.
3. Schedule each "Technology Coach" to provide training for school staff in areas indicated as needs through the Needs Assessment Survey and local school priorities.

Goal 3. Provide hardware and software that will enable staff to practice skills learned during training sessions.

Objectives:

1. Procure laptop computers as prices and the grant budget allow (approximately 16 laptops with installed software [Microsoft Office and Microsoft Works]).
2. Provide opportunities for staff to practice skills gained in training through a computer loan program.
3. Identify particular workshops and training sessions for which laptops will be made available for follow−up practice.

Action Plan

1. Continue the Poquoson Technology Academy which was established in Poquoson City Schools in 1997 to provide a variety of courses, classes, and workshops to meet the specific needs of the staff. These will include, but not be limited to:

    - **College courses** − A three−college−credit collaborative course with Thomas Nelson Community College was offered during the summer of 2000. This course was held at the individual school sites using local technologies and software. Instruction will be provided by Technology Coaches, other Poquoson staff, and experts from the Tidewater region. Instruction was geared to specific classroom applications, the State Technology SOL's, the Virginia Technology Standards for Instructional Personnel, and needs determined by the Spring 1999 Needs Assessment Survey.
    - **Mini−courses on specific topics offered within the division** − Forty to fifty mini−courses will be offered after school, during the evening, on Saturdays, and during the summer. These courses will run from two to eight hours. Mini−course topics will be developed from weaknesses found by the Needs Assessment Survey, SOL curriculum areas that had the lowest pass rates in Poquoson schools, from the requirements of the Virginia Technology Standards for Instructional Personnel, and from specific individual school priorities. Examples will include but not be limited to:

    ◊ "Using Computers in the 6−8 Math Curriculum"
    ◊ "Algebra and Computers −− A Magic Combination"
    ◊ "Tying Technology and Social Studies SOLs Together!"
    ◊ "Power Searching on the Internet"
    ◊ "Using the Scanner and Digital Camera"
    ◊ "Presentation Tools for Professional Use"
    ◊ "Using the Computer for Student Assessment and Record Keeping"
    ◊ "Student Use of Multi−Media −− No More Boring Book Reports!"

  Instructors will be drawn from the Technology Coaches, library media specialists, area experts, and/or consultants.
- **Staff development activities** − Staff development teams and technology committees in each school will determine and plan appropriate technology training to be presented during staff development times. School training will be specifically geared to the use of equipment and software in each building, curricular needs of each school's students, the appropriate grade−level SOL's and the Professional Technology Standards needed by each school's staff. Each school has been provided a copy of the summary of their Needs Assessment Survey results so they can focus training efforts on the weaker areas, as well.
- **New teacher orientation activities** − In mid−August, all teachers new to Poquoson will be required to participate in at least two days of technology familiarization and training conducted by the Director of Technology, technology coaches, library media specialists, the network administrator and other Poquoson staff.
- **Conferences** − Personnel will be provided opportunities to attend professional technology conferences in order to be exposed to new technologies and to share new ideas and applications with staff members in the division.
- **Off−site workshops and classes:**

    ◊ Consortium for Interactive Instruction − a regional partnership of area school systems and WHRO, offering a wide variety of topical classes, as well as TechTrek, a week−long intensive residential immersion in technology.
    ◊ Old Dominion University − offers a 4.5 CEU "Technology SOL Certification Course" and other courses.
    ◊ NASA − provides resources and instruction in Internet−related projects, specifically advanced training for middle school teachers to enable our students to participate in the projects sponsored by the agency.
    ◊ WHRO−TV − sponsors the National Teacher Training Institute, which focuses on interactive use of video and Internet in the classroom.
    ◊ Commercial technical training − provides school staff with necessary training and updates in network administration, troubleshooting, and advanced applications.

2. In order to expand the cadre of "experts" in the Poquoson Technology Academy, interested staff members will be encouraged to attend specific higher level training opportunities in order to return "home" to share their knowledge and skills. These teachers serve as Technology Coaches to the staff in their schools.
3. Laptop computers will be purchased for loan to staff members who participate in identified mini−courses and other training.
4. Teachers will identify areas of the curriculum, including the SOLs, in which the use of software and the Internet will enhance student learning. Release time will then be provided for teachers to become more confident with the software themselves and to plan for curricular integration.

Results

It is difficult to evaluate the actual success of any professional development program. Participating in training sessions is one thing; demonstrating consistent competence is quite a different matter. Poquoson addresses this issue by requiring teachers to develop a portfolio in either hard copy or electronic format. The portfolios are evaluated with a rubric that provides specific standards, thus making the process straightforward. For example, Virginia's first technology standard states, "Operate a computer system and utilize software." The Poquoson rubric requires teachers to present three pieces of evidence, such as a disk on which they have saved at least two files. The rubric describes this as proof of use.

In Poquoson, a school−level administrator works occasionally with a committee of peers to decide whether the state standards have been met. Portfolios like those developed by teachers in Poquoson are extremely useful in assessing/evaluating teacher competence with technology, but they do not reveal how technology is actually being applied in the classroom. Poquoson is fortunate to have administrators who know what to look for when observing teachers in the classroom.

As of spring 2000, all certificated staff members have been successfully and diligently working toward meeting their technology standards and all have met at least six of the eight required standards. Twenty percent have completed their portfolio check−off for all eight standards.

There has been a great increase of technology use professionally which has translated into increased use by students. Because of the heightened comfort and competency levels of the instructors, integration of technology into the curriculum is a regular occurrence.

Replication Details

The beauty of this portfolio model project is that many of the division schools have already adopted it and haven't had to develop it themselves!

The only factor that divisions need to consider is how they are going to offer their personnel opportunities to meet these standards.

Costs and Funding

The total cost of the program is approximately $39,400. Most of this was obtained through a Technology Literacy Challenge Grant from the Virginia Department of Education, which supported the purchase of laptop computers. An additional $6,000 was provided from the state to help districts train teachers to meet the Virginia Standards of Learning. Very little money, approximately $1,000, was obtained locally.

There is no cost for teachers to attend. Teachers work outside of school hours and are not compensated, but are motivated by re−certification requirements and the opportunity to receive college credit.

The cost of the portfolio came from a few release days for technology committee members to pay for substitute teachers and the cost of the card stock paper to print the portfolios on. It was not an expensive project, but one that was well worth the time and effort!

Sources of funding for the Technology Literacy Challenge Grant:

Virginia Department of Education: $26,650
Goals 2000 grant: $500
Virginia Standards of Learning funds: $6,000
Local supplement: $1,000

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program in Poquoson City Schools was selected as a winner in this competition.

This story exemplifies the following practices:
Assessment and Evaluation − School leaders must utilize assessment and evaluation techniques to inform decision making and ensure continuous improvement in teaching and learning.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Maryville Middle School

Maryville Middle School

Maryville, TN

School Type: Public	**School Setting:** Suburban
Level: Middle	**School Design:** Traditional
Content Presented By:	
Edvantia	

A nationally recognized Blue Ribbon School with special honors in technology, Maryville Middle School is located in Maryville, Tennessee−−about 25 miles south of Knoxville−−and serves approximately 1,030 students. Maryville middle−schoolers are accustomed to active learning, as technologically enhanced project−based learning is the norm.

All the standard subjects are taught at Maryville. The way they are taught, however, is anything but standard. Students learn by working in teams and utilizing technology to carry out problem−based inquiries. They seek answers to "real world" questions: "How do I buy my first car?" "How does HIV affect me?" "How nutritious are school lunches?" STARS−−Students Thinking, Analyzing, Researching and Solving−−is a problem−solving paradigm that helps students pursue answers to such questions over an entire school year.

Technology is integrated throughout STARS. Students begin by identifying the problem to be solved. Then a hypothesis is formed and tested by experimentation. Students conduct library and Internet research, as well as interviews with community members, to assemble information. Then they analyze the data and derive conclusions. Subsequently, students construct a multimedia presentation that is shared with parents and other community members during an open house held each spring. Teachers act as coaches and facilitators throughout the process, providing direct instruction when necessary. Students learn to narrow topics, divide responsibility among team members, gather and summarize information, and use software effectively.

The school is equipped with more than 300 networked computers, most of which are housed in labs. Each student spends at least one 50−minute period every other day in a computer lab; some, especially those described as "lower performing students," spend as much as three or four class periods a day in the computer labs. Students are taught word processing, spreadsheets, databases, desktop publishing, animation, and multimedia authoring in addition to computer−based instructional programs. These skills are demonstrated through STARS projects. Students use technology to communicate findings clearly and in a visually stimulating format.

The interdisciplinary nature of the program encourages students to cross subject boundaries. Individual and team interests guide the project development. The quest for information focuses on solving the problem, no matter where it leads the researcher. As a result, teachers work in teams to smooth and sustain this work across subjects. They plan cooperatively, encourage students to make natural connections, monitor and adjust requirements and timetables, and consult regularly with students individually or as teams. Principal Joel Giffin says, "We would individualize instruction even if we didn't have the computers, [but] technology allows us to do a better job."

The school's professional development program emphasizes successful use of instructional technology. Teachers explore technology as a tool for learning and acquire the skills they need to support students. Training is often provided by in−house staff members and focuses on such topics as using academic support software, searching the Internet, and utilizing electronic grade books. Maryville teachers do not act as disseminators of knowledge, nor do they test outcomes using only paper−and−pencil assessment tools. Be that as it may, their integrated approach prepares Maryville Middle School students to perform well on the Tennessee Comprehensive Assessment Program (TCAP), which consists of the Terra Nova standardized test and Tennessee Writing Assessment. Maryville is ranked high among Tennessee schools for improvement in student performance on the Tennessee Value Added Assessment System.

Maryville Middle School's integration of technology has taken project−based learning to a new level!

Demographics

Maryville Middle School is located in the city of Maryville, Tennessee, population 24,000. Maryville is in East Tennessee at the foothills of the Smoky Mountains National Park. Maryville City School district consists of four elementary schools, one intermediate school, one middle school, and one high school. Maryville Middle School's enrollment is approximately 700 students in grades 7 and 8.

Student Racial/Ethnic Composition:

- 2% African American
- 94% White (not Hispanic)
- 1% Hispanic
- 3% Asian or Pacific Islander
- 0% Native American or Native Alaskan

Limited English Proficient Students: 3%
Number of Languages: 4 (Japanese, Kosovar, Bosnian, Russian)
Qualify for free/reduced lunch: 15%
Receive special education services: 15%

Academic levels for MMS spans from students functioning on a first/second grade level to students functioning on advanced high school levels.

Background

Successful learning is closely linked to interest. Students become energized when they are interested in a topic or idea. Effective teachers understand the value of student interest and look for ways to help learners make connections between what they know and what society wants them to know. It is possible and often desirable for teachers to share control of classroom activities with interested learners. Under these conditions, children's natural preferences for active hands−on learning creates the right conditions for keeping them on task and productive.

Teachers at Maryville Middle School have created a variety of ways to capture and hold student interest. One such project is STARS, which allows students to analyze information and draw conclusions using a project approach to learning. STARS, a problem−solving paradigm, helps students pursue answers to such questions over an entire school year. Students develop a multimedia presentation to communicate and demonstrate the skills they have learned in the core curriculum areas through working on STARS.

Design &Implementation

Project STARS begins each year during pre−service training days (3−5 days before the beginning of the new school year). Teachers meet in grade−level planning teams to determine the responsibilities of the teachers and students during the year−long project. Inservice technology training, project planning, project monitoring, and project evaluation is done monthly during the school year. Email communication between teachers has enabled MMS to swiftly respond to any needs to modify and adjust STARS.

Technology allows Maryville to facilitate the individualization of information for our students. The goal is to allow students to work at their own level and technology supports this process. Maryville would seek to achieve this goal regardless of whether the technology was available or not.

Student ownership is crucial to the success of STARS. Students must feel that they have been the driving force behind the decisions made and products produced. Each individual has unique strengths, but everyone must make contributions to the team. By displaying projects during an open house in the spring, student motivation increases and support from the community is strengthened.

