Good Models of Teaching with Technology

Excerpts from
The Knowledge Loom: Educators Sharing and Learning Together
Web site
(http://knowledgeloom.org)

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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: Good Models of Teaching with 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/).

Good models of teaching and learning with technology (GMOTT) take into consideration a set of practices that support the effective integration of technology into the curriculum. These practices do not stand alone. Rather, each must be apparent in a well−thought−out, technology−enhanced lesson, learning activity, project, or unit of instruction.

Several samples are provided to illustrate this concept, along with a template that guides the creation of your own units or lessons, taking the GMOTT principles into consideration. Click here for the template and samples.

ESSENTIAL: The first three elements listed below are always present in good models of teaching with technology.

STRATEGIES: The fourth outlines strategies for technology integration. Any number of the strategies presented may be utilized in good models of teaching with 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).

- **Standards**
  All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
- **Assessment**
  Each learning activity should be accompanied with well−defined indicators of success.
- **Accessibility**
  Technology must be readily accessible in a way that meets the needs of all learners.
- **Multiple Learning Strategies**
  Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

For your convenience, here is a link to a print version of the elements present in Good Models of Teaching with Technology.

(This document is a reference tool that you can use to share with colleagues.)

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.

Arlene Brown and Chris Rose's 4th Grade, Mary Fisk Elementary School
Becky Baun's 6th Grade Social Studies Class − Manchester Memorial School
Char Soucy, First Grade Teacher, Fernan Elementary School
Concord School District
Connecticut Regional Vocational−Technical School System
Eulalia Texidor Ortiz's English Language Arts Class at S.U. Bartolom Javier Petrovitch School
J.M. Wright Regional Vocational−Technical School, Stamford, CT
Janis Friesler's 8th Grade at Frank Lloyd Wright Middle School
Kristi Rennebohm Franz's First/Second Grade Class, Sunnyside Elementary School
Mexico Academy and Central School District
Morristown School District (Lamoille South Supervisory Union)
Portland Public Schools Head Start
Tammy Halfacre's Kindergarten Class, Hoonah Elementary School
Whitson Elementary School

Related Web Resources: 100

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

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

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.

Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.

The practice of aligning teaching and learning activities with local, state, and national standards is not applicable to technology−supported activities alone. It is a necessary basic when planning any lesson or activity. A standards−based curriculum is always mindful of "why" a certain lesson or activity is being presented, and what learning outcome should be able to be observed or assessed. Sometimes, embracing only standards−based activities means having to eliminate "pet" activities or projects that are engaging, but do not directly link back to a stated standard. We hear teachers comment, "We don't have time to add another thing to our curriculum." Usually, though, it merely means a thoughtful assessment of what am I teaching and why, and in answering the "why" with a list of standards.

Questions to Think About

−−How is a commitment to make technology an integral part of everyday instruction garnered across the school community? How can all stakeholders be drawn into this process (teachers, administrators, parents, students, central office, etc.)?

−−How can a school logistically supply the support and training needed to encourage teachers to spend the time it takes to actively plan strategic lessons around technology tools?

−−What mechanisms are in place within our organization that support ways to share effective uses of technology that advance standards−based learning?

−−How are lessons and activities evaluated to determine if they effectively address stated standards?

Story Summaries

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.
- Teachers took into account the New York State Learning Standards, including those for use of technology, English language arts, and mathematics (www.nysatl.nysed.gov/standards.html), when modifying their lessons.
- The teachers used existing Web sites and mapping software to ensure that students learned to read, write, and speak for understanding, creativity, self−expression, and critical analysis.

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. However, the New York State Learning Standards clearly state 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).

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 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. The lessons connected to multiple New York State learning standards, and the flexibility of the technology tools helped all students make sense of the concepts of the lessons, perform critical analysis of information, and demonstrate comprehension as required by the standards.

Special education students were integrated in the classroom and were not separated out into separate groups during lessons. For both students and teachers, this process encouraged attention to the real−world applications of the work and the skills and knowledge students must acquire to be successful at each successive level of schooling.

Morristown School District (Lamoille South Supervisory Union)

- Small, rural district
- Developed information technology curriculum and benchmarks
- Teachers helped define standards, set by grade level
- Benchmarks take into account curricula in other areas
- Common categories within each standard
- Units allow students to learn how to use information technology to support their own learning

Though information technology has been an integrated part of some classrooms in the Morristown School District for about 10 years, staff have recently begun to make it a more systemic and directed effort. Since 1998, the district?s Information Technology Committee has been working on the development of a curriculum. The committee decided to use International Society for Technology in Education (ISTE) National Education Technology Standards for Students (NETS) and the American Association of School Librarians? (AALS) Student Standards as frameworks for developing a set of local standards and benchmarks. They were then able to survey how teachers were currently using information technology to support student learning.

Difficulties arose when teachers proved unfamiliar with the language of the ISTE standards. Once jargon was eliminated, data from teachers was more reliable and used to set standards. As they collected the information, committee members looked at research to see what a high school graduate should have for skills and knowledge in this field. With that vision, they broke things into grade levels and developed benchmarks that considered curricula in other areas.

Tammy Halfacre's Kindergarten Class, Hoonah Elementary School

- isolated geographic location accessible only by plane or ferry
- technology expands cultural and world awareness
- technology helps introduce literacy skills linked to early reading standards
- administrative support for resources to experiment with technology−rich project−based learning activities

Teachers often say that technology can open up new worlds and bring information to their students that otherwise wouldn't be available to them. Tammy Halfacre, kindergarten teacher at Hoonah Elementary, thinks so as well, especially considering the unique location of her school on an Alaskan island. Technology has provided Hoonah's students with learning opportunities similar to those children in larger communities have. Technology brings these young children information and also brings them in contact with peers across the United States through an electronic pen pal exchange of email, digital pictures, and video with kindergarten classes in states quite different from Alaska. Halfacre notes that beyond building rich cultural awareness, "Starting the year writing to our new pen pals is an exciting way to introduce (students to) writing, letters, sounds, signing their name and patterns. Later in the year this is excellent for mapping skills, social studies, and literacy lessons about letter writing."

The staff at Hoonah is exploring how technology can be used for authentic and project−based cooperative learning. They have encouraged the administration to use a grant to purchase a project−based learning science curriculum that utilizes computer technology. This will replace a computer lab used primarily for drill−based skills. The program builds on children's current knowledge with students working collaboratively on science activities in small groups or in pairs. The projects are correlated with the curriculum standards for kindergarten through 6th grade, and so they will enhance educational goals rather than being an add−on. Staff are willing to try something new if it is aligned with the current curriculum and will benefit student results. That?s what makes Hoonah a wonderful place to work and to learn.

Char Soucy, First Grade Teacher, Fernan Elementary School

- focus is first on curriculum with technology as a support tool
- technology activities often have deliberate literacy objectives
- students learn to distinguish when technology is the most appropriate tool and are given choice in using it

First grade teacher, Char Soucy, sees her role related to technology as an important one −− to teach students the best uses of technology to support communication, build community spirit, and as a tool for learning. Soucy keeps her focus first on the curriculum, and because of the age and developmental needs of her students, especially upon literacy. Much of their work at the computer is accomplished in small groups and in pairs. Because students work together at the computer, their social and communication skills are developed. She finds the conversation and problem solving that occurs during their work to be valuable. As Soucy's students learn to use scanners or other technologies they teach others how to use them. "When children have to explain how to do things to someone else," says Soucy, "it reinforces the task for them. It also reinforces their verbal communication skills..."

Research suggests appropriate and effective uses of technology in early learning and provides guidance in selecting the tools and creating the environment essential for successful technology use. Studies point to how technology −− computers and other tools such as tape recorders and cameras −− can be used to support and encourage the development and learning of preschool and primary age children. The critical factor is a balanced approach to technology in learning, with thoughtful planning to provide for the important needs of childhood. Char Soucy and her principal support this type of

thinking. It is learning first, using the best available tools to achieve success.

Science &Technology

- describes effective integration of technology into the science curriculum
- middle school level, Grades 4−8
- teacher uses Internet resources for off−computer student activities
- effective use of dynamic resources not available without technology

Teachers often want to enrich the science curriculum using resources available on the Internet. But often, they do not have computers available for student use. If the teacher has access to a networked computer in the classroom, library, or home, than this excellent example demonstrates how dynamic Internet resources can support a visualization activity appropriate for the middle−school science classroom. This example promotes multiple learning strategies, including active learning and authentic learning. Learners interact with dynamic visual objects in order to construct their own interpretations. They engage in a meaningful real−world tasks where they are required to drawn upon prior knowledge to construct meaning around key scientific principals. This example links directly to national science standards:

list all standards for science, geography, technology here

Connecticut Regional Vocational−Technical School System

- Seventeen vocational−technical high schools; five of them urban
- Assessed technology competency level of all teachers and administrators
- Integrated technology into both academic and trade classrooms
- Trained teachers to write Web−based learning units directly linked to academic standards and trade standards
- Integrated literacy standards into learning units in all content areas
- Created a shared online searchable database of all learning units

The Connecticut Regional Vocational−Technical School System (RVTSS) always kept up with technology through the acquisition of high−tech hardware and software. But, when the RVTSS administrators realized this major investment was not integrated with classroom instruction, they developed the "digital classroom" model, in which students would use technology to fuel independent research, collaborative inquiry, and project−based learning.

To get the project off the ground, the RVTSS partnered with the Connecticut Distance Learning Center (CTDLC) to train teachers in writing Web−based learning units that aligned with the Connecticut state standards and the National Trade Standards where appropriate. The teachers also learned how to embed reading and writing strategies and scaffolding into the learning units. The CTDLC and the RVTSS fashioned these activities with an eye toward the requirements of the Connecticut Academic Performance Test, which is given to 10th graders and focuses on four main areas −− math, science, reading across the content areas, and writing across the content areas. The online searchable database that the CTDLC helped create allows parents, teachers, students, administrators, and policymakers to view the learning units, become aware of the standards, and see how those standards are being met in the classroom.

The RVTSS also aligned their professional development efforts with the state of Connecticut's mandates by requiring yearly technology competency assessments for each instructor and administrator. By engaging in these activities the RVTSS has harnessed technology as a classroom

tool, as well as a dissemination tool for sharing professional resources.

J.M. Wright Regional Vocational−Technical School, Stamford, CT

- One of 17 regional vocational−technical schools in Connecticut
- Grades 9−12, with 24 trade and technical areas in addition to academic instruction
- Designated a "priority school": high percentage of students needing intervention on the Connecticut Academic Performance Test (CAPT)
- Instruction changed from teacher−centered style to student−centered style
- Faculty created learning units that address Connecticut standards through multiple strategies and a focus on real−world problems
- Faculty geared instruction and projects directly toward the problem−solving and comprehension skills necessary to succeed on the CAPT
- 21.6% and 19.6% of 10th graders moved out of intervention level in reading in 2002 and 2003 respectively
- 20.5% of free and reduced−price lunch students moved out of intervention level in math in 2003
- 28% jump for bilingual students from non−literate to limited literate status on the Language Assessment Scales from 2002 to 2003
- 35% decrease in detentions; 82% decrease in suspensions; 7% increase in attendance; 51% drop in failing grades

Administrators and teachers at the J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut had long been concerned about their students' academic performance. Compared to their peers at the other Connecticut Vocational−Technical schools, the students of this small urban high school consistently scored at the lowest levels in reading and math on state standardized tests. After studying the eighth−grade state test scores for their incoming students, Wright staff identified reading comprehension and problem−solving skills as the areas most in need of improvement. They hypothesized that a Connecticut Academic Performance Test (CAPT) intervention using a digital classroom model would not only improve these skills but also increase students' motivation, confidence, behavior, and metacognitive awareness.