STARS uses a project−based approach to help students solve problems based on real−world issues. Students work across disciplines as the search for information regarding such topics as year−round schools or local recycling efforts. Students spend at least one 50−minute period every other day at one of Maryville's 300 networked computers, most of which are in labs. Students may work on individual aspects of the project but all are reporting back to and working with a team.

Students take most of the year to research and develop multimedia projects based on their problem. Steps in the process include:

- identify the problem
- form the hypothesis
- test the hypothesis through experimentation
- gather information through library and Internet research sessions
- interview pertinent community members
- analyze the information collected
- draw conclusions

In order to support their students, Maryville teachers undergo training in integration practices −− often presented in−house through Maryville faculty. Students perform their own Internet searches with guidance from teachers. Beyond web browsers, students and teachers may also utilize word processing, spreadsheets, databases, desktop publishing, and multimedia authoring software. Final projects are presented using "Superlink" presentation software.

Results

One indicator of the success of the Maryville Middle School students is our performance on the Tennessee Value Added Assessment System. Value Added Assessment is a statistical procedure for measuring the impact ("effect") of different factors on student achievement (learning) across time.

Currently, the TCAP test results show how students are achieving at a particular point in time as compared with state averages. The Value Added Assessment measures how much progress or academic growth has been made by each student, each year in grades 3 through 8 in reading, language arts, mathematics, science, and social studies. Value Added Assessment helps school administrators and teachers learn what is working well and what needs to be improved.

The goal or benchmark for measuring gains by grade level and subject matter is 100%. One hundred percent is equal to the national norm. We are extremely proud of our students for making the elite group and scoring above the national norm in all areas. MMS's TVAA test scores for 1999 are:

- Math 136.6%
- Reading 134.2%
- Language Arts 184.4%
- Social Studies 162.2%
- Science 148%

The MMS three−year average is 155.9%, again, very much above the national norm of 100%.

In addition to test data, Maryville Middle School's administration and staff reviews many factors that reflect progress and success of our programs. Other accountability factors are:

1. Customer Satisfaction (students, parents, community) −− determined by surveys, attitude toward school, completion of assignments, attendance, open houses, newsletter responses, resources provided
2. Competition with other schools −− determine by how well we compete locally, regionally, and on the state level with other schools
3. Multi−media projects −− determined by the number and quality of multi−media projects completed
4. School awards −− determined by the number and quality of school awards in local, state and national competition. Maryville Middle School has won seven (7) Tennessee School Board Association Awards of Excellence in the last six (6) years. We have won a state technology &learning award and received a National Blue Ribbon Award 1994−1996.

Replication Details

STARS synthesizes several common teaching and learning strategies and could be adopted or adapted easily by most schools familiar with teaming and project−based learning, problem−based learning, and inquiry−based learning. The key to its success is the seamless integration of technology in the teaching and learning process.

Access to technology is critical and Maryville solves this problem by providing more than 300 computer workstations primarily in labs that are connected to a local network and the Internet. Software selection supports the critical steps of Internet−based research, word processing and multimedia authoring, and presentation. These software resources are common tools in many schools.

Teachers must be prepared to successfully integrate technology into their daily practice. Maryville has approached this important step by presenting professional development sessions led by its own early adopters and highly proficient staff members. Sessions are held during preservice days prior to the beginning of each school year and during inservice days. Knowing what software and hardware can support steps in inquiry process is critical.

Costs and Funding

The STARS program focuses on project−based learning and fits so well in the scope of instruction throughout the curriculum that costs for this project overlap general funding for instructional programs. Some grant funding was utilized to supplement technology resources at Maryville, but hardware and software utilized in STARS are used in other classes and programs.

Hardware included computers, digital cameras, video cameras, and scanners. Software was purchased for authoring, digitizing, and networking.

Minimal funds were added through school fundraisers and local contributions.

Funding provided by the Tennessee Department of Education:

Hardware: $40,350
Software: $13,500
Professional Development: $6,000

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program at Maryville Middle School was selected as a winner in this competition.

This story exemplifies the following practices:
Integration − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.

Mississippi Department of Education

Mississipi Department of Education

Statewide, MS

School Type: Public **School Setting:** Rural
Level: K−12 **School Design:** Traditional
Content Presented By:
Edvantia

Demographics

Mississippi is a rural state with a population of approximately 2,768,619. In 1998, Mississippi was ranked fiftieth in personal income per capita, and according to the latest U.S. Census Bureau report, roughly 31% of Mississippi's total population under the age of 18 live in poverty. There are 152 separate school districts and 1012 public schools in Mississippi that are charged with educating approximately 49,000 students. Funding the technology needs of Mississippi's public school students is difficult. Primary sources for funding technology have come from the E−Rate ($50 M), Technology Literacy Challenge Funds ($17.6 M), and state Technology in the Classroom funding ($30 M).

Background

Mississippi has seen a significant increase of technology statewide since the creation of its first Master Plan for Educational Technology in 1995. The Master Plan vision states that "The State of Mississippi is committed to ensuring that all learners have equitable opportunities to employ a variety of technological tools to enhance the learning process to offer education anywhere, any time for everyone." Guided by the state plan, every school district has a technology plan.

The state has funded a robust ATM/frame relay backbone that currently connects 95% of the schools, 100% of the districts, universities and community colleges to the Internet. Mississippi school districts have connected 65% of the classrooms to the Internet through funding assistance from the E−rate program ($50 million in discounts over 2 years), the state Technology in the Classroom Fund (one−time allocation of $57 per student and the federal Technology Literacy Challenge Fund Grants ($17 million over 3 years).

A statewide compressed video teleconferencing network links 120+ school/university/community college sites and delivers over 90 high school courses and countless professional development sessions each year. This network was upgraded to an ATM backbone this year.

Although much progress has been made in Internet connectivity, Mississippi has continued to focus on technology as a tool for teaching and learning rather than equipment acquisition. MAGNOLIA, the state−funded online database resource for schools &libraries allows students to have access to electronic periodicals and other library materials that were never affordable in a traditional library. The Mississippi Student Information System (MSIS), a comprehensive web−enabled system for state reporting, also will allow greater access to information at a touch of a button.

Design &Implementation

In an effort to promote the integration of technology in the total educational program, this year the Mississippi Department of Education, through a taskforce of individuals from the public and private sectors, developed technology standards for school administrators. The seven (7) standards are in the areas of: vision; funding and long−range planning; professional development; model user; the learning environment; student learning; and legal, ethical, and security issues. Aligned with the Milken Seven Dimensions and NCATE Curriculum Guidelines, the standards are intended as a template for the development of future technology training for administrators.

The Mississippi Department of Education is in the process of developing a state−of−the−art Technology Academy for School Leaders. TASL, will be offered in regional locations statewide, will give administrators the knowledge and skill to provide effective leadership for the integration of technology in local schools and districts. Leadership teams composed of one superintendent and up to 4 principals from 70% of the accredited public and private school districts will participate in the academies.

The goals of the Technology Academy for School Leaders (TASL) are as ffollows:

- To facilitate the integration of technology in the total district/school environment
- To enhance the principals' and superintendents' technology leadership skills in support of teaching, learning and data driven decision−making
- To facilitate the creation of learning environments that empower staff to infuse technology into teaching and learning
- To assist school leaders in definition of local problems and issues, and the development of solutions and strategies to address them

These goals are aligned with the Mississippi Technology Standards for Administrators, available at: http://teacherexchange.mde.k12.ms.us/new/Announcements/mississippi_technology_standards_ ministrators.htm

The Mississippi Department of Education has adopted the team concept module in training for school districts. Many of the training modules offered to districts require teams of one administrator and one to two teachers depending upon the module. Through district feedback we have found that to effectively integrate change in a school or district there must be a collaborative effort of both administration and teachers. In designing the Team concept for TASL we applied these same principles. By creating teams of a Superintendent and four principals, all members will have a sense of ownership to the project and its success.

The TASL will be based on the Authentic Task Approach (ATA), a research−based process that incorporates hands−on training with real−time, team−driven projects to set priorities and accomplish goals. Participants will work in teams on issues they select as important to technology integration in their school or district. Prior to attendance at the summer portion of the TASL, the teams will complete four sets of data:

1. the TAGLIT, the North Carolina−developed electronic tool Taking a Good Look at Instructional Technology,
2. a set of broad questions (examples of questions are attached) designed for the ATA process to focus the team prior to the retreat,
3. individual self−assessment of technology skills, and
4. the MS Governor's Infrastructure Survey.

These data will be completed and an issue to be addressed will be chosen prior to attendance at the retreat. Teams will make application for entrance into the program via a web−based application and be selected based on the district/schools' completion of the required data, their willingness to actively participate and support the process, and successful completion of the application.

The academy will engage school leaders in activities that show how technology fits into the larger picture of school reform. It will provide superintendents and principals with opportunities to understand the administrator's role in teacher professional growth and specific strategies for promoting the teacher's growth through the stages of technology integration. In addition activities on effective program evaluation and systemic reform will be conducted. SERVE and SEIR−TEC have developed quality resources on Comprehensive School Reform Model that will be built into the TASL.

Each TASL summer retreat will take place over three consecutive days. During this time the teams will focus on the issues they selected through the data gathering activity. During the school year, participants will engage in online activities to extend learning and collaborate on targeted issues during two follow−up retreat days approximately 3 months apart. Participants will have an opportunity for sharing products and celebrating successes.

First year teams will have the opportunity to mentor the second year teams. Through an extensive website, listserve, and other resources, the teams will have the support to continue with their projects. There will also be additional support through training and activities offered by the Mississippi Department of Education. The online activities will include participation in Connected University's online courses. Individual team members will receive a subscription to Connected University (CU) and will complete at least one of CU's 14 project−based courses. Other online activities will include participation in discussion groups, listservs, etc. Administrators will access courses for brushing up on basic skills as well as learning new technology concepts.

Results

An external evaluation will measure the effective use of technology by the participants and its impact on school districts. The TAGLIT will be an important part of the evaluation. There will be product and process evaluation. The evaluation plan and design will establish benchmarks, monitor progress, and assess the impact of Technology Academy for School Leaders (TASL) on school and district leadership behavior. The following will be evaluated:

1. success in meeting the Mississippi Administrator Technology Standards as evidenced by district/school leadership behavior, technology use, and other factors to be determined;
2. successful completion of the academy as evidenced by the completed team project and surveys;
3. effectiveness of transference of the competencies gained to the school/district environment as evidenced by interviews, documented leadership behavior, and success in meeting goals of the district plan; and
4. extent of team success in defining problems/issues and developing solutions/strategies to address the problems. Formative and summative evaluations will be conducted throughout the course of TASL and beyond to fully evaluate the long−term impact of the program.

Replication Details

Even though the underlying theme of TASL is technology, its use is to be viewed more as a tool to meet an overall goal. That goal is to provide every superintendent and principal in public and private schools with access to quality leadership development focused on whole systems change and technology integration. Building of relationships among team members is a by−product that we hope will be accomplished in the success of each project. Through technology the teams will be able to access training opportunities, valuable resources, and to be able to communicate with each other and fellow teams.

Costs and Funding

Partners in the program will include but not be limited to:

- the Office of the Governor of Mississippi, the Mississippi Economic Council,
- BellSouth Foundation,
- the MS Department of Education,
- the South Eastern Vision for Education (SERVE),
- South Eastern and Islands Regional Technology Education Consortium (SEIR−TEC),
- Howard Industries (a MS−based computer manufacturer),
- Consortium of School Networking (CoSN), and Connected University

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Rating Criteria

The Technology Academy for School Leaders (TASL) program, developed by the Mississippi Department of Education, was nominated by the Regional Educational Laboratory at SERVE, as a program that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.
Planning − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.

Bastrop Independent School District

Bastrop Independent School District

Bastrop, TX

School Type: Public **School Setting:** Rural
Level: K−12 **School Design:** Traditional
Content Presented By:
Edvantia

Students Experience WOW (World of Work) at Bastrop I.S.D. Bastrop ISD is a rural school district outside of Austin, Texas, that encompasses more than 450 square miles. Forty−three percent of its students qualify for free or reduced−price meals; 15% are in special education. The student population is 50% White, 25% African American, 24% Hispanic, 1% Asian. For some students, English is their second language. Despite the proliferation of high−tech jobs in Austin, a 45−minute drive away, relatively few students have access to computers at home. In fact, nearly a third of them don't even have electricity.

In this environment, one might assume that a computer class would be popular, if only for the novelty it offered. Yet Bastrop Middle School reported high absenteeism among both students and teachers in its seventh−grade computer literacy skills class, and 50% of the students who took the required course failed it. In 1993, school and district leaders met to determine what could be done about these problems. The class in question consisted of a six−week word processing unit followed by a database unit, then a spreadsheet unit. Students worked in isolation, doing projects for the sake of using the technology. School and district staff brainstormed together. Under the leadership of newly hired district technology director Lori Lusk, the district made sweeping changes in the computer course. The benefits were so great that the model that grew out of the initial brainstorming session has been adopted for computer courses in grades 6−12.

After reviewing information about what other schools are doing in the area of technology, school and district staff decided to change the course to a student−centered, problem−based class that provides real−world experience and skills in a cooperative setting. Students would now form companies of five individuals, each constituting an "advertising agency" in competition with each other. Each of the five students assumed one primary job responsibility, such as CEO or graphic designer, which he or she would then teach to the rest of the company. Technology would be used as a learning tool −− not as an end in itself. Learning would be centered on solving a problem −− not solely on using the computer.

The teachers and the district technology director worked that summer to create a new curriculum to assist in implementing the plan. Training was also done on changing to a constructivist environment. A new way of arranging the classroom was planned so that the setting would be more like an office. The school district replaced outdated hardware and software and used local tax revenue funds to construct office cubicles for the students. Funding was tight; teachers voluntarily attended hardware and software training sessions led by Lusk.

Project WOW (World of Work), as this new class came to be known, was an overwhelming success. Student absenteeism, tardies, and discipline problems were down dramatically, decreasing as much as

43%. Teacher satisfaction and morale were high. Parents and the community became involved in the project, resulting in more involvement in the school itself and higher satisfaction with the school district. More important, student achievement soared. In a benchmark test given the first year of the project, students who were in the Project WOW class scored an average of 22% higher than similar students who were still taking the course the old way.

Implementing Project WOW required a commitment by both teachers and administrators to change to a "guide on the side" teaching style, as opposed to a "sage on the stage" approach. It also required an understanding that the room's noise level would increase as students engaged in problem−solving discussions. Teachers practiced team teaching in classrooms that often had as many as 50 students. Block scheduling meant that classes would meet for 90 minutes every other day. This extended class time allowed for more complexity in the projects being done.

Changes that began with a seventh−grade computer class back in 1993 have carried over into other grade levels throughout the district. The new teaching model is now used for required ninth−grade computer courses as well as for elective computer classes offered in grades 6−12. The district reports no attendance problems −− in fact, the elective computer classes are always full. Team teaching methods pioneered in the technology department have since spilled over into other academic disciplines: Teachers in language arts, math, science, and social studies have adopted this approach for particular units of study.

Demographics

Bastrop ISD is a rural school district outside of Austin, Texas that encompasses more than 450 square miles. Forty−three percent of its students qualify for free or reduced−price meals.

Student Racial/Ethnic Composition:

25% African American
50% White (not Hispanic)
24% Hispanic
1% Asian or Pacific Islander
0% Native American or Native Alaskan

Limited English Proficient Students: (not reported)
Number of Languages: 2
Qualify for free/reduced lunch: 43%
Receive special education services: 15%

Background

Bastrop Middle School originally taught computer literacy skills in isolation, doing a word processing unit for six weeks, followed by a database unit, followed by a spreadsheet unit. The students worked in isolation creating projects for the sake of using the technology.

Design &Implementation

The teachers and the central office technology administration met to discuss the problems with the current isolated learning situation. Data involving student achievement and course satisfaction was examined, and it was decided by all that a change was needed. After doing research on what other districts were doing to meet the challenge, it was determined that a totally new approach was needed.

The district decided to change the course to a student−centered, problem−based class with the goal being to provide real−world experience and skills in a cooperative setting. Students would now form companies of 5 individuals each and would work as advertising agencies in competition with each other. Each of the five individuals would have one main job responsibility (such as CEO or graphic design), which he or she would then have to teach to the rest of the company. Technology would be used only as a tool and not as an end in itself. Learning would be centered on solving a problem, and not on using the computer.

The teachers and the district technology director worked that summer to create a new curriculum to assist in implementing the plan. Training was also done on changing to a constructivist environment. The campus principal was also involved.

In addition, a new way of arranging the classroom was drawn up and created so that the setting was more like an office. New equipment was purchased and installed, and the teachers were trained on the hardware and software.

Results

Project WOW (World of Work), as this new class came to be known, was an overwhelming success. Student absenteeism, tardiness, and discipline problems were down dramatically (up to a 43% decrease). Teacher satisfaction and morale were high. Parents and the community became involved in the project, resulting in more involvement in the school itself and higher satisfaction with the school district.

More importantly, student achievement soared. In a benchmark test given the first year of the project, students who were in the Project WOW class scored significantly higher than similar students who were still taking the course the old way (an average of 22% difference).

Replication Details

Implementing Project WOW requires a commitment by both the teachers and the administration to change to a "guide on the side" teaching style, as opposed to a "sage on the stage." It also requires an understanding that the room will be noisier than in the past as students talk with each other to solve problems.

BISD had 2 teachers with 50 students at a time in the classroom, which worked well, allowing for team teaching. This is not a requirement for replication, but did add to the project's success. The teachers also were on the block schedule, meeting for 90 minutes every other day. This extended time allowed for more complexity in the projects being done, but is not required for successful implementation.

Costs and Funding

This project can be implemented for no additional cost at all. BISD did choose to replace outdated hardware and software at the same time as the project was implemented, but that is not required.

The district did use local funds to construct office cubicles for student use, but again, this is not required. The same results can be achieved by simply grouping the students together using existing furniture.

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Rating Criteria

Bastrop Independent School District was nominated by the Southwest Educational Development Laboratory (SEDL), as a district that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Integration − School leaders must model the purposeful use of technology and ensure that teachers and students integrate technology into daily classroom practice.

Columbia County Schools

Columbia County Schools

Lake City, FL

School Type: Public **School Setting:** Rural
Level: K−12 **School Design:** Traditional
Content Presented By:
Edvantia

Demographics

Tech TEAMS is comprised of a consortium of 12 rural school districts and 3 cooperating universities in northern Florida. It is headquartered in Lake City. The 1995 per capita income averages less than $15,000 in communities surrounding the targeted schools. Most of the schools are Title 1 schools and have 50 to 85 percent of children eligible for free or reduced−price lunches, and an average of 16 percent of students who receive special education services.

Percentage of students who qualify for free or reduced price meals: 50−85
Percentage of students who receive special education services: 11.1

Background

This information will be added soon.

Design &Implementation

The goals of Tech TEAMS are to maximize success for students with special needs, effectively integrate technology into the curriculum, and support the creation of teams of teachers who work collaboratively. The project also seeks to restructure the school day to improve teaching and learning and establish demonstration sites for teachers to observe innovation in action.

Tech TEAMS has developed support for professional development and effective technology integration based on three research−based models: Apple Classrooms of Tomorrow (ACOT) Apple Staff Development, Creating Independence through Student Owned Strategies (CRISS), and Multiple Intelligences. Each of the 12 participating school systems sent a team comprised of teachers, administrators, and technology specialists to three−day training sessions in the summer of 1997. Follow−up sessions occurred throughout the school year during the evening and weekends.

The ACOT model is based on the findings that teachers progress through five stages of technology integration, from basic familiarity of technology though more advanced phases that progressively incorporate and utilize the unique capabilities of technology. These five phases are:

1. entry
2. adoption
3. adaptation
4. appropriation

5. innovation.

In this model teachers learn more than technology basic skills but are forced to consider their basic beliefs and philosophies about teaching and their roles as teachers. Teachers move from content−centered to student−centered instruction and from the presentation of information to guiding students to build their own relevant knowledge base.

Team members develop curriculum units linked to the Florida Sunshine State Curriculum Standards. In application, all student−−including students with disabilities−−often work in teams to solve problems based in real−word situations.

In the latter stages of the project, training shifts from integration techniques to leadership skills development. Teachers are encouraged to take an active role in training their peers in integration activities in which they now have experience. Principals receive special attention in the third phase which is designed to help principals serve as agents of systemic reform for their schools. During this phase, principals develop an action plan that includes comprehensive professional development, strategies for restructuring the components of the school day to support the inclusion of all students, and the implementing of effective teaching strategies in a technology−supported environment.

Results

Tech TEAMS capitalizes on the demonstration of success through multiple measures in alternate formats. The goal of model technology classrooms has been achieved at each target school. These classrooms are an effective resource for staff to witness and participate in effective integration activities.

Both teachers and administrators have progressed through the final stages of the program and this wave of completers serves as leaders throughout the boundaries of the program to support and serve as mentors to staff members at their own sites.

Indicators for student success include:

- students become more responsible for their own learning
- students work collaboratively to solve problems
- students demonstrate critical thinking skills
- students use technology as a tool for learning
- students demonstrate their understanding of content through product development
- all students participate in the program, including students with special needs

Replication Details

Tech TEAMS was a large, cooperative effort and replication would involve support from similar players. Smaller versions of the project are possible at fewer sites−−even a single site−−due to the incorporation of well−established, research−based professional development models. These models serve as the foundation for measurable success.

Scheduling of training requires a commitment from organizers and participants. Note that training sessions continued beyond the initial summer three−day event. Follow−up training is key to the success of the program and decision−makers must budget time and funds for training sessions outside of the school day. Training sessions during the school year may occur during scheduled in−service days or may require funds for substitutes and release time for teachers.

Finally, a commitment from all levels of the school is necessary−−especially from the administration. In Tech TEAMS, principals are not only required to attend sessions but are expected to demonstrate growth as leaders and support their staff as they embark on the journey of effective integration of technology. A strong commitment from the administration will more likely encourage success for teachers and students.

Costs and Funding

Goals 2000 funds support the program in the form of a $440,000 professional development grant from the Florida Department of Education. Additional grants were written for two subsequent years, with funds totaling $575,000 available for grant activities.

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Rating Criteria

In 1999, SEIR*TEC at AEL sponsored a competition to acknowledge school programs in the Southeast that represent best practices in educational technology. Twelve winners were selected by a panel of national experts and stories from each of these schools have been collected in the publication "Patterns of Promise." The program in Columbia County Schools was selected as a winner in this competition.

This story exemplifies the following practices:
Vision − School leaders must articulate a shared vision of how technology will be effectively used to support teaching, learning, and school management.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Canfield Avenue School (Elementary)

Canfield Avenue School (Elementary)

Mine Hill, NJ

School Type: Public	**School Setting:** Suburban
Level: Elementary	**School Design:** Traditional
Content Presented By:	
Edvantia	EDVANTIA

Demographics

Mine Hill, New Jersey is located 25 miles east of New York City. The comparative cost per pupil, as determined by the New Jersey Department of Education is $6,927. This is the lowest cost per pupil in Morris County. Canfield Avenue School has a total enrollment of 375 students.

Student Racial/Ethnic Composition:

- 4% Asian
- 7% African American
- 12% Hispanic or Latino
- 77% White

Limited English Proficient Students: 1%
Number of Languages: 6
Qualify for free/reduced lunch: 3%
Receive special education services: 8%

Background

The Mine Hill Township School District with the help of a community wide technology steering committee was able to evolve from a district that had a few old Apple computers to a district that features a networked environment with smart boards, laptops, a technology lab and science lab.

The District also provides programs in the evening for parents and students such as: Family Computers, Family Tools and Technology, and Family Internet.

Design &Implementation

Our philosophy is based on the premise that technology is a tool utilized to achieve our goals for students, staff and community. The steering committee needed to understand the value of technology in the learning process so that committee members could articulate the concept in the community.

The committee made a recommendation to the Board of Education so that the Board could incorporate the financial implications into the budget process. Thus, all elements of the school community were included in the technology plan.