The digital classroom model incorporates the use of technology with content area material through Web−based learning units. The Connecticut Regional Vocational−Technical School System had already partnered with the Connecticut Distance Learning Consortium (CTDLC) to create the template for these learning units and piloted them a year before Wright implemented the intervention. Dr. George Cicchetti of the CTDLC, who had trained the teachers involved in the pilot, trained all the remaining Wright Tech 10th grade teachers for the intervention and developed four web−based learning units specifically geared toward the skills needed on the CAPT that were also aligned with the Connecticut State Curriculum Goals and Standards.

With coaching from Dr. Cicchetti, school administrators, and teaching colleagues who had participated in the pilot, Wright Tech teachers used the template to develop their own learning units. Once these units were complete, teachers, parents, students, administrators, and policymakers could access them from a searchable online database, allowing them to become familiar with the standards and how they were being met in the classroom.

Comments from student focus groups conducted periodically throughout the intervention showed that the explicit standards and rubrics included in the learning units gave students a clear path to improvement. Students emphasized that this helped them stay focused and boosted their confidence and abilities when they took the CAPT in May 2002. The evidence bears this out. Since the

intervention began in 2001, there have been dramatic drops in disciplinary incidents, failing grades, and absenteeism among the students involved—and significant increases in reading and math scores. (See the Results section for more details.)

Wright Tech acknowledges that it took a team effort to implement the intervention. The following staff members gave their time and effort to ensure the success of the digital classroom model: Peg Sonntag and Trevor Jones, master teachers and coaches; Diane Bauby, school director; Dr. Maria Romero and Edward Kennedy, assistant directors; John Tarnuzzer, Ann Sandagata, and Mike Suntag, central office administrators; and Don Bartels, Peter Clark, Dave Cronin, Sara Gonzalez, Dr. Charbel Herayoui, Justo Karell, Phil Lepinasse, Doug Moffat, Joe Rios−Ninos, Roberta Schwartz, Karen Stabile, Shannon Winchell, and German Yanez, teachers.

Karen Moody's Second Grade Classroom at Laura E. Richards School

- second grade class in rural Maine
- software supports standards−based curriculum
- technology use increases student engagement and motivation

At Laura E. Richards School in rural Maine, second grade teacher Karen Moody uses technology to enhance the education of all of her students. She carefully selects software and designs projects that reinforce her standards−based curriculum and provide multiple entry−points for learning. Desktop publishing software supports Moody?s ?big books? program, one component of her literacy curriculum. Multimedia slide show software allows her students to develop and display their knowledge of a theme in science or social studies. A variety of supplemental software provides students of all levels with extra practice on reading, writing, and math skills. This access to carefully integrated technology resources has led to a dramatic improvement in the motivation and engagement of Moody?s students.

Arlene Brown and Chris Rose's 4th Grade, Mary Fisk Elementary School

- Fourth grade class in suburban New Hampshire
- Teacher and media specialist adapt science unit on plants and animals to integrate technology and research skills
- New unit aligns with state frameworks and district science and research proficiencies

Concerned that his science unit on plants and animals was not capturing his students' interest, fourth grade teacher Chris Rose thought technology integration might help him to create a more engaging unit that still met district and state standards. Partnering with media specialist Arlene Brown, Rose adapted his unit so that it covered research practices as well as science content and used technology to improve student learning. Rose and Brown identified a list of skills they wanted their students to master and fine−tuned this list after consulting the New Hampshire frameworks and their district's science and research proficiencies. The end result was a new unit full of exciting, technology−enhanced activities aligned with both local and state standards.

Janis Friesler's 8th Grade at Frank Lloyd Wright Middle School

- Eighth grade classroom in urban/suburban Wisconsin has fully equipped computer lab.
- Teacher collaborates with colleagues to design and revise multidisciplinary projects based on state and national content and technology standards.
- District−wide writing initiative is integrated into project−based learning and supported by technology.

- Students master a wide variety of software.
- Students' writing skills, depth of understanding, and discipline improve.

Eighth−grade language arts teacher Janis Friesler takes full advantage of her computer lab/classroom, using technology to improve her project−based curriculum. Often collaborating with her team colleagues, she designs multidisciplinary units based on state and national standards and a district−wide writing initiative. In her unit *An Investigation of Heroism through the Holocaust and Underground Railroad*, Friesler's students explore the life of an unsung hero in the context of larger historical forces. In the process, they learn to do research on the Internet, organize and revise their writing with the help of computer software, and work together to meet common goals. The results of this approach to learning are clear: not only do Friesler's students become proficient at a variety of technological tasks, but they also improve their writing skills, deepen their understanding of unit topics, and leave many of their behavior problems behind.

To view Friesler's unit plan for *An Investigation of Heroism through the Holocaust and Underground Railroad*, click here.

Becky Baun's 6th Grade Social Studies Class − Manchester Memorial School

- 6th grade social studies class in rural community north of Boston
- Teacher integrates technology projects into her World Geography curriculum
- All units align with Massachusetts state social studies frameworks and technology standards
- Collectively, the units require students to use multiple learning strategies

Sixth grade teacher Becky Baun wanted to create an updated and engaging series of units for her World Geography class. She decided to use technology to enhance the material. Students studied four continents during the course of the year, using the five major themes of geography as a foundation, and incorporating increasingly sophisticated technology components into each unit. Baun?s lessons allowed students to use a variety of learning strategies, including collaborative, reflective, and active learning. In addition, they were closely aligned with state social studies frameworks, which require students to systematically learn geography around the world continent by continent; and technology instructional standards that require students to demonstrate an ability to use technology to locate and process information and to solve problems.

Related Web Resources

An Investigation of Heroism through the Holocaust and the Underground Railroad (83)
Arlene Brown &Chris Rose's 4th Grade Unit on Living Things (14)
Edtechnot.com (6)
Great Resources for Integrating Technology in Schools (28)
ISTE Technology Foundation Standards for Students (26)
National Council of Mathematics Teachers Standards for School Mathematics (8)
National Standards for History in the Schools (32)
NCTE/IRA English Language Arts Standards (30)

Reality Check 2002: The Standards Movement (21)
SCORE (Schools of California Online Resources for Education) (27)
The National Science Education Standards (31)
The U.S. Department of Education: Office of Educational Technology (29)
The Union City Story: Education Reform and Technology: Students' Performance on Standardized Tests (70)

Assessment
Each learning activity should be accompanied with well−defined indicators of success.

Standards−based teaching and learning has been embraced in the U.S., and well−defined national, state, and local standards are emerging. However, "covering" the standard does not imply reaching the standard. A well−conceived assessment component must be included in all curriculum activities. Just as educators prepare lessons to accommodate diverse learning styles and intelligences, there is an equal and related need to develop multiple measures of assessment to truly determine what students know. It is important to remember that although there is currently a focus on standardized testing as the ultimate measure of attaining high standards, standardized tests are only one form of assessment.

Students should be aware from the beginning of any lesson or activity what they are expected to know and how they will be asked to demonstrate their learning. In many cases, students can be involved in helping to develop the rubrics and assessment indicators by which they will be judged.

In addition to content standards, the International Society for Technology in Education (ISTE) has developed technology standards for students. These standards have been driven by the belief that to live, learn, and work successfully in an increasingly complex and information−rich society, students must be able to use technology effectively. The ISTE web site provides these standards as a guideline, and it includes links to performance indicators, curriculum examples, and scenarios.

Parallel to student technology standards, The National Council for Accreditation of Teacher Education (NCATE), the official body for accrediting teacher preparation programs, and the International Society for Technology in Education have recommended guidelines for educational computing and technology in accredited teacher preparation programs.

Questions to Think About

Before this practice can be effectively embraced, there are important issues that should be considered by those who will be affected by the practice. Use the questions below for discussion during professional development activities and for meetings of your key stakeholder communities.

−−What performance assessments are currently used within your organization? How are these graded? How are they weighted against standardized tests?

−−How can the use of performance assessments build student self esteem? What is the connection between student learning preferences and assessment practices?

−−How can students be involved in the process of creating assessment rubrics and performance indicators?

−−Parents are often confused by non−traditional performance reporting. How can

parents effectively and realistically be brought into the process of understanding and supporting multiple assessment measures?

−−Is an assessment mechanism to evaluate effective teacher use of technology built into your school?s professional review process? Should it be? Why or why not?

Story Summaries

Morristown School District (Lamoille South Supervisory Union)

- ◊ District assessment rubrics aligned with ISTE standards
- ◊ Cross−referencing of both student achievement data and staff knowledge level of technology
- ◊ Students have multiple chances to achieve each of the benchmarks
- ◊ Common categories within each standard

Though information technology has been an integrated part of some classrooms in the Morristown School District for about 10 years, staff have recently begun to make it a more systemic and directed effort. Since 1998, the district?s Information Technology Committee has been working on the development of a curriculum.

During the 2001 ? 2002 school year, staff plan to assess student projects at the 3rd, 6th, 8th and 12th grade levels using the district?s assessment rubrics. From these assessments they will be able to tell whether the new curriculum is meeting the standards that they want children to achieve. Also, they have surveyed all teachers and their skill and knowledge level. By cross−referencing both the student achievement data along with the staff knowledge level of technology, they expect to be able to pinpoint any trouble spots.

Whitson Elementary School

- ◊ students create portfolios
- ◊ performance assessment is an ongoing activity
- ◊ technology supports various types of performance assessment: recordings, hard−copy products, multimedia displays, etc.
- ◊ technology team guides acquisition and use of technology throughout the school

Whitson Elementary School is a place where children come first, and where the staff are dedicated to giving students the freedom to explore, experiment, and grow. The phrase "all children learning" is not just a clich there; it is a fact. And that fact is evident in Diann Beseda's Second Grade classroom where multiple learning strategies and multiple assessments are the norm.

In Beseda's class, whether using technology or not, learning is project−based −− active, hands−on, and varied to suit learning styles and preferences. Children are assessed by demonstrations of what they discover and know. They use computer slide shows to present information, and are very eager to demonstrate their projects. The slide shows let children create their own drawings and accompanying text. The children can record their voices reading the text aloud. This enhances their literacy learning, and their verbal and written skills, as well as providing opportunities to

create art. Electronic portfolios are used as an effective tool to document how well students have progressed with reading, writing, and oral communication skills. The children record samples of their reading at various times throughout the year. When they play them back, they can hear for themselves how much progress they have made. When parents hear these reading samples, says Beseda, they are excited about their child's progress.

J.M. Wright Regional Vocational−Technical School, Stamford, CT

- ◊ One of 17 regional vocational−technical schools in Connecticut
- ◊ Grades 9−12, with 24 trade and technical areas in addition to academic instruction
- ◊ Designated a "priority school": high percentage of students needing intervention on the Connecticut Academic Performance Test (CAPT)
- ◊ Teachers trained to write learning units that include rubrics with clear indicators of standards and expectations
- ◊ All learning units contain dialogue center activities in which students discuss expectations, clarify assignment information, and compare their work and strategies to those of other students through a peer editing process
- ◊ 21.6% and 19.6% of 10th graders moved out of intervention level in reading in 2002 and 2003 respectively
- ◊ 20.5% of free and reduced−price lunch students moved out of intervention level in math in 2003
- ◊ 28% jump for bilingual students from non−literate to limited literate status on the Language Assessment Scales from 2002 to 2003
- ◊ 80% decrease in disciplinary incidents in 2002 and additional 35% drop in detentions in 2003; 17% drop in absenteeism; 51% drop in failing grades between 1999−2000 and 2002−2003.