Results

Canfield Avenue School is a U. S. Department of Education Blue Ribbon School and was named one of "America's Best Schools" by Redbook Magazine. The parental involvement program was named the best in the state by the New Jersey School Boards Association. The school has been recognized by the Computer Learning Foundation.

In 1997−1998, standardized test scores were among the highest in the country. The percentage of students in basic skills and special education classes has dropped from 30% to 8%.

Replication Details

We believe that when parents are on our side, schools can be more effective. But parent and community involvement does not just happen. It needs to be planned for.

Replication can begin with an assessment of the level of parent and community involvement and, of course, existing technology. Parents and community members need regularly scheduled meeting times, usually in the evening. Teachers should be provided with release time and stipends.

Costs and Funding

In order to establish a community wide technology advisory program, time and energy are needed. The actual financial investment is minimal. The Mine Hill program was a volunteer effort that consisted of parents and staff. Because the community was involved in developing our technology plan, it was more inclined to support our annual school budget, as well as a referendum in 1998.

The Mine Hill Township Board of Education supported our technology initiative and was represented by a Board member on our advisory program. Each budget reflected adequate funding for in−district and out−of−district professional development for staff. Volunteers helped to install our network and file server.

As the technology program began to develop, the district was successful in obtaining a number of grants. The Geraldine R. Dodge Foundation funded a unique proposal to establish technology−based alternative assessments in our fine and performing arts program ($15,000.). Bell Atlantic and the New Jersey Association of School Administrators funded a proposal to establish evening technology−based programs, taught by our staff, for parents and their children.

In 1998, our community approved a $4 million school expansion referendum that included a $200,000 technology component. As a result, Canfield Avenue School offers a technology center with 40 IMACS. Each classroom has at least one IMAC connected to the internet. Our science lab has an IMAC on each station and grade 5−6 students can use IBooks to complete assignments in and out of school. Finally, we have 10 smart boards in the building. Our 375 students have access to 264 computers.

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Rating Criteria

The Canfield Avenue School was nominated by the Appalachia Educational Laboratory (AEL), as a school that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.
Planning − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.

Deer Park Elementary School

Deer Park Elementary School

Centreville, VA

School Type: Public **School Setting:** Suburban
Level: Elementary **School Design:** Traditional
Content Presented By:
Edvantia

Juxtaposed between the gently rolling countryside of former farmland in Northern Virginia and the hustle and bustle of the nation's capitol, Deer Park Elementary School engages its faculty, 862 students, and their families in its mission of harnessing technology for the purpose of teaching and learning. Many of the parents who send their children to Deer Park are government or technology professionals who are fully aware of the new technology−based skills that are quickly changing workforce requirements. Opened in 1994 to ease overcrowding at two other Centreville schools, the school's principal, Lynne Pope, had a vision of establishing a "Total Technology School" and drew upon the resources and expertise of its teachers and parents.

Planning was key to realizing the school's vision to employ technology "consistently throughout the school's educational programs resulting in measurable increases in student achievement." The school established technology goals under the guidance of Diane Painter, Deer Park's Technology Resource Teacher, and a technology committee comprised of teachers from each grade level or special program. This committee works closely with the school's PTA to plan hardware and software initiatives.

The technology goals are closely aligned with the school's computer/technology standards and the state's recent Technology Standards of Learning (SOLs). While focused on curricular goals, the school's technology goals are also open−ended and encourage integration of appropriate technologies in teaching and learning. The technology committee members also continually monitor new and emerging technologies with an eye to the roles they may play in education. Closely linked to the school's technology goals are evaluation components. These goals are available on−line at http://www.fcps.k12.va.us/DeerParkES/techgoal.htm

Fairfax County Public Schools had a "Model Technology" program in place prior to Deer Park's opening. This designation emphasizes access to technology in Kindergarten through second grade. Deer Park extended its vision to include all students in all grades and has become a self−described "Total Technology School." All classrooms house four Macintosh computers with Internet access, TV monitor for classroom presentations, a laserdisc player, and VCR.

In addition, the school houses a computer lab, special education learning labs, and a media center with five student work stations. The media center has five Inlex stations that allow access to information about what resources are available throughout the school system and the county's public library systems. The entire school is networked and an NT fileserver allows teachers to work from any station throughout the building.

Technical support in terms of troubleshooting or instructional support to personnel comes from several sources. The full−time technology resource teacher (TRT) works with teachers and their students to create and implement technology initiatives that address curriculum areas. The part−time school−based technology specialist (SBTS) works with the technology resource teacher to provide troubleshooting support of hardware and software issues, as well as coordinate inservice training sessions. The school system also provides itinerant support for hardware and software issues the SBTS can not resolve.

Deer Park provides pedagogical support that capitalizes on the high level of access. With help from Painter and the technology committee, teachers from each grade set specific curricular goals and plan lessons that incorporate appropriate technology to meet these goals. All of the teachers at Deer Park are committed to integrating technology and all have developed technology−rich lessons.

The school also supports students and helps them to become familiar with complex software applications, such as spreadsheets and databases, through age−appropriate software and activities that focus on curricular goals. First−graders may use ClarisWorks for Kids to record their observations of local weather patterns and then create weather charts and bar graphs based on their own research. HyperStudio and ClarisWorks applications can support scanned pictures and create multimedia presentations to illustrate topics such as economic terms or famous historical figures −− covering skills similar to creating research papers, but in a more dynamic setting. Fifth−graders create spreadsheets that record purchases and calculate totals, as well as tax expenditures. In addition, the school sponsors an after school computer club for students wishing to develop web pages for the ThinkQuest Jr. competition.

Deer Park places special emphasis on teacher research projects to better understand the impact access to technology has had on teaching and learning. These projects are published in a variety of settings, including Web−based publications, and faculty members frequently present their findings at conferences. Says Painter, "These projects document the type of interactions, behaviors, skills, and learning that we see take place as children use technology." Better than scores from multiple−choice tests, the results from these research projects provide valuable lessons for teachers to reflect upon when integrating technology in their classrooms.

Early experiments with telecommunications projects taught Painter that not all schools have the access to technology or organizational skills to support these informative projects beyond the initial state of enthusiasm. While successful projects expanded Deer Park students' understanding of life in places such as Australia and other areas of the United States −− well beyond the limits of textbooks and videos −− the school also suffered through less successful pairings. Documenting interactions between students in the school's "Web Weavers Club" has helped teachers better understand the impact of collaborative learning and develop effective strategies to use when creating and implementing these projects in their own classrooms.

An early commitment to providing extensive access to technology for students and teachers has helped Deer Park effectively incorporate technology as a tool to support teaching and learning. Deer Park's supportive environment capitalizes on this access and helps teachers to face their curricular goals with a variety of appropriate tools. The school's technology plan focuses on curricular goals, but keeps an eye on new and emerging technologies that might impact education. The faculty, staff, and parents of Deer Park have helped the school's students face the challenges of developing the information literacy skills necessary to succeed in a technology−rich society.

Demographics

With a general population of approximately 800 students, there are 129 students with special assistance, 106 in the Gifted and Talented program, and 30 in the ESL program. The school is located in a suburban area of Northern Virginia. There are 48 teachers, 2 counselors, 11 instructional assistants, 2 principals, 5.5 office staff members and 6 custodians.

Student Racial/Ethnic Composition

90% White
3% Asian
3% African American
3% Hispanic or Latino

Limited english Proficient Students: < 3%

For more information on district statistics, see http://www.fcps.k12.va.us/about/stuach.htm

Background

Deer Park ES is a located in Fairfax County, Virginia. The district is one of the top ten school districts in the country. It is a large suburban district in Northern Virginia with a large population of ESL students in areas that are closer to the District of Columbia. Deer Park ES is located in a middle class area along the High Tech corridor of the county. Many parents are college educated with professions in the government or tech areas.

Deer Park Elementary School is proud to have opened its doors to students for the first time on September 8, 1994. The school is the people: staff members, parents, and students have worked cooperatively to support the school's academic mission and to establish traditions and programs.

Instructional staff members come from 28 different county schools and two graduate programs. One strength coming from this diversity is the wealth of ideas that enrich instruction, including theme days, Illumination Celebration, Colonial Days, and Winter Gifts choral program. In addition, curriculum committees sponsor schoolwide events such as Family Math Night.

Community members have helped to establish a school climate in which working together is valued. Our PTA has fostered family involvement by sponsoring open house and family dance socials, skating parties, a Reflections arts program, and Computer Night. Parent volunteers are also welcomed in the classroom, media center, and instructional materials production center. We have also received support from scouting groups, through troop volunteer time and Eagle Scout projects, and from SGA leaders from the high school.

Students are creating school traditions, too. A chorus of more than 150 students practices weekly for two major performances. The safety patrol force of 80 helps all students arrive safely each day. The SCA, representing students in grades three through six, has conducted the vote for school colors and a mascot, sponsored the Big Help Day, and collected canned food.

From anchors to camera crew, students produce a daily TV news broadcast, "DPES." Deer Park holds the promise of the future children who are well educated in the core subjects, who have technology as their tool, and who value old−fashioned teamwork. Our after school computer club is comprised of ThinkQuest, Jr. web teams. Our scores on the VA Technology Standards of Learning (SOL) ranges from 96−97% passing rate each year.

Design &Implementation

Staff members and community members worked together along with the school district administration to state the Mission and Goals of the school when it was founded. Each year a theme is chosen and specific areas of focus are stressed These areas are highlighted during curriculum night presentations to parents. Staff inservices address the theme and areas of focus. The planning for these activities is done through staff/parent committees, such as the Language Arts Committee, Math and Science Committee, etc.

The mission of Deer Park Elementary School is to provide programs to meet the educational needs of all students, while focusing on the development of the whole child. In a safe and nurturing environment, all students will have learning experiences that

- encourage them to be independent, lifelong learners
- develop critical and creative thinking
- stimulate risk−taking
- use critical thinking and problem−solving strategies

We promote respect of all individuals and strive to meet the needs of individual learning styles. The school is a model technology school, using technology as only one tool for learning. For the school year 2000−2001, "science" is an emphasis with the theme "Learning Lights the Way."

Each staff member writes three goals each year designed to demonstrate how he/she will individually strive to meet the school's mission, goals and objectives. Members work on grade level teams to design and carry out programs that address the curriculum and learning objectives as stated.

In addition, the school has a technology committee with representatives from each grade level or special program that also monitors progress toward technology goals and objectives. Finally, there is a Teacher−Research Team (TRT) whose members investigate various areas of learning and report back to the staff their findings at an end−of−the−year Round Table research presentation session which is usually held in May.

Results

In order to assess instructional programs, standardized tests are administered each year and are available on the county web site at http://www.fcps.k12.va.us Click on Index to search for specific reporting areas.

Teacher−Research findings are reported on the web page for Deer Park Elementary School. Go to http://www.fcps.k12.va.us/DeerParkES and follow the links to Teacher−Research.

Replication Details

Technology and subject area committee members meet once a month on an early release Monday afternoon. The committees are comprised of grade level teachers and specialists.

The technology committee has four sub−committees: software, hardware/grants, inservice, and Computer Club. The Teacher−Research Team members meet monthly for a half−day session. Deer Park ES usually has between 6 to 12 members each year on this team. Members comprise specialists and classroom teachers. Grants must be written to find substitutes for teacher−research members to be released from teaching responsibilities in order to meet.

Costs and Funding

Funding to support teacher−research comes from a series of grants that are awarded to teams conducting site−based research. Grants have been received from the National Council of Teachers of English (NCTE), the Virginia Association of Teachers of English (VATE), and several Impact II grants.

Fairfax County Public Schools also funds teacher−research through the Teacher−Research Network which it supports. This network supports a yearly conference where teacher−researchers from all over the county present their findings and hear a key−note speaker (teacher−researcher) address site−based research. The county also supports a countywide teacher−research web page. Go to http://www.fcps.k12.va.us and click on Index and the letter T and follow the links to teacher−research. This conference is also supported by the Greater Washington Reading Council and the Northern Virginia Writing Project at George Mason University.

Approximately $1200 to $2,000 is spent on substitutes for Deer Park's Teacher−Research Team each year. An additional $200 for dissemination and research materials is usually needed. To attend the annual countywide conference, the cost would be approximately $20 per person.

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Rating Criteria

Deer Park Elementary School was nominated by the Appalachia Educational Laboratory (AEL), as a school that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Access − School leaders must ensure equitable access to current hardware, software, and connectivity that supports instructional goals.
Support − School leaders must ensure that a technical and pedagogical support system exists that facilitates the use and maintenance of technology in their schools.
Planning − School leaders must play a central role in the cyclical development, assessment, implementation, and revision of school technology plans.

The Nueva School (Elementary)

The Nueva School (Elementary)

Hillsborough, CA

School Type: Private	**School Setting:** Suburban
Level: K−8	**School Design:** CSRD/Other Non−Traditional
Content Presented By: Edvantia	EDVANTIA

Nestled between "Silicon Valley" and "Internet Alley," the Nueva School tackles some of the tough issues of Internet use by educating parents and students about this resource. This P−8 school serves 310 gifted students from the San Francisco Bay Area.

The Nueva School is committed to open, unfiltered access to information and educates parents about Internet use and its application at the school. This program, "Parent Internet Driving School," began as a two−hour workshop with an hour of introduction to educational applications of the Internet followed by an hour of hands−on use.

In 1996, the Nueva School developed an Acceptable Use Policy (AUP) that supports the principles of its Library Selection Policy. The Nueva School does not use textbooks and develops curriculum yearly to fit the wide interests and needs of gifted students; therefore, the Internet is a necessary extension to the resources in the school's library. The AUP subscribes to tenets of the Library Bill of Rights, which states that, "A person's right to use a library should not be denied or abridged because of origin, age, background or views."

The school also offers extensive Web−based resources created by students, staff, and parents, and offers e−mail accounts to members of these communities. The Nueva School's "Parent Internet Driving School" introduces parents to information technology and its value in supporting the school's curricular goals.

The library and technology staffs −− now the Technology, Library, and Curriculum Department (TLC) −− developed the program to help parents advance their own skills in our increasingly technology−rich world. When they come to these education opportunities, parents also learn more about the school, its curriculum, and its AUP.

The Nueva School does not teach parenting skills, but it provides the opportunity for parents to become more familiar with the ethical and legal issues facing their children in a networked society. This information helps parents discuss and make "techno−parenting" decisions.

Parents also gain a better understanding of the potential and suitability of Web−based applications for collecting and analyzing data, as well as supporting collaboration and mentoring. Debbie Abilock, the TLC Department Coordinator says, "In a information−driven driven world where four−thousand hits from a search engine is considered a 'manageable' result, parents are being expected to both supervise and guide their children without much support or advice. This generation of children are multitasking 'technology optimists' who believe that they can skim the 'Net to get all the answers they need, while their parents have −− more or less readily −− adapted to these new technologies, while finding themselves still more comfortable in the print world."

The success of the school's programs has increased technology use and supported an increase in staffing of the TLC Department. Providing all staff with a computer for their use and creating three wireless "labs" of laptops −− about 60 computers −− has been they key element in the development of technology−rich curriculum. All teachers integrate technology into their teaching, and even teachers who might not have used computers a few years ago now want additional training to support their curricula. Requests for additional training and for time to collaborate with the staff have grown exponentially.

The Nueva School relies heavily on student portfolios and products, such as Web pages or software−based projects, as assessments of student learning. "Alternative products are no longer seen as frills but as authentic demonstrations of complex learning," says Abilock.

Increased familiarity with networked technology has also opened new lines of communication between the school and families, while providing unique opportunities for parents to volunteer. Parents have demanded additional topics for the Driving School and parents now operate school−related Web pages that inform and collect input from all participants through the school's network, NuevaNet. The parent section of the school's Web pages conduct surveys on issues like homework and diversity while providing electronic hot lunch sign−up and information on learning differences.

As parents gain confidence with their own Internet skills, they can also better understand and support the curricular requirements placed upon their children. Homework assignments are posted on−line and teachers e−mail letters about ongoing classroom events and curriculum that might contain pictures or media clips of work being done in school.

Methods of supporting acceptable Internet use remain a source of contention at many schools. Local and federal policymakers and legislators continue to propose a variety of methods for curtailing unacceptable use. The Nueva School demonstrates a successful process of education and communication that relies heavily on parent involvement. Abilock states, "Only in partnership with parents could we hope to develop a strong sense of ethical and responsible behavior with our students."

Demographics

The Nueva School is located about 16 miles south of San Francisco and 25 miles north of San Jose in Silicon Valley. The school draws approximately 310 gifted students from the San Francisco Bay area. It is located along 280, the major north−south Peninsula highway, in a residential town called Hillsborough.

Student Racial/Ethnic Composition:

8% Asian
1% African American
1% Hispanic
74% White
16% Multiracial

Limited English proficient students: 1%
Receive special education services: 10%

Background

As early adopters of technology who volunteered to wire the entire school for the Internet in 1996, our library and technology staff felt that schoolwide education about this medium was essential. Our AUP http://nuevaschool.org/~debbie/library/policies/aup/NNAUPp1.pdf was written to mesh with and support the principles in our Board−approved Library Selection Policy, which references the American Library Association's Library Bill of Rights and its interpretations.

We have always been committed to open, unfiltered access to information in this Pre−K through 8th grade school, and believe that the best support for this is an educated parent body. This belief formed the basis for the design of our initial "Parent Internet Driving School" classes http://nuevaschool.org/~debbie/library/parent/pids.html

Over time the need for and design of training has changed. Currently we are trying to support an active group of parents who are learning to maintain the Nueva Parent Association Web pages. Their section of our Web site includes a FileMaker database for hot lunch orders, online Nueva Notes (a weekly communication tool about issues and events at the school), and survey forms through which parents can register their opinions about parent math education classes and the design of the summer school program.

By design and of necessity, parent education has always been a strong component of the school's culture. Curriculum at the school is designed, delivered and evaluated yearly by the staff. It is important for parents to understand the school's educational philosophy, and gain information about the curriculum and assessment procedures which are, in most cases, different than the education that our parents experienced as students.

In addition, parent volunteerism is high. There are opportunities for parents to help in classrooms, to help with programs such as the Book Fair, the Math/Science/Technology Fair, fieldtrips, and fundraising events. Literary Clubs are composed of small groups of students led by trained parent−volunteers who meet weekly to discuss literature (see http://nuevaschool.org/~debbie/library/reading/reading.html). All students in grades 2−8 are involved. Family Math brings parents to school with their children to learn to use manipulatives and other math tools together. In each of these cases, as parents become more involved in the school community, the need for training grows.

Design &Implementation

According to a 10−year study of high school students, parents are one of the most critical influences on a teenager's performance in school. However, many of the parents in the study did not know what their teenagers did after school hours or how they were progressing in school, and 40% of them had never attended a school program.

"Parent Internet Driving School" was designed by both library and technology staff to educate parents about the value of online resources and projects to Nueva's constructivist educational program. As a school without textbooks, the materials and resources available online are essential. Recently we have added three carts of wireless computers, spread equally across the campus. Access has become widespread and uses of technology are growing exponentially. As our society continues to raise questions about the value of technology for young children and the supervision of children online, we find that the need for communication with and education of parents has not abated. It has become clear that we will always need to plan for a strong partnership between home and school.

These years of working together on common goals has brought the library and technology staff into a powerful alignment. This year (2000−2001) we have integrated staff and budgets into a new department called "TLC" (Technology, Library and Curriculum Department). The goals of our newly created department are: communication, curriculum integration and innovation, professional development and teacher support, and delivery of resources.

Telecommunications has become a bridge between our homes and the school, inviting working parents into the school in new ways. Weekly e−mail letters with photos or I−movies from our teachers to the parents of students in their classrooms and regular reports from Middle School Advisors to the parents of their advisees are common communication devices. Our homework assignments are online and can be accessed by students who are sick or parents who want to keep abreast of their child's homework load.

New challenges are being raised by our extensive use of wireless laptops. The school has become the library with access to resources everywhere. The need to teach students sensible behavior online is acute; only in partnership with parents could we hope to develop a strong sense of ethical and responsible behavior with our students.

We tailor the content of the parent education program to fit our curriculum and Acceptable Use Policy. However, because NuevaNet does not use any filtering software, we feel it is important to explain our policies and practices, as well as the American Library Association's Intellectual Freedom statements. Further, Nueva has always supported e−mail accounts for children. But offering access without discussing "techno−parenting" strategies, or even providing information on the pros and cons of software filters for home use, does not provide enough support for parents to do their job in a society permeated by technology. Our workshops allow time for participants to discuss parenting strategies in order to learn from each other.

Another of our goals is to acquaint parents with examples of how the Internet is integrated into our curriculum. We take them through examples of how teachers have used NuevaNet for their projects. Examples of such projects are:

- **Turn−of−the−Century Child** − created by a humanities teacher and librarian, as American Memory Fellows at the Library of Congress
  http://nuevaschool.org/~debbie/library/cur/20c/turn.html
- **Global Warming; Science and Society** − a simulation developed by a science teacher and the librarian
  http://nuevaschool.org/~debbie/library/cur/sci/gw/globalwarm.html

Currently we are at work on a series of lessons to teach "Habits of Mind," including visual literacy and Web evaluation skills (see http://nuevaschool.org/~debbie/hom/habits.html).

By showcasing the unique suitability of the Internet for information/data collection and analysis, collaborative problem solving, information literacy and mentoring, parents grow to understand the value of the Internet to our school, to their children, and to their own lives.

During the second hour of our Driving School, parents begin to explore a series of bookmarks on subjects we believe will be of interest. We point out each child's work on our Web pages, as well as The Nueva Library's research help pages and the fee−based resources to which we subscribe. One hour's "drive" in a lab will not turn novices into competent computer users. However, Parent Internet Driving School creates a bond and a common understanding among the staff and parent members of our school community.

Results

We have doubled the number of computers in the school this year, increased TLC staffing, and provided every teacher and staff person with either a desktop or laptop computer. The most obvious change is in the school's climate −− all teachers, not just the risktakers, are experimenting with the use of computers in their curriculum and for personal or professional uses. Questions, requests for additional training, and offers of parent expertise to support this infusion of technology are pouring in.

As a school with no grades and few tests, the results in terms of student learning will be judged by the quality of our students' work −− their portfolios, performances and products. We will track the professional growth of teachers and their infusion of a variety of appropriate technology uses into their classrooms.

Replication Details

Here are some tips for planning parent education workshops:

1. Make sure you have the support of both the administration and the people with whom you will teach, including the systems administrator.
2. Brainstorm an outline of the workshop with team members to decide what could be taught.
3. Share the content and structure of what you will teach with other members of the team, so that anyone can teach any section of the workshop in the event of illness.
4. Brainstorm the checklist of responsibilities and let your team members choose their roles. The person who has to leave early may want to sign−up parents in advance, photocopy handouts, put up notices, or come early to set up equipment.
5. Schedule the workshops when parents will be at school for parent conferences or for other events, or when their students are in classes.
6. Set aside time after the event for evaluation. Take notes on what worked, what needs follow−up, and what you forgot to include on the checklist.
7. Don't forget to report back to your administrator. It's a chance to demonstrate productive library/technology/teacher collaborations and garner support for your next project.
8. Teaming to implement a parent education workshop with a common goal forms bonds which transcend any particular event. You are laying the groundwork for more complex and valuable exchanges with fellow educators and with your parents, who are partners with you in the education of their children.

Costs and Funding

The original Internet wiring project was a volunteer effort by teachers and parents. Initially, the school supplied $2000 to purchase Category 5 cable to wire the school.

The school received a $90,000 grant from the Peninsula Community Foundation, which enabled us to provide the initial online training of an equal number of our own teachers side−by−side with teachers from other schools. Parent Internet Driving School has always been taught by staff volunteers.

The initial purchase of equipment was made possible by matching donations from parents in technology companies. This year the school will spend over $650 per child for technology equipment, plus staffing costs.

The Technology Library Curriculum (TLC) Department consists of the following personnel:

- Technology, Library, Curriculum Coordinator
- Two Technology Integration Specialists, one of whom is the Network Administrator
- Assistant Librarian
- Part−time cataloger
- Technology Assistant
- We are in the process of hiring one additional assistant.