Administrators and teachers at the J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut had long been concerned about their students' academic performance. Compared to their peers at the other Connecticut Vocational−Technical schools, the students of this small urban high school consistently scored at the lowest levels in reading and math on state standardized tests. After studying the eighth−grade state test scores for their incoming students, the Wright Tech staff identified reading comprehension and problem−solving skills as the areas most in need of improvement. They hypothesized that a Connecticut Academic Performance Test (CAPT) intervention using a digital classroom model would not only improve these skills but also increase students' motivation, confidence, behavior, and metacognitive awareness.

The digital classroom model incorporates the use of technology with content area material through the use of Web−based learning units. The Connecticut Regional Vocational−Technical School System (RVTSS) had already partnered with the Connecticut Distance Learning Consortium (CTDLC) to create the template for these learning units and piloted them a year before Wright implemented the intervention. Dr. George Cicchetti of the CTDLC, who had trained the teachers involved in the pilot, trained all the remaining Wright Tech 10th grade teachers for the intervention and developed six learning units that included standards for success on the CAPT and explicit rubrics for assessment.

Teachers used the template to develop their own learning units and worked with two

master teachers, Peg Sonntag and Trevor Jones, to make sure students understood the expectations and processes for completing each assignment. Dr. Cicchetti also helped teachers embed rubrics for behavior and respect of others' ideas into dialogue center activities.

When teachers made these expectations explicit, students felt comfortable sharing information and taking advice from peers during dialogue center activities. Students were also given paper copies of each unit and transparencies to provide them with a clear path to improvement and success.

This strategy increased students' motivation and personal responsibility for their learning. Following the intervention, Wright saw 21.6% (2002) and 19.6% (2003) decreases in the students scoring at intervention level in reading on the CAPT. A more detailed 2003 study also found a 20.5% drop in the number of free and reduced−price lunch students scoring at intervention in math and significant gains for English language learners on the Language Assessment Scales. Wright also had dramatic drops in disciplinary incidents, failing grades, and absenteeism in 2002 and 2003. (See the Results section for more details.)

Wright Tech acknowledges that it took a team effort to implement the intervention. The following staff members gave their time and effort to ensure the success of the digital classroom model: Peg Sonntag and Trevor Jones, master teachers and coaches; Diane Bauby, school director; Dr. Maria Romero and Edward Kennedy, assistant directors; John Tarnuzzer, Ann Sandagata, and Mike Suntag, central office administrators; and Don Bartels, Peter Clark, Dave Cronin, Sara Gonzalez, Dr. Charbel Herayoui, Justo Karell, Phil Lepinasse, Doug Moffat, Joe Rios−Ninos, Roberta Schwartz, Karen Stabile, Shannon Winchell, and German Yanez, teachers.

Karen Moody's Second Grade Classroom at Laura E. Richards School

Arlene Brown and Chris Rose's 4th Grade, Mary Fisk Elementary School

- ◊ Fourth grade class in suburban New Hampshire
- ◊ Media specialist and teacher integrate technology into a science unit to improve student learning and engagement
- ◊ Variety of assessment tools help teachers and students to evaluate progress

Fourth grade teacher Chris Rose was a favorite with students at Mary Fisk Elementary School, but not when it came to his science unit on plants and animals. Seeking to add some excitement to this unit and to improve student learning in the process, Rose met with media specialist Arlene Brown to adapt it. Together, they created a new, technology−infused unit that is designed to help their students develop research skills while improving their content knowledge.

A critical element of this new unit is its variety of assessment tools. Throughout the unit, Brown and Rose's students will complete daily entries in their science journals to document their learning. During the research process, the teachers will also use a rubric to evaluate students' skills in time management and use of information. After students apply their research to the creation of plant and animal cell models, Brown and Rose will evaluate these models using another rubric created using RubiStar, a free, online tool for teachers. Finally, the students will assess their own progress in learning the differences between plants and animals by comparing charts they created

before and after the unit using Inspiration Software, a set of tools for brainstorming and graphic organizing.

Related Web Resources

"Did anybody learn anything?" Assessing Technology Programs and the Learning Accomplished, From Now On (33)
Accountability Design (13)
Arlene Brown &Chris Rose's 4th Grade Unit on Living Things (14)
Assessment: At a Glance (7)
Does It Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics (38)
Does it Compute? The Relationship Between Educational Technology and Student Achievement in Mathematics (69)
Edtechnot.com (6)
Evaluating Online Educational Materials for Use in Instruction (81)
Fair Assessment Practices: Giving Students Equitable Opportunities toDemonstrate Learning (16)
ISTE Technology Foundation Standards for Students (26)
Making Technology Happen (57)
PBL+MM Guide Activities with Strong Assessment Components (35)
Recent Research on the Effects of Technology on Teaching and Learning (59)
Scoring Rubrics (1)
TAGLIT (Taking a Good Look at Instructional Technology) (23)
The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say (36)
The Research Gap, From Now On, Vol. 10, No. 2, October, 2000 (34)
Unwarranted Intrusion (22)

Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Incorporating a variety of teaching and learning strategies supported by technology can have a noticeable affect on student engagement and achievement. When educators apply the use of varied teaching strategies, they are supporting a belief in individual learning styles and preferences, and they are more apt to engage students in the successful acquisition of knowledge. Below are five learning strategies and the characteristics of each. They are drawn from the work of David H. Jonassen, a researcher in the field of instructional technology (see the "Research" link for more information).

◊ Active Learning Strategies
Active learning strategies focus on exploration.
−−learners interacting with an environment
−−learners manipulating the objects in that environment
−−learners observing the effects of their interventions
−−learners constructing their own interpretations
−−focus on exploration

◊ Constructive Learning Strategies
Constructive learning strategies bring context to learning as students begin from a point of already existing personal experience, knowledge, or interests.
−−learners construct models to explain observations
−−multiple solutions to problems accepted
−−errors used to clarify and refine knowledge in activity
−−builds on prior knowledge

◊ Cooperative Learning Strategies
Cooperative (collaborative/group) strategies take advantage of and build upon shared individual knowledge.
−−learners working in groups
−−learners working to complete a common task
−−requires communication
−−individuals have different roles/responsibilities

◊ Intentional/Reflective Learning Strategies
Reflective learning strategies provide opportunities for students to construct their own knowledge and understandings.
−−learners articulate the learning goals
−−learners explain what they are doing or strategies they use

−−learners explain how they find answers
−−learners manage and/or monitor their own learning

◊ Authentic Learning Strategies
All of the above strategies can be based on authentic tasks that reach beyond text book learning and engage students in the application of knowledge as they participate in real−word tasks. Authentic tasks discourage the asking of that age−old student question, "Why do we have to know this?"
−−meaningful, real−world tasks
−−case−based or problem−based environment
−−connections to community, state, world outside of school
−−personal connections

Questions to Think About

−−How can a school actively and realistically provide the technical support to keep equipment running reliably, as well as provide strong, job−imbedded training to support teachers through the learning curve of using technology in meaningful ways?

−−Is an assessment mechanism to evaluate effective teacher use of technology built into your school's professional review process? Should it be? Why or why not?

−−What are the classroom management issues that must be addressed to ensure the effective use of technology in collaborative and hands−on learning environments?

Story Summaries

Kristi Rennebohm Franz's First/Second Grade Class, Sunnyside Elementary School

◊ multi−age classroom
◊ meaningful integration of technology into early elementary curriculum
◊ project−based learning supported and enhanced by technology
◊ research−based pedagogical practice supports the technology use
◊ authentic, active, and cooperative learning strategies employed throughout the project

Kristi Rennebohm Franz integrates social studies, science, math, world language, visual arts, and service learning through a project she has developed in which her first and second grade students restored the habitat of a pond located near the school. The hands−on project approach Rennebohm Franz uses is research−based (Vygotsky 1986; Harste, Short, &Burke 198; Gardner, 1993; Ferreiro &Teberosky, 1982; Freire &Macedo, 1987; Fuller, 1972; Fox, 1993; Cazden, 1988; Graves, 1994; and Rosenblatt, 1994) and integrates email and Internet technologies to accomplish its goals. Her work is also further informed by the Teaching for Understanding Framework (Wiske 1997).

The project incorporates authentic, active, and cooperative learning strategies throughout its various tasks. Students work in cooperative groups to solve a meaningful, real−world problem related to the habitat of the nearby pond. They make connections to the world outside of school, both at their local community level and

seeking advice from peers in other countries. Throughout the project, they manipulate objects and resources within their environment and observe the effects of their interventions. In addition to an emphasis on problem−solving and peer−to−peer mentoring, tasks focus on increasing literacy through real−world activities.

Portland Public Schools Head Start

- ◊ 12 diverse cultures and languages represented
- ◊ meaningful integration of technology into early childhood curriculum
- ◊ technology fosters a home−school connection
- ◊ active and cooperative learning strategies employed

Portland Public Schools Head Start has five sites across the city with 612 three−, four−, and five−year−old children representing 12 diverse cultures and languages enrolled in full− and half−day sessions. Recently, they received a small amount of funding specifically for technology integration. Before adding technology to their curriculum, staff members from the five sites formed a committee to answer the question, ?What will be most beneficial and useful in supporting student learning??

They developed a philosophy statement to guide any use of technology in the classroom, which sums up their philosophy for technology integration. Before recommending any purchases, the committee carefully considered the developmental needs of the students, the current curriculum, potential uses of technology tools by teachers to achieve learning goals, and available resources. Based on this data, the committee recommended purchasing a computer, scanner, printer, and drawing program for each classroom and a digital camera for each school.

Children are encouraged to work together at the computer to enhance communication skills, and the digital camera has become a useful and versatile tool for the teachers. It is used regularly to assist with the transition between home and school; to help children stay on task, gain independence, and increase time management skills; and to enhance communication between parents and child, as well as parents and school.

Judging from the success of this technology integration, the staff anticipates purchasing an additional computer and age−appropriate, open−ended software for each classroom. A priority is to get additional digital cameras, which they see as the most useful and beneficial to the objectives of their program.

Char Soucy, First Grade Teacher, Fernan Elementary School

- ◊ technology resources serve as a collaboration opportunity
- ◊ students are called upon to manipulate information and resources and teach one another
- ◊ tudents learn to distinguish when technology is the most appropriate tool and are given choice in using it

First grade teacher, Char Soucy, sees her role related to technology as an important one −− to teach students the best uses of technology to support communication, build community spirit, and as a tool for learning. She does this by having students work at the computer collaboratively and encouraging them to explain the "how" and "why" of their tasks to her and to each other. She also emphasizes that sometimes technology, such as the Internet, can make information collecting faster, while at other times it is less appropriate. It's a "right tool for the right job kind of thinking."

Soucy keeps her focus first on the curriculum, and because of the age and developmental needs of her students, especially upon literacy. Because students work together at the computer, their social and communication skills are developed. She finds the conversation and problem solving that occurs during their work to be valuable. As Soucy's students learn to use scanners or other technologies they teach others how to use them. "When children have to explain how to do things to someone else," says Soucy, "it reinforces the task for them. It also reinforces their verbal communication skills..."

"A lot of technology isn't beneficial for children's development," Soucy says. And she adds, "Children, especially at the first grade level, need to manipulate objects to have a concrete model from which to develop abstract concepts." Sometimes a computer simulation can do a better job and sometimes it is a poor substitute for the real objects. The trick is to know which to use and when. Much of the work her first−graders engage in −− both on and off the computer −− is inquiry−based, with conversations related to wondering and discovery highly encouraged.

Whitson Elementary School

- ◊ second graders use technology in appropriate ways to enhance learning
- ◊ active learning strategies extensively evident that focus on exploration, with learners interacting with the environment
- ◊ cooperative (collaborative/group) strategies take advantage of and build upon shared individual knowledge
- ◊ technology team guides acquisition and use of technology throughout the school

Diann Beseda's second grade classroom is alive with activity. Few of the children sit at desks. On the carpet a child sews up a paper quilt. At the computers, children try a new software program −− at one computer two children work together, one child using the mouse, the other the keyboard. In another area children are spread out on the floor using pattern blocks to build shapes with symmetry. They take pictures of each other's shapes using a digital camera. In the midst of all this activity, one of the guinea pigs in the center of the room (in a cage) lets out an excited squeal, and some children come over to see why. The learning environment is child−centered, with evident displays of multiple learning strategies in use. These include active learning that focuses on exploration, with learners interacting with the environment, and cooperative (collaborative/group) strategies that take advantage of and build upon shared individual knowledge.

Beseda's classroom echoes the culture in the school. Administrators and teachers have long understood that technology, if integrated wisely into the curriculum, can add to the variety of learning experiences they can offer students to ensure achievement. A technology team, including the principal and five teachers, thoughtfully plans the acquisition and use of technology and ensures that staff are comfortable with the tools and applying them to standards−based activities which are child−centered, active, and hands−on. In 2000, the school received a Gates Foundation Grant that will help expand this child−centered model to further a technologically−enriched educational experience in every classroom for every student.

Science &Technology

- ◊ describes effective integration of technology into the science curriculum
- ◊ middle school level, Grades 4−8
- ◊ teacher uses Internet resources for off−computer student activities
- ◊ effective use of dynamic resources not available without technology

Teachers often want to enrich the science curriculum using resources available on the Internet. But often, they do not have computers available for student use. If the teacher has access to a networked computer in the classroom, library, or home, than this excellent example demonstrates how dynamic Internet resources can support a visualization activity appropriate for the middle−school science classroom. This example promotes multiple learning strategies, including active learning and authentic learning. Learners interact with dynamic visual objects in order to construct their own interpretations. They engage in a meaningful real−world tasks where they are required to drawn upon prior knowledge to construct meaning around key scientific principals. This example links directly to national science standards:

list all standards for science, geography, technology here

Connecticut Regional Vocational−Technical School System

- ◊ Seventeen vocational−technical high schools; five of them urban
- ◊ Twenty−four trade and technology areas in addition to academic instruction
- ◊ Teachers trained to write learning units that include active, cooperative, constructive, and authentic learning strategies
- ◊ Modeled learning units around a real−world problem or question
- ◊ Created a Dialogue Center where students discuss, clarify, and share the information they have gathered through the use of technology.

The Connecticut Regional Vocational−Technical School System (RVTSS) always kept up with technology through the acquisition of high−tech hardware and software. But, when the RVTSS administrators realized this major investment was not integrated with classroom instruction, they developed the "digital classroom" model, in which students would use technology to fuel independent research, collaborative inquiry, and project−based learning.

Connecticut Distance Learning Center (CTDLC) consultant, Dr. George Cicchetti used David Jonassen's Good Models of Teaching with Technology to develop a professional development program for the RVTSS. The training taught teachers how to write learning units that allow students to build on their existing knowledge, manipulate virtual and actual materials to complete a project, work in groups with specific tasks, improve their literacy skills, and connect the material to their lives outside of the classroom. Projects also varied in form and presentation to allow students to use new forms of media and technology. In addition, teachers built Dialogue Center activities into the learning units in order to engage students in discussion and to encourage them to share their ideas with the class.

Because multiple learning strategies are built into every learning unit, and because the learning units are available from the online searchable database, special education teachers have been able to modify the learning units to suit the needs of their students. Also, these learning units encourage students with stronger English skills to help others in the class. The strategies in these learning units encourage students to collaborate on the material and learn from one another.

J.M. Wright Regional Vocational−Technical School, Stamford, CT

- ◊ One of 17 regional vocational−technical schools in Connecticut
- ◊ Grades 9−12, with 24 trade and technical areas in addition to academic instruction
- ◊ Designated a "priority school": high percentage of students needing intervention on the Connecticut Academic Performance Test (CAPT)
- ◊ Instruction changed from teacher−centered style to student−centered style
- ◊ Master teachers serve as mentors to help teachers adjust their practice to the reciprocal teaching method and the apprenticeship model
- ◊ Teachers trained to write learning units that include active, cooperative, constructive, and reflective strategies
- ◊ All learning units contain dialogue center activities in which students share information, clarify their thinking on a specific project, and peer edit
- ◊ 21.6% and 19.6% of 10th graders moved out of intervention level in reading in 2002 and 2003 respectively
- ◊ 20.5% of free and reduced−price lunch students moved out of intervention level in math in 2003
- ◊ 28% jump for bilingual students from non−literate to limited literate status on the Language Assessment Scales from 2002 to 2003
- ◊ 35% decrease in detentions; 82% decrease in suspensions; 7% increase in attendance; 51% drop in failing grades

Administrators and teachers at the J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut had long been concerned about their students' academic performance. Compared to their peers at the other Connecticut Vocational−Technical schools, the students of this small urban high school consistently scored at the lowest levels in reading and math on state standardized tests. After studying the eighth−grade state test scores for their incoming students, the Wright Tech staff identified reading comprehension and problem−solving skills as the areas most in need of improvement. They hypothesized that a Connecticut Academic Performance Test (CAPT) intervention using a digital classroom model would not only improve these skills but also increase students' motivation, confidence, behavior, and metacognitive awareness.

The digital classroom model incorporates the use of technology with content area material through the use of Web−based learning units. The Connecticut Regional Vocational−Technical School System (RVTSS) had already partnered with the Connecticut Distance Learning Consortium (CTDLC) to create the template for these learning units and piloted them a year before Wright implemented the intervention. Dr. George Cicchetti of the CTDLC, who had trained the teachers involved in the pilot, trained all the remaining 10th grade teachers for the intervention and developed six learning units that included multiple learning strategies.

Teachers used the template to develop their own learning units and worked with two master teachers, Peg Sonntag and Trevor Jones, to shift their practice from teacher−centered instruction to an apprentice approach in which students watched the teacher model a process and then worked independently to complete a project using the demonstrated skills. Dr. Cicchetti also helped teachers develop reciprocal learning discussions with students in the dialogue center. These conversations, and sharing and editing with peers, allowed students to reflect on their own processes and clarify their thinking.

These multiple strategies allowed students to control their pace and take responsibility for their own learning. In a student questionnaire given during the intervention, the school found that 91% of students acknowledged cooperating with fellow students to help one another and solve problems. Approximately 91% also stated that they were learning the reflective skills necessary to become a self−directed learner.

This increased motivation and responsibility translated to 21.6% (2002) and 19.6% (2003) decreases in the students scoring at intervention level in reading on the CAPT. A more detailed 2003 study also found a 20.5% drop in the number of free and reduced−price lunch students scoring at intervention in math and significant gains for English language learners on the Language Assessment Scales. Wright also had dramatic drops in disciplinary incidents, failing grades, and absenteeism in 2002 and 2003. (See the Results section for more details.)

Wright Tech acknowledges that it took a team effort to implement the intervention. The following staff members gave their time and effort to ensure the success of the digital classroom model: Peg Sonntag and Trevor Jones, master teachers and coaches; Diane Bauby, school director; Dr. Maria Romero and Edward Kennedy, assistant directors; John Tarnuzzer, Ann Sandagata, and Mike Suntag, central office administrators; and Don Bartels, Peter Clark, Dave Cronin, Sara Gonzalez, Dr. Charbel Herayoui, Justo Karell, Phil Lepinasse, Doug Moffat, Joe Rios−Ninos, Roberta Schwartz, Karen Stabile, Shannon Winchell, and German Yanez, teachers.

Janis Friesler's 8th Grade at Frank Lloyd Wright Middle School

- Eighth−grade classroom in urban/suburban Wisconsin has fully equipped computer lab.
- Teacher collaborates with colleagues to design and revise multidisciplinary projects based on state content and technology standards.
- Projects focus on authentic learning: students' investigation of real−world questions.
- Cooperative learning strategies contribute to stronger work ethic.
- Students master a wide variety of software.
- Students' writing skills, depth of understanding, and discipline improve.

Eighth grade language arts teacher Janis Friesler takes full advantage of her computer lab/classroom, using technology to improve her project−based curriculum. With the help of a variety of learning strategies, including cooperative learning and authentic learning, she allows her students to deepen their educational experience while they gain useful technological skills.

After participating in a series of team−building activities, Friesler's eighth−grade students choose their own collaborative group a different group for each project and divide up project tasks, combining their work electronically. Friesler puts a few supports in place to assist with the cooperative learning process having students initial their own contributions, for example, and designating a group coordinator to e−mail her if a group member isn't completing his work but the professional appearance that technology can lend to projects is one of the greatest supports. "I don't have a lot of trouble with collaboration," Friesler explains. "Once the project starts taking shape, the students feel a sense of accomplishment because the finished products especially PowerPoint presentations look so polished."

Friesler's classes also benefit from authentic learning in the classroom. For example, in the

unit *An Investigation of Heroism through the Holocaust and Underground Railroad*, Friesler provides her students with the time and the resources to consider carefully the questions "How do the events of history turn ordinary people into heroes?" and "In what ways is our community today being shaped by unsung heroes?" After reading the play *The Diary of Anne Frank* and the biography *Harriet Tubman: Guide to Freedom*, Friesler's students use computer technology to support their investigation of the unsung heroes of the Underground Railroad, the Holocaust, and the current age.

Computer technology has given a big boost to Friesler's project−based curriculum, and her use of cooperative and authentic learning strategies has helped her students to embrace the learning process even further. As they work collaboratively to explore real−world questions, Friesler's students have become more deeply involved in their learning, better able to learn from each other, and more skilled at expressing their ideas in writing.

To view Friesler's unit plan for *An Investigation of Heroism through the Holocaust and Underground Railroad*, click here.

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 teachers worked in groups of three to four to discuss the benefits and logistics of technology integration.
- The teachers used existing Web sites or software such as Kidspiration or Inspiration, to improve student engagement and understanding of topics.
- Students were asked to listen to information about a lesson, map out their observations on the computer, and use additional information gained through Internet research to write or design a piece that showed understanding.
- Students worked in groups and shared knowledge of technology with one another.
- Lessons either used projector system for whole−group discussion or called for smaller group work on library computers.

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.

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, 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 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. Some students worked in pairs or small groups, sharing information and assisting one another. The lessons connected to multiple New York State learning standards and the software offered students the opportunity to express themselves in pictures as well as in words.

Special education students were integrated in the classroom and were not separated out into separate groups during lessons. For both students and teachers, this process used cooperative, constructive, and reflective learning strategies. Students discussed how they reached certain conclusions and received feedback from the class as a whole. Teachers received feedback on their lessons from Spath and other teachers who had created similar lessons.

Becky Baun's 6th Grade Social Studies Class − Manchester Memorial School

- 6th grade social studies class in rural community north of Boston
- Teacher integrates technology projects into her World Geography curriculum
- All units align with Massachusetts state social studies frameworks and technology standards
- Collectively, the units require students to use multiple learning strategies

Sixth grade teacher Becky Baun wanted to create an updated and engaging series of units for her World Geography class. She decided to use technology to enhance the material. Students studied four continents during the course of the year, using the five major themes of geography as a foundation, and incorporating increasingly sophisticated technology components into each unit. Baun's lessons allowed students to use a variety of learning strategies, including collaborative, reflective, and active learning. In addition, they were closely aligned with state social studies frameworks, which require students to systematically learn geography around the world continent by continent; and technology instructional standards that require students to demonstrate an ability to use technology to locate and process information and to solve problems.