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Rating Criteria

The Nueva School was nominated by the Appalachia Educational Laboratory (AEL), as a school that demonstrates excellence in technology leadership for K−12 education.

This story exemplifies the following practices:
Ethical and Legal Issues − School leaders must model and promote an understanding of ethical and legal issues related to the use of technology.

Maine School Administrative District #11

Maine School Administrative District #11

Gardiner, ME

School Type: Public

School Setting: Rural

Level: K−12

School Design: Traditional

Content Presented By:

The Education Alliance at Brown University

Walk through the schools in Maine's School Administrative District #11 (MSAD #11), and you'll see second graders using HyperStudio software to create multi−media science slideshows; middle school teachers reading the minutes of a committee meeting posted online; ninth graders giving Power Point presentations for their "Career Essentials" class; and twelfth graders working toward their certification as network associates through the Cisco Networking Academy. Technology is an integral part of education in this district in central Maine; it has improved the efficiency of school management and had a major impact on how, as well as what, students learn.

The schools of MSAD #11−−serving the towns of Gardiner, West Gardiner, Pittston, and Randolph−−have not always been a model for educational technology. When Jack Mara left his post as principal of Miller Elementary School in 1994 to become Assistant Superintendent for the district, he knew he had his work cut out for him. His new district had been a bustling blue−collar community of shoe and textile factories, but over the years most of the industries had left, dragging the tax base of the area into the lowest fifth in the state and leaving few job opportunities for new high school graduates. Furthermore, a number of parents in the district were concerned that their children were not receiving the education they needed; Gardiner area schools received some 50 requests a year from parents who wanted to move their children to another district. However, the district was also filled with committed teachers and administrators, as well as concerned community members, all seeking to improve the education their students received. For Mr. Mara, who quickly rose from Assistant Superintendent to Superintendent, one key response to these problems−−and one way to direct the energies and talents of these educators and community members−−was the strategic integration of technology into the curriculum and daily operations of his schools.

As a high school English teacher and newspaper advisor in the 1970's, Mara had caught a glimpse of how technology could open doors for students at all levels. He noticed that working on the student newspaper−−one of the first in New England to be created on computers−−not only challenged high−achieving students but also engaged previously low−achieving students, who were excited to see their words on screen, and later, in print. "Kids who otherwise had very little interest in writing were all of a sudden taking great pride in what they wrote and great pride in putting a paper together," he remembers. A few years later, Mara watched his five−year old son, who previously had shown very little interest in reading, decipher the words on a computer screen in order to create his own on−screen designs. These initial experiences made it clear to Mara that technology could be a valuable tool in motivating and teaching students. As principal of Miller Elementary School, he also came to see its value as a resource for school management. Once he began to work at the district level in MSAD #11 and consult with local business leaders, Mara became convinced of another important role for technology in the schools: the preparation of students for the modern workforce.

This three−tiered vision of technology integration helped to guide the work of teachers and administrators at the district, but they needed more than just vision. First, they needed money. In 1994, none of the schools in the Gardiner area district were wired for Internet access and none had enough computers or up−to−date software for wide−scale student and teacher use. Furthermore, the district was among the poorest in the state. Despite this financial challenge, however, the people of the community pulled together to help equip their schools with the latest technology. Using materials donated from local businesses, Mara and a team of teachers, administrators, and other community members volunteered numerous hours for little or no money to wire all the schools in the district. Some members of the team also helped him write grants to fund new hardware, software, and professional development. Now the district's technological infrastructure and equipment are maintained by a district technician, district technology director, middle school integration specialist, and high school video production teacher, as well as technologically proficient teachers, parent volunteers, and high school students.

Once the development of its technological infrastructure was underway, the district also needed to build the technological skills and commitment of its staff. While a number of teachers and administrators in Mara's district already viewed technology as a useful tool for improving student learning, others saw computers in the school as distractions from real education, too inaccessible or unreliable to spend valuable time learning about. Changing these attitudes has been a gradual process, possible largely because of the persistence of committed administrators and the concrete examples of effective technology integration offered by teacher leaders like Debra Butterfield−−who uses the laptops provided by a statewide initiative to ensure that her seventh graders receive an engaging and technologically rich education aligned with Maine's new standards−−and Megan Hennerlau, who uses software like Inspiration and HyperStudio to help her fifth graders examine complex problems and explain them in logical and graphically exciting ways. "If you have exceptional teachers who are successful using technology, but they don't have the support of administrators," Mara explains, "technology can never be fully integrated because administrators are the gatekeepers for everything."

At the Gardiner schools, administrative oversight of technology integration takes the form of both support and gentle pressure. The support begins with professional development. The district provides extensive, ongoing professional development offerings, with the assistance of the Northeast and the Islands Regional Technology in Education Consortium (NEIRTEC). NEIRTEC workshops, many of them offered online, have encouraged the collaboration of teachers and administrators and fostered the creation of numerous technology−infused lessons and units, as well as new instructional and assessment techniques. (See the story on Karen Moody's second grade classroom in the Good Models of Teaching with Technology spotlight.)

However, administrators do not simply ask their teachers to attend technology workshops and hope that these workshops will inspire new forms of teaching and learning. They also model the value of building personal technology skills−−Mara is now completing his Ph.D. in Educational Technology at Nova Southeastern University−−and hold teachers accountable for gradually integrating technology into their practice. Now teachers district−wide are required to create a technology goal based on NEIRTEC's "Good Models of Teaching with Technology" (GMOTT) as part of their yearly evaluation. With the help of Technology Director Terry McGuire, Middle School Integration Specialist Lisa Foster, and teacher leaders willing to share their strategies for technology integration, more and more teachers who were reluctant to experiment with technology are finding that they can meet this expectation. In fact, all the seventh grade teachers in the district recently volunteered two days of their summer vacation to participate in a professional development workshop to prepare for the new statewide laptop initiative−−a sign not only of district faculty's commitment to their students but also of their sense that technology integration is a worthwhile means of enhancing learning.

According to McGuire, teachers have responded best when technology is introduced gradually into the classroom. She suggests "starting out on a smaller scale," not overwhelming teachers with big projects but helping them adjust gradually to spending time in the computer lab with their students, discovering first−hand how technology can enhance learning. Another strategy the district has found helpful is to embed technology use in the normal operations of its schools. As principal of Miller Elementary School, Jack Mara learned that if he required teachers to submit their classroom budgets on a disk instead of paper, they would learn quickly to use computers. Foster has applied a similar principle at Gardiner Regional Middle School, where an electronic communication system has helped to build a sense of community while also demonstrating to staff the usefulness of technology. She has set up a series of electronic conferences that allow teachers to share information about their teams or committees, announce events happening in the school, sign−up for time in the computer lab, request that jobs be done by the custodial staff, and express gratitude and congratulations to other staff members for tasks that they do. "It's become an expectation that people go in there and find out what's going on in the school," Foster explains, "so if you don't it comes back on you when you have missed a deadline or you don't know what's going on." She has also created a conference for homework, so teachers can post homework assignments for students and parents to access through the Web. District−wide, Web pages and e−mail are also facilitating easier communication between teachers and parents.

While developing teachers' skills and interest in technology integration is a priority for the Gardiner technology program, community partnerships have also played an important role. When he came to Gardiner, Mara found a core group of skilled teachers and administrators who shared his vision of technology integration and were willing to promote it in their schools and in the larger community. They found a community that was not only supportive of the district's technology initiatives but also quite helpful in shaping and implementing these initiatives. Local business leaders have offered advice and funding for the design of a "Career Essentials" course at the high school. Parents with technology expertise regularly volunteer their time to assist elementary school students and teachers with the use of computers. The school board has provided thoughtful guidance throughout the whole process. In fact, support for the new direction the district has taken can be felt even beyond the immediate community. Now, instead of losing 50 students a year to neighboring districts, MSAD #11 attracts 64 students from other districts, which pay their Gardiner tuition.

MSAD #11 has clearly succeeded in integrating educational technology into its classrooms. Grants have helped to maintain a state−of−the art technology infrastructure in the district. Except for the high school, all schools in the district are now equipped with ports for wireless Internet access, and thanks to a recent statewide initiative, all seventh graders and their teachers now have their own laptops. In addition to its sophisticated video production equipment, the high school is one of only a few schools in the nation to house a fully−equipped ATM (asynchronous transfer mode) lab for two−way, real time video communication and data transmission. These cutting−edge resources do not go to waste. According to Superintendent Jack Mara, the vast majority of teachers have their students use technology "weekly if not daily" to enhance their learning. The ATM lab allows Gardiner students to take courses in Japanese and American Sign Language that are broadcast from other schools in Maine and to participate with other Maine students in the production of an online literary magazine. Students at the high school, under the guidance of Video Production Teacher Rob Munzing, have won three first place awards in Panasonic's national Kid Witness News Competition in the last five years. Other students participating in the Cisco Certified Networking Academy will graduate from high school ready to work as certified network associates. For those not interested in such specialized training, the three−semester "Career Essentials" course required for all ninth− and tenth−grade students ensures that they will all be proficient users of the latest software for research, writing, and giving presentations.

MSAD #11 has earned national recognition for its success with technology integration and regional recognition for its overall improvement. Most recently, it was identified as a national leader in educational technology by the Educational Development Center (EDC) at Harvard University and was chosen to participate with EDC in a federally funded online staff development program. The high school was also moved from "warning" status with the New England Association of Secondary Schools and Colleges (NEASSC) to full accreditation, and two of its elementary schools were recognized with a "Making the Grade" award from the Maine Board of Education. Nevertheless, according to Technology Director Terry McGuire, the district still has a great deal of work to do. Teachers and students at the district are becoming increasingly adept at using technology. The next step for MSAD #11, she says, is to help guide teachers toward using it as a tool for "higher order thinking." Another challenge is to help teachers become more independent in their planning and implementation of technology−integrated lessons, relying less on technology specialists and taking advantage of more of the district's professional development offerings. McGuire and district technology mentors will also work to spread the "hotbeds of technology use" in schools and classrooms throughout the district so that all students can benefit regularly from the best learning opportunities that technology can offer. Ultimately, district and school leaders hope that teachers will continue to develop technology−rich curricula to improve students' reading, writing, and math skills as well as prepare them for the demands of the modern workplace.

Demographics

Maine School Administrative District #11 (MSAD #11) is located in the towns of Gardiner, West Gardiner, Pittston, and Randolph, all part of Kennebec County. The population of this mostly rural region is approximately 15,500, about 3800 of whom are under 18. Kennebec County is overwhelmingly white, with a very small percentage of Latino and Asian residents and an even smaller percentage of African−Americans, American Indians, and Pacific Islanders. Average income in the region is low; its tax base ranks in the lowest fifth for the state.

District Statistics*

- Number of schools: 6 elementary schools, 1 middle school, and 1 high school
- Total student enrollment: 2450
- Students enrolled from other districts, which pay their Gardiner tuition: 64
- Students who receive free or reduced lunch: 40%
- Students enrolled in special education programs: 20%
- Ethnic Background of students: 99% white, .01% African−American, .003% Hispanic, .006% Asian, .007% American Indian
- K−8 Per Pupil Expenditures for District (2000−2001): $4691
- For State: $4918
- 9−12 Per Pupil Expenditures for District (2000−2001): $5395
- For State: $5702
- Graduation Rate (2000−2001): 81%
- Intent to Enroll in Post−Secondary Education (2000−2001): 57%

*All statistics are for the 2001−2002 school year, unless noted.

Background

In the early 1990's, the Gardiner area schools were struggling. They suffered from a poor reputation with parents, and the curriculum and infrastructure of the schools reflected almost none of the technological advances of the past two decades. Graduates of Gardiner Area High School, many of whom had no plans for further study, were entering the workforce with few of the skills that the modern market required. When Jack Mara joined the district in 1994, first as Assistant Superintendent and later as Superintendent, he brought with him a vision of how educational technology could help to solve these problems, and he joined with a team of teachers and administrators to make this vision a reality.