Eulalia Texidor Ortiz's English Language Arts Class at S.U. Bartolom Javier Petrovitch SchoolMany public schools in Puerto Rico are now participating in the Center for Integration of Technology (CENIT) program, an island−wide initiative designed to help teachers integrate technology into their academic curriculum. The program, which started in 2001 and has since had three separate one−year phases, is contributing to a change in teaching ideologies, giving way to a more constructivist learning and teaching style.

Each group of participating schools begins the program in January by receiving funding from the Department of Education and information to determine what kind of computer lab, either mobile or stationary, would work better in each school. While each school buys and installs its lab, a lead teacher is selected by CENIT staff. Lead teachers work with other participating teachers in the school to get them up to speed on using the new computers and software programs. In June teachers attend a five−day Authentic Task Academy to get more acquainted with the CENIT program and gather ideas for how to integrate technology and real−world problems into the classroom. When schools open in August, teachers participating in the program begin to introduce their students to the new technology, giving them the opportunity to

learn how to use it by taking part in technology−rich lessons in a variety of subjects. Teachers meet throughout the semester, get further training, and in December give presentations outlining their experiences during their participation in CENIT.

One school currently participating in the CENIT program is the S.U. Bartolom Javier Petrovitch School of Cabo Rojo, where Eulalia Texidor Ortiz, a sixth, seventh, and eighth grade English language arts teacher, is the CENIT III Lead Teacher. As the lead teacher, Texidor Ortiz models authentic and reflective learning strategies for the other participating teachers. She works closely with the students in her class to choose projects relevant to their personal interests and community concerns and to decide which technologies best support their goals for a given project. Her students are encouraged to use the computers provided to search for information on the Internet, and to use digital and video cameras and a myriad of software programs that enhance the learning experience.

Research Summary

Research SummaryThe four best practices listed in the Good Models of Teaching with Technology (GMOTT) spotlight are taken from the work of TERC in Cambridge, Massachusetts. TERC, The Regional Alliance for Mathematics and Science Education, is dedicated to support K−12 mathematics and science improvement, and it is a partner in the Northeast and Islands Regional Technology in Education Consortia (NEIRTEC), the creators of this spotlight content. TERC has developed face−to−face workshops where these GMOTT practices are explained and demonstrated.

TERC's work, in turn, is drawn from the work of David H. Jonassen, a researcher in the field of instructional technology, and a Professor of Instructional Systems at Pennsylvania State University. Jonassen is the author of "Computers as Mindtools for Schools: Engaging Critical Thinking 2nd Edition" (1999). His work is widely respected and cited as fundamental to much of what is considered "cutting edge" in the field.

Jonassen focuses on individual learner differences as an essential aspect for consideration in the learning process, and he proposes five characteristics for meaningful learning environments. Learning environments should be:

Active
Learners explore and manipulate components and parameters of the learning environment and observe the results of their activities.

Authentic
Learners examine and attempt to solve complex, ill−structured, real−world problems.

Intentional
Learners determine their own goals, which allows them to regulate and manage their own activities.

Constructive
Learners articulate what they know and have learned, and they reflect on meaning and importance of this knowledge in larger social and intellectual contexts.

Cooperative
Learners collaborate with others and socially negotiate the meanings they have constructed.

These characteristics have influenced TERC's thinking around the multiple learning strategies proposed in the GMOTT spotlight for the successful and meaningful integration of technology into the K−12 curriculum.

Related Web Resources

44 Benefits of Collaborative Learning by Ted Panitz (12)
A Review of Research on Project−Based Learning (75)
A Successful Model for School Improvement (84)
Accelerated Schools Project (73)
Alternative Instructional Strategies: Critical, Creative, Cooperative, Motivational (41)
An Investigation of Heroism through the Holocaust and the Underground Railroad (83)
Constructivist Teaching Strategies (79)
Count Us In Games (4)
Design Online (89)
Edtechnot.com (6)
EduHound (56)
Embed Technology Use in Content Specific Professional Development (98)
Explorathon AZ (86)
Fablevision (85)
From Black and White to Color: Technology, Professional Development and Changing Practice (99)
Graphic Organizers in Education (63)
Grazing the Net: Raising a Generation of Free Range Students (80)
Higher−Order Thinking Strategies for the Classroom (40)
How People Learn (9)
Making Technology Happen (57)
On Constructivism (77)
Printable Crafts (72)
Reconstructors Solve Medical Mysteries (96)
Ride the Wave to Success in the Classroom (15)
Role of Gender in the Design of Electronic Learning Environments for Children (87)
Scoring Rubrics (1)
Social Studies Teachers and Technology (58)
Student Learning and the Meyer−Briggs Type Indicator (76)
Students Teaching Students with Technology (61)
SWAT Savvy: A Model for Effective Classroom Technology Using Student Experts (62)
Synergy Learning (95)
Technology for Learning: How Does Technology Support Inquiry? (97)

The Best Web Quests (5)
The Project Approach in Elementary and Early Childhood Education (74)
Transforming Learning Through Technology (42)
Using the Web to Design Online Courses (39)
What's Basic: A Constructivist's View (78)

Accessibility
Technology must be readily accessible in a way that meets the needs of all learners.

To be used effectively, technology must be readily accessible in a way that meets the needs of all learners. This includes both ready access to hardware, software, and connectivity, as well as ready access to content and ideas being presented. Many times, schools and educators accommodate special needs students quite effectively. Special keyboards and input devices, adaptive software, and web sites that comply with universal access principles ensure that all students can access content and ideas. However, the concept of creating lessons and curriculum that take into consideration "universal design" principles must extend to ALL learners.

Universal design principles were established first in the field of architecture, with impetus from the Americans With Disabilities Act (ADA) and with accommodations like wheel chair ramps and door levers, rather than knobs. In the same way, curriculum designed to accommodate the widest spectrum of users meets the mandates of the ADA, but it also makes sense in supporting the belief that all students can reach high standards. Additionally, it's important to remember that it's always better, whether in the field of architecture or education, to "build in" rather than "add on." Lessons should be developed with ALL learners in mind.

"Universal design applies not only to the content of a curriculum, but also to its goals, methods, and manner of assessment." (CAST, 1998) Universal design includes: −−Multiple representations of information (printed text, digital content, text−to−speech, graphics, multimedia); −−Multiple means of expression (written−−paper and pencil or word processing, spoken, visual representation−−illustration); −−Multiple means of engagement (hands−on, cooperative groups, individual learning).

Questions to Think About

Before this practice can be effectively embraced, there are important issues that should be considered by those who will be affected by the practice. Use the questions below for discussion during professional development activities and for meetings of your key stakeholder communities.

−−How can today's technologies help all students, including disadvantaged students, meet high academic standards?

−−How are multiple intelligences and preferred learning styles related to the notion of universal design? What do you already do in your school/district to accommodate learning preferences?

−−How does implementing a philosophy of universal design affect assessment? What multiple measures of assessment are already used in your school/district? Is what you are doing sufficient?

Story Summaries

Concord School District

- ◊ Concord encourages collaboration of general and special education in its technology planning to meet the mandates of the Individuals with Disabilities Education Act (IDEA).

- ◊ Concord High School uses ULTimate Reader, a software program that provides built−in reading supports such as sequential highlighting of words, sentences, or paragraphs, and full synthetic speech in conjunction with the digitized text. All supports may be individually controlled and customized to support students with reading disabilities.

- ◊ In Concord elementary schools, special keyboards are used to support students with motor needs and developmental delays.

- ◊ Concord converts all its curriculum materials to digitized form. This endeavor is a huge undertaking, involving searches and scanning. In order to make the process more efficient, programs and policies have been instituted, including a well−organized system of volunteers, and the coordination of requests from teachers.

School districts today are faced with multiple needs generated by standards−based reform, the implementation of technology, and the mandates of the Individuals with Disabilities Education Act (IDEA). Through the collaboration of general and special education in its technology planning, Concord, New Hampshire has worked to align those efforts. Concord's goal of universal access is centered on using technology to make the curriculum accessible to all students. To reach this goal, the district (1) provides adaptations of print materials; (2) integrates technology that is universally designed; (3) supports teachers to adapt the curriculum with these technologies. The feature story includes examples of how technology has helped specific students and video illustrations.

Related Web Resources

A Successful Model for School Improvement (84)
CAST: Universal Design for Learning (37)
Design Online (89)
District Technology Planning for All Students: Helping to Meet the IDEA '97 Mandate (24)
Edtechnot.com (6)
Explorathon AZ (86)
Level of Technology Implementation (55)
Listing of Available Accessibility Software Tools (71)
Making Technology Happen (57)
The Equity Network (91)

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.

Concord School District

Concord School District

Concord, NH

School Type: Public

School Setting: Urban

Level: K−12

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

To read more about how Concord New Hampshire School District successfully addresses the issue of universal access, click on this URL: http://www.edc.org/LNT/news/Issue9/feature1.htm. This site contains stories about specific students who have been assisted by technology and video illustrations of many of the district's endeavors.

The feature story also contains information about the district's demographics and notes about their design and implementation for universal design planning.

Demographics

Concord, New Hampshire, a city of 37,000 inhabitants, is situated in the state's south central region called the Merrimack River Valley. Three rivers run through the city's center and close−knit neighborhoods of colonial homes sit on hills overlooking downtown. Located near New Hampshire's major ski slopes, students are dismissed at noon one day a week during the winter to go skiing. Because of its centrality in the state and in the region, Concord has historically been an industrial and commercial hub. Concord stagecoaches were manufactured here during the 19th century, and the nearby granite quarries earned the state its nickname, "The Granite State." As the capital, Concord serves as seat for the state's politics, and garners national attention every four years as New Hampshire ushers in the presidential primaries. The district consists of nine elementary schools, one middle school, and one high school that just celebrated its 150th anniversary. Buildings in the district are a mix of old and new, and the architecture is a reminder of Concord's history: solid red brick, granite steps, pointed roofs, towers, and columns; inside are large wooden doors, wide staircases, and spacious hallways. There are 5500 students attending neighborhood schools. Approximately 53 percent of graduates go on to four−year colleges and another 10 percent attend post−secondary programs. Expenditures per pupil amount to $7,087. An average of 12 percent of students receive special education services, and the majority of students with disabilities are included in regular education classrooms.

Background

Design &Implementation

Results

Replication Details

Costs and Funding

Contact Information

CAST
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Peabody, MA 01960
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http://www.concord.k12.nh.us

Rating Criteria

In 1997, Concord (New Hampshire) School District hired Skip Stahl, Director of Professional Training at the Center for Applied Specialized Technology (CAST). CAST works with school districts to expand the learning of students with disabilities through technology. In the past, their focus was on supporting and developing assistive technology to meet the needs of individual students. Now, however, CAST has moved from an individualized approach to "universal design for learning"(UDL). It is CAST's commitment to UDL that has impacted Concord's work in technology for students with disabilities. This case study has been used by Educational Development Corporation (EDC) in their LNT online courses as a catalyst for participating schools to discuss their own districts' efforts to meet the needs of students with disabilities through technology planning.

This story exemplifies the following practices:
Accessibility
Technology must be readily accessible in a way that meets the needs of all learners.

Morristown School District (Lamoille South Supervisory Union)

Morristown School District (Lamoille South Supervisory Union)

Morrisville, VT

School Type: Public

School Setting: Rural

Level: K−12

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

When the Morristown Information Technology (IT) committee was charged by the School Board to develop an information technology curriculum during the 1998 − 1999 school year, technology was not new to the district. In fact, the Morristown Elementary School had been awarded with an Apple Classroom of Tomorrow (ACOT) grant in 1992, outfitting four classrooms with technology to see how it enhanced the learning process for children. The problem at this juncture was that there was nothing in place to ensure that ALL students had access to technology.

"Some classrooms were highly infused" with technology, says Bill Kimball, the information technology director of the Lamoille South Supervisory Union. "But there was still a chance that some students might go through his or her educational career with very limited exposure to integration of IT, whereas someone else might get more just by chance. We didn't want to leave it to chance."

Thus, the team set about determining what students needed to know. The Information Technology Committee is made up of nine teachers (each representing two grade levels), a media specialist, the high school principal, and the information technology director. The committee has met every two to three weeks over the past three years.

All curriculum committees in Morristown follow a process when developing and reviewing curriculum. Using this process, the IT committee determined to use the National Standards of Students from the International Society for Technology in Education (ISTE) and the Student Standards from the American Association of School Librarians (AASL) as a framework to develop benchmarks for students throughout their time in the K−12 district.

Once the IT committee had a process and a framework to work from, they were able to survey how the teachers were currently using information technology to support student learning. As they collected the information, they looked at research to see what a high school graduate should have for skills and knowledge in this field. With that vision, they broke things into grade levels and developed benchmarks that considered curricula in other areas.

The committee developed two surveys that asked teachers how students use information technology to enhance their learning while in their class. The first survey was developed based on the ISTE

Standards for Students. The survey was open−ended and asked what teachers where doing according to each standard. However, an important problem emerged as data was collected. The information was not reliable since most teachers did not understand the ISTE standards without professional development. Kimball says it's crucial to get everyone on board to understand and use the same language when talking about technology.

"The teachers weren't used to the ISTE language," he says. "So we had to develop another survey based on things that they knew. We asked about software, student products, and whether a student is able to produce a PowerPoint presentation, for example, Once we got the information, we linked it to the ISTE standards and then knew where teachers were with things and what students were doing. Then the curriculum we developed could point to where we wanted them to be and how to get there."

As part of the survey, the committee asked whether the teachers taught the skills and knowledge to use the items or whether the students needed prior knowledge to use the objects. They related the items on the list to the six standards and were able to see what the students were doing across the district.

To develop benchmarks and expectations for students in the Morristown School District, the IT committee felt that it needed to expand the number of teachers so they had representation from all the grade levels. Once this work was done, a sub−committee looked at the work. For the past 9 months, they have refined the document to have common categories within each standard. To see the completed matrix of benchmarks and expectations, visit the district's web site. Click on each standard to see the benchmark.

The 2001 − 2002 school year will be the district's pilot year to implement the integration of the IT standards and benchmarks into the curriculum to enhance student learning. The information technology director, teacher leaders, and the integration specialist will work with grade level groups that are the same as the division of benchmarks to develop the learning opportunities for the students. While working on this process, they want to make sure that students have multiple chances to achieve each of the benchmarks. Throughout the next school year, teachers will teach units that allow students to learn how to use information technology to support their own learning.

Kimball advises any school making such changes to ensure that administrators and teachers work together as the process moves forward. "If you have the grassroots without the leadership, it won't happen, and vice versa," he says. "You need leadership with vision. You need to have both to make it happen."

Demographics

- Small, rural district
- PreK−12
- Student population of 1,085
- Teacher population of 102
- Title 1 district; greater than 50% poverty
- District services a town of approximately 5,500 people and tuition students from two surrounding towns

Background

The district is in the beginning of a curriculum improvement process for all curriculum areas. The Morristown Elementary School had been awarded with an Apple Classroom of Tomorrow (ACOT)

grant in 1992, outfitting four classrooms with technology to see how it enhanced the learning process for children. However, the problem at this juncture was that there was nothing in place to ensure that ALL students had access to technology.

Design &Implementation

Over the past three years, the Morristown School District?s Information Technology Committee has been working on the development of a curriculum. In so doing, the committee decided to use International Society for Technology in Education (ISTE) National Education Technology Standards for Students (NETS) and the American Association of School Librarians? (AALS) Student Standards as frameworks for developing a set of local standards and benchmarks for all students. In the Morristown School District, all curriculum committees follow the same process while developing and reviewing curricula. An outline of the process follows.

1) **Establish a structure and Process** The Information Technology Committee is made up of nine teachers (each representing two grade levels), a media specialist, the high school principal, and the information technology director. The committee has met every two to three weeks over the past three years.

2) **Curriculum Audit** The committee developed two surveys that asked the teachers how students use information technology to enhance their learning while in their class. The first survey was developed based on the ISTE Standards for Students. The survey was open−ended and asked what teachers were doing according to each standard. The information that we gathered was not very reliable, since most teachers did not understand the ISTE standards without any professional development. The second survey was based on the use of hardware, software, and products that students produced in the class. They developed 25 questions and asked teachers to identify whether students used and/or produced items that were on the list in their classes. Teachers were also asked whether they taught the skills and knowledge to use the items or whether the students needed prior knowledge to use the objects. The committee related the items on the list to the six standards and were able to see what the students were doing across the district.

3) **Review Research** In preparing for the development of the Information Technology Curriculum, the IT Committee reviewed several different documents and research projects. The first thing they looked at was their own past project with Apple computers. They also looked at the work the Milken Family Foundation has done on expanding on the work that Apple started. The main document they used was the research from the "Seven Dimensions of Learning." What helped shape the work was the National Educational Technology Standards from ISTE. Once all the members of the committee understood the standards, they were able to start working on the benchmarks that are aligned with the ISTE and AASL student standards.

4) **Expectations and Benchmarks** To develop benchmarks and expectations for students in the Morristown School District, the IT committee felt that it needed to expand the number of teachers so they had representation from all the grade levels. In the summer of 2000, the expanded IT committee met for 3 days to work on benchmarks and expectations for all students at each grade level. The members broke up into groups of PreK through 2nd grade, 3rd through 5th grade, 6th through 8th grade and 9th through 12th grade. Each group looked at the ISTE and AASL student standards and asked two questions: what should a student be able to do and know to meet that standard, and what is developmentally appropriate for the students at this grade level? With those questions in mind, they began to write the scope and sequence for the curriculum. Once this work was done, a sub−committee looked at the work. For the past 9 months, they have refined the document to have common categories within each standard. To see the completed matrix of benchmarks and expectations look at

http://www.morrisville.org/msd/curriculum/infotech.htm. Click on each standard to see the benchmark.

5) **Implementation** The 2001 ? 2002 school year will be the district's pilot year to start with implementing the integration of the information technology standards and benchmarks into the curriculum to enhance student learning. They plan to have the information technology director, teacher leaders and the integration specialist work with grade−level groups that are the same as the division of benchmarks to develop the learning opportunities for the students. While working on this process, we want to make sure that students have multiple chances to achieve each of the benchmarks. Throughout this next school year, the teachers will teach units that allow students to learn how to use information technology to support their own learning.

Results

During the 2001 ? 2002 school year, staff plan to assess student projects at the 3rd, 6th, 8th and 12th grade levels using the district?s assessment rubrics. From these assessments they will be able to tell whether the new curriculum is meeting the standards that they want children to achieve. Also, they have surveyed all teachers and their skill and knowledge level. By cross−referencing both the student achievement data along with the staff knowledge level of technology, they expect to be able to pinpoint any trouble spots. To see the district?s assessment rubrics look at the assessment section on http://www.morrisville.org/msd/curriculum/infotech.htm.

NOTE: 2001−02 data will be added when available.

Replication Details

It is very important to go through the process of reviewing the ISTE technology standards and really understanding what they mean before beginning the process that the Lamoille South Supervisory Union School District outlines. Then it?s essential to map the ISTE standards to your own local curriculum −− across content areas, as well as connect them to your own school improvement goals for technology use and integration. In the case of Lamoille South, a strong mandate from the administration, as well as a strong technology leader (the information technology director) really made the collaborative benchmarking process effective. The information technology director was able to approach regular classroom teachers at each grade level in a non−threatening way to select a representative to work on the technology team. He was able to support the technology specifics of the process, while still allowing the educators to maintain their positions as the content experts.

Costs and Funding

Contact Information

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Rating Criteria

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Assessment
Each learning activity should be accompanied with well−defined indicators of success.

Kristi Rennebohm Franz's First/Second Grade Class, Sunnyside Elementary School

Kristi Rennebohm Franz's First/Second Grade Class, Sunnyside Elementary School

Pullman, WA

School Type: Public

School Setting:

Level: Elementary

School Design: Traditional

Content Presented By:

North Central Regional Educational Laboratory (NCREL)

The Northwest Regional Educational Laboratory presents a feature success story (http://www.ncrel.org/engauge/framewk/efp/research/efpressu.htm) about Kristi Rennebohm Franz?s First &Second Grade, Sunnyside Elementary School, Pullman, Washington and her technology−integrated pond habitat project. The project incorporates authentic, active, and cooperative learning strategies throughout its various tasks.

The feature offers a link to a video of the water habitat project and a link to further information about the Teaching for Understanding Framework.

Demographics

Background

Design &Implementation

Results

Replication Details

Costs and Funding

Contact Information

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Naperville, Illinois 60563
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Kristi Rennebohm Franz, First/Second Grade Teacher
Sunnyside Elementary School
Pullman, Washington

509/334−1800

Rating Criteria

Over $7 billion is invested annually in educational technology. Increasingly, policymakers, administrators, and teachers are being asked:

- What value does technology bring to our nation's schools?
- How can our schools ensure a return on these investments?
- Why does technology work in some schools and not in others?

The North Central Regional Educational Laboratory (NCREL) with the Metiri Group has developed EnGauge (http://www.ncrel.org/engauge/), a new Web−based framework, which provides deep insights into these critical questions. The EnGauge Web site was initially released on December 1, 2000 and is under constant development based on feedback from field experiences. New resources and features are added continually. The story about Kristi Rennebohm Franz?s First &Second Grade, Sunnyside Elementary School, Pullman, Washington is one of the resources provided on the Web site.

This story exemplifies the following practices:
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Portland Public Schools Head Start

Portland Public Schools Head Start

Portland, OR

School Type: Public

School Setting: Urban

Level: Pre−K

School Design: Traditional

Content Presented By:

Northwest Regional Educational Laboratory (NWREL)

Northwest Educational Technology Consortium (NETC)

The role of technology in early childhood education, birth to age eight, is a controversial topic. Parents and educators have concerns about potential benefits or harm to young children. Critics contend that technology in schools wastes time, money, and childhood itself by speeding up the pace and cutting down on essential learning experiences (Cordes &Miller, 2000; Healy, 1998). Proponents suggest that children should have the advantages that new technologies can offer. Thoughtful observers are concerned that while exciting and potentially valuable things are happening with children and computers, we may not be using these tools in the best ways, or obtaining the results we expect (Healy, 1998; Kleiman, 2000).

The issue is sometimes presented as a simple question: Should my students, my children, use computers or not? While this question is valid the issues are broader and more complex. Computers are already in homes and classrooms, and young children are using them. The more useful question is, What are appropriate and meaningful uses of technology with children? And, since technology is being used, how can educators take advantage of the power of these tools to enhance children's learning and development, while avoiding potential problems?

Research suggests appropriate and effective uses of technology in early learning and provides guidance in selecting the tools and creating the environment essential for successful technology use. Studies point to how technology −− computers and other tools such as tape recorders and cameras −− can be used to support and encourage the development and learning of preschool and primary age children. The critical factor is a balanced approach to technology in learning, with thoughtful planning to provide for the important needs of childhood.