Design &Implementation

The district's technology initiative began when a small group of teachers and administrators united around a common vision of technology integration that they started spreading to their colleagues and the larger community. District leaders applied for grants and asked for contributions to support the purchase of appropriate hardware and software, the wiring of school buildings, and the professional development of teachers. Administrators then began to embed technology use in the daily activities of school staff in ways that simplified their lives and supported their professional goals. The district also provided ongoing professional development opportunities that allowed teachers to practice using technology to help their students learn; in conjunction with this effort, teacher leaders modeled good uses of instructional technology for their colleagues. In addition to the technology−infused curricula being developed by individual teachers, high school and district leaders developed a comprehensive, mandatory "Career Essentials" technology course for all ninth and tenth graders to familiarize them with the technology they would be using in school and, possibly, at work, for research, writing, and presentations.

As they spread successful technology−infused instructional reforms district−wide, teachers and administrators continue to share their vision of technology integration with parents, community leaders, and the school board, demonstrating the value of technology as a learning tool and its usefulness in preparing students for the modern business world. District staff also continue to build and maintain partnerships with local and international businesses to support effective student and teacher use of technology.

Results

The positive changes at MSAD #11 since the mid−1990's are due to a variety of factors, only one of which is the initiative for technology integration. Thus, while some of the results listed below focus specifically on educational technology, others reflect the efforts of district educators and community members on a number of different fronts.

- No parents now transfer their children to other districts; 64 students from other districts now attend MSAD #11 schools
- District identified as a national leader in educational technology by the Educational Development Center (EDC) at Harvard University
- Most schools in the district equipped with ports for wireless Internet access
- Most classes use technology weekly or daily to enhance their learning
- "Career Essentials" course required for all ninth− and tenth−graders ensures proficiency in the latest software for research, writing, and presentations
- ATM (asynchronous transfer mode) lab allows high school students to take courses in Japanese and American Sign Language broadcast from other schools
- High school students have won three First Place awards in a national video production contest in the last five years

- High school now fully accredited by New England Association of Secondary Schools and Colleges (NEASSC)
- Two elementary schools recognized by State Department of Education for "Making the Grade"

Replication Details

The following tips from MSAD #11 might be helpful to educational leaders seeking to integrate technology into their schools or districts:

- Choose hardware and software that lends itself to novice users. Simple applications for storing data, designing curriculum, and presenting information will reduce frustration among teachers, administrators, and students and build their confidence in the usefulness of technological tools.
- Invest heavily and wisely in ongoing staff development for technology integration.
- Make the use of technology fun. Provide teachers and administrators with technological skills and knowledge they can use for their own enjoyment, not just for the completion of school tasks.
- Make technical capacity an issue in every new job interview, whether hiring a band director, a science teacher, or a literacy specialist.
- Don't try to find shortcuts; effective and enduring technology integration takes time.

Costs and Funding

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Rating Criteria

This story exemplifies the following practices:
Vision − School leaders must articulate a shared vision of how technology will be effectively used to support teaching, learning, and school management.

Support − School leaders must ensure that a technical and pedagogical support system exists that facilitates the use and maintenance of technology in their schools.
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.
Community Relationships − School leaders must develop strategic community relationships that foster collaboration in planning, implementing, and assessing the use of technology in schools.

Louisiana's America2000 Technology Innovation Program

Louisiana's America2000 Technology Innovation Program

Macon Ridge, LA

School Type: Public

School Setting: Rural

Level: K−12

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

Demographics

Macon Ridge, Louisiana is a rural area spread out over 150 square miles in the northeast corner of the state. The region is home to five of Louisiana's poorest counties—or parishes, as they are known locally: Catahoula, Concordia, Franklin, Morehouse, and Tensas. The United States Department of Education (USDE) has designated Macon Ridge as a high−poverty area.

Poverty, school dropout, and teen pregnancy rates are among the highest in the state. Unemployment for the five districts typically hovers at 10% or more, with much of the employment opportunities being seasonal and related to agriculture or the oil industry. Cotton, corn, and lumber are the dominant industries.

Of the 16,200 students, 71.3% qualify for the free/reduced−price lunch program, 54.6% are African American, and 45.2% are white.

Background

Beginning in 1994, members of the Concordia Parish school staff, including Personnel Director Leinda Peterman, won grant money that enabled them to purchase limited computer equipment and install 56K lines for high−speed Internet access in selected schools in Macon Ridge, Louisiana.

Excited about the potential for technology to provide access to resources that were otherwise unavailable in their rural system, the staff wanted to find additional ways to wire classrooms, provide broadband access, and train teachers. Libraries were limited or non−existent in many of the schools, and wiring the buildings was a way to break down barriers.

Looking for ways to enhance professional development in technology, Peterman sought out other districts with similar characteristics and needs in Macon Ridge. She found an opportunity to expand an existing partnership between Catahoula and Concordia Parish (County) School Systems. Those two districts asked three other districts to join them in applying for the America 2000 Technology Innovation Challenge Grant, a multi−million dollar grant offered through the United States

Department of Education's Office of Educational Research and Improvement. Online professional development (OPD) was a key part of the proposal. The Macon Ridge group received the grant in 1998.

Today Peterman heads the America2000 Technology Innovation Challenge Grant for the five parishes that comprise Macon Ridge, and the grant is in its fifth year. The project has been approved for a sixth year but with no additional funding.

America2000's online professional development program evolved into a national training model that is now used in other districts. The new program, known as EdTech Leaders Online ?(ETLO) is implemented by the Education Development Center (EDC) in Massachusetts and funded in part by the ATTFoundation. EDC cites Macon Ridge as a success story precisely because it integrates the online work into a complete professional development plan.

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Design &Implementation

In Macon Ridge, Louisiana, the America2000 grant supported online professional development for teachers through the EdTech Leaders Online (ETLO) program, which is implemented by the Education Development Center (EDC).

1. The EdTech Leaders Online (ETLO) program is a train−the−trainer, capacity−building program for teams of local participants from school districts, regional service providers, state departments of education, or teacher−training institutions.
2. The teams are trained in semester−long online courses to facilitate online workshops, developed by EDC, on integrating technology into the curriculum (Facilitating and Implementing OPD), or to develop their own online workshops for teachers or high school students (Online Course Design Program).
3. Teams can range in size from a minimum of three participants from a single school or small district, trained in a cohort with four to six teams from other educational organizations, to a full cohort of 24 participants from a single, large organization such as a big city, a consortium of school districts, a state department of education, or a university.
4. The EDC online workshops are project− and standards−based and include six sessions of one to two weeks. Some of the workshops are focused on specific grade levels and subject areas, such as Using Technology to Support Literacy Development in Primary−Level Classrooms, and others address the needs of teachers and administrators across grade levels and curricular areas, such as Approaches and Tools for Developing Web−Enhanced Lessons.
5. Participating teams facilitate the EDC workshops or the workshops they have designed for teachers, administrators, or students in their schools or educational organizations. These workshops begin in the year following the training program.
6. EDC works closely with each participating team to develop and manage their local online programs and provide ongoing support, in online specialist forums, to the trained facilitators and course developers.
7. These national forums foster ongoing, collaborative communities of trained online professional development (OPD) specialists. One important lesson learned from this work is that OPD works best when it is integrated carefully into ongoing local programs and combined with face−to−face opportunities.

The following equipment was provided to each teacher in Macon Ridge, Louisiana:

- A multimedia PC for the classroom
- Printer
- Updated software, including MS Office
- TV with computer capability
- VCR/Camcorder
- Digital camera
- High−intensity overhead projector
- Internet connections provided by A2K

The following equipment was provided to each school in Macon Ridge, Louisiana:

- Internet connections (provided by A2K)
- 5 multimedia PCs in a project room for content−area teachers? use with students
- TV with computer capability
- High−intensity overhead projector
- VCR
- Printer(s)
- Video−editing equipment

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Results

During the 2002−03 academic year in Macon Ridge, Louisiana, online professional development was delivered to 310 teachers, with 14 workshops offered through the EdTech Leaders Online (ETLO) program by the Education Development Center (EDC).

Now in the fifth year of the program, the original group of Macon Ridge teachers is taking over the facilitation of the courses altogether. They are also working with EDC's Center for Online Professional Education (COPE) to expand the range of online course offerings. The clear goal is local capacity building, as district staff grow into online professional development specialists who serve as resources for their own communities.

Positive results can be seen in evaluations of classes taught by teachers who participated in online workshops through ETLO. Classroom observations by external evaluators are conducted annually to determine implementation levels. The purpose is to determine technology applications and student and teacher skill and comfort in using techniques learned during professional development. A pre−/post−project comparison study is underway.

Evaluators visited 61 classrooms in 1999−00 and an additional 60 in 2000−01. Of the 61 classes observed, 36, or 59% of the lessons, were rated as satisfactory on the 45 attributes assessed during the teaching/ learning process. Fifteen, or 24.6% of the lessons, were found to exhibit satisfactory and/or exemplary performance, while 10, or 16.4% of the classes, exhibited the need for achievement of certain indicators assessed within the lesson.

Replication Details

In Macon Ridge, Louisiana, the America2000 grant supported online professional development for teachers through the EdTech Leaders Online (ETLO) program, which is implemented by the Education Development Center (EDC).

To those who wish to develop an online professional development program (OPD), EDC recommends the following:

- Assess local professional development needs and develop an OPD plan based on these needs.
- Connect OPD with other ongoing, face−to−face professional development activities.
- Carefully select and train OPD−specialist team members.
- Build a strong local team.
- Develop incentives.
- Publicize the OPD program and involve local stakeholders.
- Provide readily available and reliable access to technology and support.
- Foster a rich, interactive online learning community.
- Integrate online workshops with face−to−face meetings.

Online professional development (OPD) generally includes several main components, including Web−based learning opportunities, courses, workshops, and online interactions with instructors, mentors, and colleagues. For educators, the best model tends to be the community model of OPD. This model, which combines readings, activities, and facilitated, peer−to−peer collaborative discussions, is at the core of the EdTech Leaders Online (ETLO) program.

1. In this model, participants access their course materials on the Web and complete a sequence of Web−based readings and activities during each course session.
2. Activities may include exploring a Web site or a computer−based simulation, experimenting with a new technology tool or piece of software, viewing an online video clip.
3. The focal point of the session is the online discussion, where learners participate asynchronously to share their reflections, ideas, comments, and questions in response to a focused discussion prompt posed by the facilitator.
4. Because participants and facilitators are able to take time to prepare comments and responses, online discussions can be more reflective than synchronous discussions or face−to−face workshops; they also provide all participants ample opportunity to contribute to the discussion.
5. A record of each online discussion is kept automatically, so participants and facilitators can always review previous discussions to build on them in later discussions; this contributes to the depth and inclusiveness made possible by the learning community model.

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Costs and Funding

To succeed with an online professional development program like ETLO, the only prerequisites are Internet and e−mail access, computers, and a goal of bringing professional development in technology to the district. Even if a district doesn't have money available for such a program, the ETLO Web site offers guidance for grant−writing. A number of districts have also incorporated the ETLO program into grant proposals for professional development funding.

Some districts, including some in Los Angeles and Philadelphia, have secured funding for the program from the ATTFoundation, which supports their participation as part of its agenda to help address the digital divide.

America2000 is funded by a five−year $7.3 million Technology Innovation Challenge Grant from the U.S. Department of Education. This grant program is focused on professional development for teachers about integrating technology into the curriculum.

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Rating Criteria

This story exemplifies the following practices:
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Mexico Academy and Central School District

Mexico Academy and Central School District

Mexico, NY

School Type: Public

School Setting: Rural

Level: Elementary

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

A group of elementary students from the Mexico (NY) Academy and Central Schools studies a *Peanuts* cartoon by Charles Schulz. The cartoon's story is set in a movie theater, and the students−−in keeping with New York State English language arts standards−−must find a way to demonstrate their understanding of the elements of the story. How can they gather their thoughts, arrange the information they've gathered, and display their understanding? Enter the tools of technology.

The students in this particular class used software, including Kidspiration and Inspiration, to map out the concepts of the story and organize their ideas about the reading. The software also allowed the children to use pictures to get their points across.

"They may not have been able to spell *theater*," says Amy Spath, the technology integration specialist from the Oswego County Board of Cooperative Educational Services, "but they knew how to pick out a picture of a reel or a video camera."

The use of technology as a teaching and learning tool has become a hot topic in New York State. The state learning standards even incorporate the expectation that students will learn to "access, generate, process, and transfer information using appropriate technologies" and apply the knowledge gained through technology use to address real−world problems (www.nysatl.nysed.gov/standards.html). But many teachers, including those in the Mexico district, shy away from integrating the use of technology into their lesson plans.

"Most concerns that teachers share with me are centered on their comfort level of using technology and that they are hesitant to use it with students since they 'don't know everything' about the software," says Spath.

To counter this lack of confidence and encourage more teachers to take advantage of the benefits of using technology in the classroom, Spath decided to participate in an online Designing for Technology Integration (DTI) workshop sponsored by The Northeast and Islands Regional Technology Consortium (NEIRTEC). This experience provided her with some thoughts about how best to get the teachers to use technology as an everyday teaching and learning tool. She incorporated these ideas into a professional development plan for elementary teachers in her district, which would guide them through the process of effectively integrating technology into lessons that students had trouble understanding in the past.

Following the course, Spath immediately presented her workshop idea to the director of technology at Mexico Academy and Central Schools and the district's Technology Training Initiative Team. She understood that the teachers involved would have various levels of teaching experience and technology expertise. Many of the previous technology staff development offerings were optional to teachers, and staff developers did not usually model integrated lessons at these sessions. Developers had mentioned tips and suggestions for using software in the classroom, but the teachers wanted more detailed information about what was available to them. They had continually requested more software and lists of useful Web sites for kids−−especially math sites.

Spath decided that the best way to begin was to have the teachers meet with her, by grade level, while a substitute teacher taught their classes. They would meet by building, by grade level, in groups of approximately four teachers. One of the benefits to working with such small groups was the ability to work with each teacher at his or her own technology comfort level. "Amy [Spath] instructs at each and every person's individual level," says one of the teachers who attended the first round of workshops. "She is gifted in recognizing where each student is in ability."

The goal of the professional development experience was for the individual teachers to be able to technologically enhance a lesson that had posed some problems for students in the past and to be able to present their lesson to their class with support from Spath. The experience consisted of two partial days. The first half−day focused on teacher learning, and the second partial day involved the presentation, with feedback from Spath. During the first half−day session, Spath modeled a lesson, appropriate to the grade level, with technology embedded in the lesson.

Teachers then discussed the ways in which technology enhanced the teaching and learning process. The teachers briefly shared stories about using technology in their past lessons and also described the lessons that they hoped to enhance. As a group, the teachers brainstormed ways to incorporate technology into each lesson in order to enhance instruction and student comprehension. Because most of the teachers have special education inclusion students in their classrooms, the teachers discussed using technology as a way to differentiate instruction for those students. They then broke up into pairs to work on the logistics of incorporating technology into their lessons. "I chose to have the teachers work in pairs to share ideas and successes with technology integration, since they seem to be more honest and comfortable working in small groups," says Spath.

Working in pairs also helped the teachers assess the information they already had in the lesson and what they needed to add or adjust. The teachers kept an eye on the New York State learning standards, including ways in which they could use Web sites or software to help students read, write, listen, and speak for understanding, artistic creation, self−expression, and critical analysis. Spath says the Kidspiration software specifically helped teachers incorporate mapping and brainstorming into their lesson plans. The teachers' new lessons expected students to listen, map out what they were hearing, gather more information if necessary, and then go on to writing and demonstration of knowledge.

When teachers were ready to present the new lessons to their students, Spath helped them set up, team−taught the lessons with them, and met with each teacher after his/her lesson to discuss how the teacher felt the lesson went. In several cases, Spath found that she could not even differentiate the special education students from others in the classroom. In fact, after completing a lesson in one classroom, she asked the teacher if there were any inclusion students in her classroom. The teacher replied, "One third of my students are special education students. They were some of your keenest participants!"

According to Spath, the flexibility inherent in certain software and learning Web sites makes technology−based lessons perfect for integrated classrooms. Technological tools that allow students to use pictures, glossaries, and interactive features help students express themselves easily and teachers understand the viewpoints and learning styles of their students.

"One of the nice things about using this software is that students can be free to try different things," says Spath. "They're not constrained to doing things this way or that way."

In developing the lessons, the teachers also took into account whether to use technology as a teaching tool with the whole group of students or break the students up into pairs and groups to complete an assignment. Spath thought the group work was important because students who were more experienced with the software or the Internet helped those with less expertise.

"If one needed help, they were close to each other," says Spath. "They were also sharing work, which helped them think of new ways to gather or present information."

Immediately following the presentation of the new lessons to their students, teachers expressed their pleasure about the high levels of student engagement they observed. When designing her workshop, Spath had incorporated this reflection time as an informal assessment of the teachers' progress. Because she wanted the teachers to feel secure throughout the process, she also built in time for teachers to share with one another and ask others for suggestions. In this way, the teachers could learn from the assessment mechanisms without feeling threatened.

Spath also asked the teachers to complete a follow−up survey a few weeks after the experience. The surveys highlighted the positive results of the workshop experience. One specific lesson using the Web site www.edheads.org drew rave reviews from the students and the presenting third−grade teacher. The lesson encouraged exploration of simple machines around the home, including a faucet, a flagpole, and an alarm clock, and students were able to access a glossary of terms to enhance their understanding. The students commented that the lesson kept them interested because "we were learning at the same time we were playing" and because "the animation was cool." The teacher wrote that at least a quarter of her students had shared the Web site with their families.

Fourth−grade teachers also noted that the Kidspiration and Inspiration software helped them address the elements of the fourth−grade state English language exam with ease. Students became comfortable with the use of graphic organizers and the task of identifying story elements. One teacher even wrote that the experience inspired her to try follow−up technology sessions with her students that went very well.

"This issue is always time," says another participant teacher. "Having the workshop forced me to make the time to integrate the technology...the kids enjoyed it and they demonstrated learning. That makes me want to keep trying to do this more. It helped ease my own uncertainty."

Now that Spath has completed her first round of the professional development experience, she is gearing up to work with more of the elementary teachers in the district. She hopes to inspire others to step out of their "comfort zones" and reap the benefits of integrating appropriate technology tools into their lessons.

"This is a little step for the teachers," she says. "They need that little step. I show them just what they need to know to show the kids what they need to know. Now their confidence level is up there."

Demographics

The Mexico Academy and Central School District is located in Mexico, New York, approximately 40 miles north of Syracuse. The population of this rural community is predominantly white and middle class. There are five buildings: three elementary schools, a middle school, and a high school in this district. There are 2760 students with 195 teachers. Approximately 830 students participate in the free and reduced−price lunch program. There are 410 special education inclusion students in kindergarten through 12th grade. There are no English language learners (ELLs) in the Mexico Academy and Central Schools. Each elementary classroom has five computers with Internet access. Each elementary school has two projectors available for teachers' use.

Background

The Mexico (NY) Academy and Central School District has had a technology integration specialist for the past four years. Amy Spath works three days a week at Mexico Academy and Central Schools. She splits her time among the three elementary buildings, the middle school, and the high school. Her main focus is to provide teachers with basic technology training and technology integration training. She also offers personalized trainings for individual teachers.

The elementary teachers in the Mexico district have various levels of teaching experience and technology expertise. Many of them have attended training for the software installed on the school computers, such as Max's Sandbox (an early childhood interface for Microsoft Office), Microsoft Office Suite, Inspiration, and Kidspiration. They are familiar with basic usage of the software and can help their students with minor problems; however, they have differing levels of confidence when it comes to integrating technology into their lesson plans.

To improve her ability to guide teachers through the process of integration, Spath enrolled in the online Designing for Technology Integration course offered by TERC and the Northeast and Islands Regional Technology Education Consortium (NEIRTEC). She was particularly interested in finding new ways to get elementary teachers in the Mexico district excited about integrating technology into their curriculum. During the course, Spath created a professional development experience that would help her elementary teachers improve student engagement and understanding through technology integration.

When Spath presented her professional development experience to the director of technology and the elementary principals in Mexico, they loved the idea and wanted to know how to get started. To begin, each elementary building principal selected grade levels to participate first in the experience, with the knowledge that teachers in the remaining grade levels would experience the same sessions at a later date in the school year. One school focused on second− and third−grade teachers, while the other two buildings involved the third− and fourth−grade teachers. The fourth−grade students were preparing for the Fourth Grade New York State English Language Arts exam.

Design &Implementation

At each of the three elementary schools at Mexico (NY) Academy and Central School District, Amy Spath, the technology integration specialist for the district, collaborated with teachers from three elementary school grade levels to integrate technology into standards−based lessons that were already taught in the classroom without the use of special software or the Internet. The half−day professional development session consisted of the following activities:

- Participating in a model lesson, demonstrated by Amy Spath, with integrated technology
- Reviewing Web sites or software relevant to the topic of the lesson
- Determining which technologies best fit into their own lessons. Teachers considered software,

such as Inspiration and Max's Sandbox, use of the Internet, and whether to use a projector for whole−class instruction or bring their students to the library, in their building, to use the computers in pairs for the lesson.

- Developing assessment strategies
- Scheduling class periods, library times, and use of the school's projection systems

On the follow−up dates, the teachers presented their technology−enhanced lessons to their students with help from Spath.

Results

At each of the three elementary schools at Mexico (NY) Academy and Central School District, Amy Spath, the technology integration specialist for the district, collaborated with teachers from three elementary school grade levels to integrate technology into standards−based lessons that were already taught in the classroom without the use of special software or the Internet. The preliminary results of this collaboration−−and of the new lessons it produced−−are promising.

Immediately following the presentation of the new lessons to their students, teachers expressed their pleasure about the high levels of student engagement they observed. Spath also asked the teachers to complete a follow−up survey a few weeks after the experience. The surveys highlighted the positive results of the workshop experience. One specific lesson using the Web site www.edheads.org drew rave reviews from the students and the presenting third−grade teacher. The lesson encouraged exploration of simple machines around the home, including a faucet, a flagpole, and an alarm clock, and students were able to access a glossary of terms to enhance their understanding. The students commented that the lesson kept them interested because "we were learning at the same time we were playing" and because "the animation was cool." The teacher wrote that at least a quarter of her students had shared the Web site with their families.

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Now that Spath has completed her first round of the professional development experience, she is gearing up to work with more of the elementary teachers in the district. She hopes to inspire others to step out of their "comfort zones" and reap the benefits of integrating appropriate technology tools into their lessons.

Replication Details

Not Available

Costs and Funding

The schools used funds from Title IID to pay for substitute teachers so that teachers could meet for the half−day professional development experience.

Contact Information

Rating Criteria

This story exemplifies the following practices:
Professional Development − School leaders must provide relevant, meaningful, and ongoing professional development for all staff.

Related Web Resources

This is an annotated list of resources found on other Web sites that relate to this spotlight topic on The Knowledge Loom. We encourage you to access them from the links provided on The Knowledge Loom. To do this, go to the Web address noted in the header. Then click on the Related Resources link.

For an overview of additional content presented on The Knowledge Loom Web site that may not have been selected for this print document, see the Spotlight Overview located earlier in the document.

Content Providers

This is an annotated list of organizations that provided content for this topic on The Knowledge Loom.

1) The Education Alliance at Brown University

The Education Alliance, a department at Brown University, has been working to effect real change in education for more than 25 years. The organization helps schools and school districts provide equitable opportunities for all students to succeed. It applies research findings and develops solutions to problems in such areas as school change, secondary school restructuring, professional development, first and second language acquisition, educational leadership, and cultural and linguistic diversity.

2) Edvantia

Edvantia is a nonprofit education research and development corporation, founded in 1966, that partners with practitioners, education agencies, publishers, and service providers to improve learning and advance student success. Edvantia provides clients with a range of services, including research, evaluation, professional development, and consulting. Edvantia was founded in 1966 as the Appalachia Educational Laboratory, Inc. (AEL); on September 1, 2005, AEL became Edvantia, Inc. The Regional Educational Laboratory for the Appalachian region is known as the Appalachia Educational Laboratory at Edvantia.