This story about Portland Public Schools Head Start demonstrates how they put the needs of students and the curriculum first and thoughtfully devised strategies to integrate technology as an enhancement of their teaching and learning goals.

Portland Public Schools Head Start has five sites in North, Northeast and Southeast Portland. Six hundred and twelve three−, four−, and five−year−old children representing 12 diverse cultures and

languages are enrolled in full− and half−day sessions.

The district recently received a small amount of funding specifically for technology integration. Before adding technology to their curriculum, staff members from the five sites formed a committee to answer the question, "What will be most beneficial and useful in supporting student learning?"

The committee agreed that any technology should be a tool and not a teacher, and that it should not take the place of something else in the program, or replace interaction among the children. They developed a philosophy statement to guide any use of technology in the classroom. This brief document sums up their philosophy for technology integration: Technology should be interactive and empowering, promote creativity, support language development, provide an opportunity for language interaction, and should be used to enhance children's learning.

Before recommending any purchases, the committee carefully considered the needs of the students, the current curriculum, potential uses of technology tools for the teachers, and available resources. Based on this data, the committee recommended purchasing a computer, scanner, and printer for each classroom. They looked at software in light of its appropriateness for the developmental needs of young children and selected an open−ended drawing program. In addition, they purchased a digital camera for each school.

The classroom computer is available to the students as one of their choices during center activity time. Two chairs are placed in front of the computer to foster interactions and conversations. Children are encouraged to work together and share their projects.

The digital camera has become a useful and versatile tool for the teachers. It is used to enhance learning in several ways:

- To assist with the transition between home and school. Photos of the many things children see on the first day of school (the bus and bus driver, the school entrance, the office and secretary, the class and teacher) are printed and shared with children and parents during the first home visit.
- As a tool to help children stay on task, gain independence, and increase time management skills. Teachers show students a picture of themselves successfully performing tasks as a reminder of what is expected. This strategy is both motivating and reinforcing to the student.
- To enhance communication between parents and child, as well as parents and school. Photos of activities such as zoo visits and open houses are often sent home with the students. No captions are needed, so when the children share the pictures with their families they can be discussed in the home language.

Looking ahead, the staff anticipate purchasing an additional computer for each classroom. They are also considering additional software purchases. But the priority is to get additional digital cameras, which they see as more useful and beneficial to the program.

Demographics

Portland Public Schools Head Start has five sites in North, Northeast and Southeast Portland. Six hundred and twelve three−, four−, and five−year−old children representing 12 diverse cultures and languages are enrolled in full− and half−day sessions.

Background

The district recently received a small amount of funding specifically for technology integration. They wanted to ensure that its use, especially in early education, was appropriate and effective.

Design &Implementation

The Portland Public Schools Head Start recently received a small amount of funding specifically for technology integration. Before adding technology to their curriculum, staff members from their five sites formed a committee to answer the question, ?What will be most beneficial and useful in supporting student learning??

The committee agreed that any technology should be a tool and not a teacher, and that it should not take the place of something else in the program, or replace interaction among the children. After carefully considering the needs of the students, the current curriculum, potential uses for the teachers, and available resources, they recommended purchasing a computer, scanner, and printer for each classroom. They looked at software in light of its appropriateness for the developmental needs of young children and selected an open−ended drawing program. In addition, they purchased a digital camera for each school.

The classroom computer is available to the students as one of their choices during center activity time. Two chairs are placed in front of the computer to foster interactions and conversations. Children are encouraged to work together and share their projects.

One piece of software, the drawing program, is provided, and children are encouraged to explore it in depth. The digital camera has become a useful and versatile tool for the teachers.

The Portland Public Schools Head Start committee developed a philosophy statement to guide any use of technology in the classroom. This brief document sums up the reasons for their success. Technology should:

- be interactive and empowering;
- promote creativity;
- support language development;
- provide an opportunity for language interaction; and
- should be used to enhance children's learning.

Results

The staff at Portland Public Schools Head Start observed the following outcomes as a result of their thoughtful use of technology with their pre−school students. These outcomes support the program?s philosophy about the appropriate use of technology to support the learning and development objectives of young children.

- Technology encourages communication and enhances children?s language and concept development.
- Digital photos encourage child−family communication.
- Digital cameras provide personal, visual clues indicating daily routines and transitions.
- Digital cameras provide children firsthand visual clues for developing self−concept and understanding their role in social interactions with peers.
- Digital cameras document experiences with community, such as field trips and guest artists, further enriching children?s connection to the world outside of school.

Replication Details

Tips from the educators at the Portland Public Schools Head Start program for incorporating technology in schools for young children:

- Consider technology as one tool among many used to enhance learning, not as a substitute for child interactions with each other, with adults, or with other modes of learning.
- Allow children to make their own choices of when and how they use technology; never force it upon them.
- Allow teachers to make their own decisions on when and how to use technology with their students.
- Involve staff in the decision−making process when defining technology policies.
- Have a formal committee to screen technology tools and software for the entire program.

Costs and Funding

Contact Information

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Northwest Regional Educational Laboratory
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For questions about the By Request series call (503) 275−0454 or email info@nwrel.org

Rating Criteria

The Portland Public Schools Head Start story has been selected by the Northwest Regional Educational Laboratory (NWREL) as an example of a site in the Northwestern United States using technology to support early childhood learning. This is one of many excellent programs in the Northwest noticed by NWREL.

Educators at some sites have integrated technology into their classrooms for several years, others for a much shorter time. The scope of the use varies. Though each has a unique approach, all share the common philosophy that technology, used appropriately, can enhance children's learning. Included for each site profile is contact information, observed outcomes from the thoughtful use of technology, and tips from these educators for incorporating technology in schools.

This story is an excerpt from The Northwest Regional Educational Laboratory's (NWREL) June 2001 issue of their "By Request" series. NWREL publishes By Request quarterly. For a complete version of this By Request, titled Technology in Early Childhood: Finding the Balance, go to:

http://www.nwrel.org/request/june01/

This story exemplifies the following practices:
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Tammy Halfacre's Kindergarten Class, Hoonah Elementary School

Tammy Halfacre's Kindergarten Class, Hoonah Elementary School

Hoonah, AK

School Type: Public

School Setting: Rural

Level: Elementary

School Design: Traditional

Content Presented By:

Northwest Regional Educational Laboratory (NWREL)

Northwest Educational Technology Consortium (NETC)

Teachers often say that technology opens up new worlds to their students, that it brings information to their students that otherwise wouldn't be available to them. Tammy Halfacre, kindergarten teacher at Hoonah Elementary, thinks so as well, especially considering the unique location of her school.

Hoonah is a community of about 900 on Chichagof Island, forty miles west of Juneau, Alaska. Hoonah's population is about 80 percent native Tlingit. Getting to and from Hoonah can be quite involved. The only transportation means are by a twice−weekly ferry or by three to six passenger planes that fly to Juneau and back several times a day, depending on weather and other factors.

Technology has provided Hoonah's children learning opportunities similar to those children in larger communities. Besides providing access to information, technology can be used to show Hoonah's children how other children live and learn all around the country. Halfacre's students are penpals with kindergarten classes in New Jersey and in Texas. Halfacre takes digital photos of her students and emails them to the other classes. The classes also have exchanged videotapes of their activities.

The children communicate with their penpals frequently, either writing individual letters on class stationery they created themselves, writing group letters or through email. Halfacre says on her web site:"Starting the year writing to our new pen pals is an exciting way to introduce writing, letters, sounds, signing their name and patterns. Later in the year this is excellent for mapping skills, social studies, and literacy lessons about letter writing."

Technology is used to celebrate student achievements. Every class at Hoonah has a part of the hall's wall to celebrate their successes. Halfacre has covered her wall with dozens of vibrant, colorful digital photos of her students engaged in all sorts of activities. The pictures show the children doing everything from saying the pledge of allegiance at the Potlatch, to working on various projects. In the middle of the pictures is the caption "Look How Far You Have Come!" Halfacre takes pictures at every opportunity, and they are displayed around the school, in the monthly school newsletter, on her

class web site, and in the school yearbook. As Halfacre says, "When the children see their pictures everywhere, they have a sense of pride and ownership of their school." Sharing the pictures with parents encourages family−school−student communication, and is exciting for the parents to see their children's accomplishments. "The kid's excitement is what prompts me to do this," says Halfacre. The pictures also give the children immediate positive feedback, because the digital pictures can be displayed instantly. The advantage to having instant pictures is especially important when it can take a week to send pictures to Juneau for developing.

Like other schools that are beginning to integrate technology into the curriculum, Hoonah's administration has supported the staff by listening to their suggestions, and giving them the resources and independence to experiment and implement their ideas. The staff is currently exploring how technology can be used for authentic and project−based cooperative learning. Staff have encouraged the administration to use a grant to purchase a project−based learning science curriculum that utilizes computer technology. This would replace a computer lab used primarily for drill−based skills. The program builds on children's current knowledge with students working collaboratively on science activities in small groups or in pairs. The projects are correlated with the curriculum standards for kindergarten through 6th grade, and so they will enhance educational goals rather than being an add−on.

The replacement of the drill−based computer lab for this hands−on module lab, will be an adjustment for some. However, says John Halfacre, one of the teachers involved in the new lab, most of the staff are willing to try something new if it is aligned with the current curriculum and will benefit the students.

The staff and administration's enthusiasm for trying new ideas if they benefit the kids' whole learning is one reason this school is a wonderful learning environment. Infusing various technologies in the classroom, whether it is a digital camera, videotape, or project modules enhance learning and encourages children to learn.

Demographics

Hoonah is a community of about 900 on Chichagof Island, forty miles west of Juneau, Alaska. Hoohnah's population is about 80 percent native Tlingit. Getting to and from Hoonah can be quite involved. The only transportation means are by a twice−weekly ferry or by three to six passenger planes that fly to Juneau and back several times a day, depending on weather, and other factors.

Background

Because of Hoonah Elementary School?s isolated location, they have a special need for exposure to information and services outside of their own environment. Technology has provided Hoonah's children with learning opportunities similar to those children in larger communities have. Besides providing access to information, technology is used to show Hoonah's children how other children live and learn all around the country. And services formerly provided, at the closest, in Juneau can now be obtained in a more immediate way. For example, digital cameras provide immediate documentation of learning activities, rather than sending film to Juneau and waiting for more than a week for processing.

Design &Implementation

The kindergarten teacher at Hoonah Elementary School in Alaska, and the district as a whole, focus on the curriculum standards first, and see technology as a tool for introducing and mastering these

standards. Some of the activities they have incorporated into the teaching and learning process to accomplish this objective are:

- **Establishment of a kindergarten pen pal project with classes in other states to introduce literacy skills, reading readiness, and cultural awareness.**
  Children communicate with their pen pals frequently, either writing individual letters on class stationery that they create themselves, writing group letters, and through email. Lessons evolve from an introduction to the purpose of writing, recognizing letters and sounds, signing your name, and noticing patterns to mapping skills, social studies, and literacy lessons about letter writing. The kindergarten teacher takes digital photos of her students and emails them to the other classes. The classes also exchanged videotapes of their activities.

- **At the request of the school?s staff, the computer lab primarily used for drill and practice has been replaced with science curriculum materials that support authentic and project−based cooperative learning.**
  Staff encouraged the administration to use a grant to purchase a project−based learning science curriculum that utilizes computer technology. The program builds on children's current knowledge, with students working collaboratively on science activities in small groups or in pairs. The projects are correlated with the curriculum standards for kindergarten through 6th grade.

- **Digital photographs are regularly used to celebrate student achievements.**
  Colorful digital photos of students engaged in all sorts of activities are hung in a special hallway display, right as the activities are happening. This is especially important when it can take a week to send pictures to Juneau for developing. The pictures encourage parent awareness of the curriculum and help students to compare learning, growth, and what they have accomplished over time.

Results

Tammy Halfacre, kindergarten teacher at Hoonah Elementary School, made these observations about how technology affected relationships and communication in the classroom and with parents:

- Photos taken with the digital camera celebrate student learning and reward their achievements in an immediate way.
- Technology promotes greater understanding of others.
- Technology brings communities closer together.
- Technology enhances communication with parents as they can see what their children are doing on the class web site and pictures in the newsletter.
- Technology brings out children's individual strengths.

Replication Details

The Hoonah, Alaska staff offer these tips for successfully carrying out a technology−use plan for young children:

- Just jump in and play with it.
- Observe other people until you get more confortable using it yourself.
- Administration should encourage experimentation and staff to try new ideas.

Costs and Funding

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Rating Criteria

Tammy Halfacre's Kindergarten Class, Hoonah Elementary School story has been selected by the Northwest Regional Educational Laboratory (NWREL) as an example of a site in the Northwestern United States using technology to support early childhood learning. This is one of many excellent programs in the Northwest noticed by NWREL.

Educators at some sites have integrated technology into their classrooms for several years, others for a much shorter time. The scope of the use varies. Though each has a unique approach, all share the common philosophy that technology, used appropriately, can enhance children?s learning. Included for each site profile is contact information, observed outcomes from the thoughtful use of technology, and tips from these educators for incorporating technology in schools.

This story is an excerpt from The Northwest Regional Educational Laboratory's (NWREL) June 2001 issue of their "By Request" series. NWREL publishes By Request quarterly. For a complete version of this By Request, titled Technology in Early Childhood: Finding the Balance, go to: http://www.nwrel.org/request/june01/

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.

Connecticut Regional Vocational−Technical School System

Connecticut Regional Vocational−Technical School System

Stamford, CT

School Type: Public

Level: High

School Setting:

School Design: Vocational

Content Presented By:

The Education Alliance at Brown University

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Introduction

When 20−year veteran Peg Sonntag's social studies classroom at the J.M. Wright Regional Vocational−Technical School in Stamford, Conn. underwent a makeover in the fall of 2000, she was thrilled to make the change. It all began when Connecticut Regional Vocational−Technical School System (RVTSS) administrators Ann Sandagata, Mike Suntag, and John Tarnuzzer replaced the rows of desks and chairs in her classroom with computers arranged in a horseshoe and established a Dialogue Center consisting of long work tables in the center of the horseshoe where students could share information and discuss ideas. This created what the RVTSS called "digital classrooms."

"I had previously incorporated several Web−based projects in my classrooms and was itching to do more," says Sonntag. "I was excited by the chance to take my plans to another level. What I really wanted to be able to do was to expose my students to the wealth of historical resources and the variety of information and media that was readily available, and to challenge my students to become modern researchers."

The administrative group was committed to making learning active, constructive, and project based. In order to do that, Sonntag and her fellow teachers took a specially designed training course to learn how to create learning units that incorporate the use of technology, independent research, sharing, discussion, reading, writing, and presentation skills. The teachers also learned how to align their lesson plans with state and national academic standards as they connected the content to real−world concerns that the vocational students would face after graduation.

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II: Why Change the Approach to Technology?

The Regional Vocational−Technical School System (RVTSS) is organized into 17 regional schools that represent racially and economically diverse populations across Connecticut. Five of the schools are considered urban, priority schools. In the RVTSS, priority schools are those that have the most students in need of intervention on the Connecticut Academic Performance Test (CAPT), which is administered to 10th graders; poor attendance; a high percentage of students needing free or reduced lunch; problems with staffing and fiscal resources; and low staff retention rates.

The RVTSS administrators chose to pilot a digital classroom with Peg Sonntag's 10th grade class at Wright Tech in Stamford in part because her school ranked first among the technical schools in the percentage of students needing intervention in all four areas of the CAPT−− math, science, reading across the disciplines, and writing across the disciplines. Overall, for the class of 2003, 75% of 10th graders from the technical schools did not meet the state goal in any of the four areas.

At the same time, the system had also invested time and money to keep up with technology trends related to hardware and software acquisition since the early 1980s. But in a 1999 audit of technology use in the schools, Mike Suntag, consultant for educational technology with the RVTSS, found that most computers were located in computer labs and the trade area workshops. Teachers and students were not integrating the technology with instruction in any of the academic or trade classrooms.

The administrators knew they had to overhaul the system's vision of educational technology with an eye toward the state standards and integrating reading and writing strategies into all the content areas, including the trade clusters, if they hoped to justify technology expenditures and demonstrate the technology's impact on student achievement.

When designing the digital classroom model, the administrators envisioned classrooms with a computer−to−student ratio of 1:1 and an effective integration of the technology into the curriculum. Within a year and a half, this idea took shape in the form of 10 digital classrooms in 8 of the system's 17 schools. This number will rise to 25 classrooms divided among all 17 schools by the end of the 2002 school year.

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Student−Centered Instruction

The new vision for technology use in the Connecticut Regional Vocational−Technical School System (RVTSS) has changed the traditional classroom's physical arrangements and demanded a change in instructional practice. Instruction now centers around the students. Instructors work as facilitators and guides for students who are creating their own meaning within the work they are doing.

Teachers learned how to design learning units that combine the benefits of technology with instruction that supports the students' development of research, writing, and discussion skills. This approach allows students to learn in ways not previously possible. The learning units present students with a question or a real−world problem or concern. Then, instead of giving the students information in a lecture style, the teachers suggest technology tools and resources that will help students find the information, analyze and synthesize the information, and then explain and clarify a solution or concept in the Dialogue Center with their classmates. Each unit offers a rubric that guides student

work and sets clear standards for achievement (see samples of learning units at http://www.ctdlc.org/votech. There are rubrics for students' products as well as their Dialogue Center participation. The goal is to gradually shift responsibility for active, constructive learning from the instructors to the students themselves.

"My role as an instructor definitely changed from the first moment my students started to use the digital classroom model," says Wright Tech's Peg Sonntag. "I began to be pushed to the back as my students took over their own learning. The structure of the learning units requires students to work independently, to organize their time, and plan their own solutions. I am now a facilitator, keeping them on track and monitoring their dialogue sessions. I believe my students look on me more as a fellow learner, collaborator, and team member instead of the one with all the answers."

Mike Suntag, consultant for educational technology with the RVTSS explains, "We are attempting to harness the power of technology to provide educational opportunities for our students that were not possible in the past. The changes that technology is fostering in every area of our society compel our school system to parallel those changes with a reflective study of what we teach and how we teach it."

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Professional Development and Standards

The implementation of a digital classroom model forced the Connecticut Regional Vocational−Technical School System (RVTSS) to make drastic changes to the nature of instruction at the schools. The administrative team sought to make this a system−wide effort rather than a school−by−school one. Mike Suntag, consultant for educational technology with the RVTSS, began by initiating an assessment of technology competency levels for instructors and administrators. The schools' professional development teams or technology committees now update their assessments every year.

The RVTSS then partnered with the Connecticut Distance Learning Consortium (CTDLC) and its director, Edward Klonoski, to develop staff training for the new instructional model and a searchable database for the Web−based learning units that the teachers would be creating. These units, available on the CTDLC database at http://www.ctdlc.org/votech, relate learning in the classroom to real−world problems and allow students to research topics independently and use technology to find the necessary information and solutions. They incorporate the resources available through different kinds of media with writing, discussion, analytical skills, student collaboration, and an eye toward state and national standards.

Dr. George Cicchetti, a CTDLC consultant, developed the training course, called "Designing Web−Based Learning Units," using David Jonassen's Good Models of Teaching With Technology (GMOTT) framework. The first round of teachers took the course as part of a year−long professional development initiative in the RVTSS and learned how to create learning units that incorporated these essential elements:

1. Alignment with the Connecticut Framework, Curricular Goals, and Standards, and alignment with the National Trade Standards when appropriate
2. Clear rubrics and indicators of success for students
3. Flexibility to meet the needs of all students, including those with special needs

The administrative team also sought to include multiple learning strategies in the development of the units in order to prepare students for the diverse demands they will encounter in higher education and

the working world. These strategies included:

1. Active Learning: Students manipulate virtual and actual materials to complete the learning activities.
2. Constructive Learning: Building on what they already know, students construct their own understanding of the material.
3. Authentic Learning: Projects revolve around real−world problems or tasks, which connect students to the world around them.
4. Cooperative Learning: Students work in groups and have specific tasks or roles within their group.
5. Intentional/Reflective Learning: Students are encouraged to generate their own questions and explain their problem−solving strategies. Instructors use a reciprocal teaching approach at the Dialogue Center to encourage metacognitive skill development.

(For more information about GMOTT, see http://knowledgeloom.org/gmott and click on the "Investigate" button.)

Each unit also includes constructive reading and process writing strategies with scaffolding resources, and planned Dialogue Center activities, where students discuss the information they discover with the class, share their thoughts on the topic of the unit, and work with the instructor to clear up any misconceptions about the work.

The instructional design of the units follows Gagne's Events of Instruction. First, engage the students, then state the instructional objectives and products, activate background knowledge, set up learning activities with guidance, provide informative feedback, and finally, assess learning.

Through field−testing, the team determined that each learning unit should be completed in approximately a week and should contain three objectives or projects for students to complete. However, some teachers piloting the digital classrooms say the time element is still evolving.

The teachers encountered several issues in the training. Some had trouble building scaffolding for reading and writing strategies into the units. Others had discussed topics in their classrooms but never included that activity in a learning plan or set up a rubric for participation. To enhance the training for the second wave of teachers who are currently going through the program, Dr. Cicchetti wrote lessons addressing each of these challenges and added them to the online professional development course.

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Elements of the Learning Unit

Based on the work done in professional development courses with over 250 teachers in the Connecticut Regional Vocational−Technical School System (RVTSS), the administrative team determined that a polished Web−based learning unit for use in the digital classrooms should include these features:

1. A core topic or essential question(s). The core topic statement indicates the most important concept of the unit, and the essential question is usually a "why" or "how" question about the core topic. These elements lay the groundwork for the abstract that will be uploaded to the searchable database. The abstract also includes an explanation of the unit's alignment with the Connecticut Framework, Curricular Goals, and Standards or the National Trade Standards.

2. An introduction. This describes a real−world problem for students to solve or a question that is connected to the community, state, or world outside of school. This promotes increased collaboration between subject area teachers and trade/technical teachers.
3. A statement of instructional objectives. The objectives or products that the students will complete must require higher order thinking such as creating, analyzing, and solving.
4. Knowledge−building resources and Dialogue Center activities. Teachers provide links for developing background knowledge, and the students collaborate, read, take notes, and share their information in the Dialogue Center. The teacher clarifies any misconceptions and provides scaffolding for understanding. The Dialogue Center is consistent with Lev Vygotsky's concept that students learn more from adult guidance and peer collaboration than they could learn as an individual. This part of the unit helps students clarify, modify, or reinforce their ideas.
5. Learning activities. All subject areas include directions, examples, graphics, and other supporting materials that help the students complete the activity and objective. Dialogue Center activities may include reciprocal teaching, explanation, sharing, elaboration on responses, and peer editing. These activities allow teachers to promote reading and writing strategies in a context that is meaningful to the students.
6. Rubrics for assessment. Teachers are encouraged to write clear and specific expectations and to discuss these with the class at the onset of a lesson.

Wright Tech's Peg Sonntag produced one of the first Web−based learning units to follow this format. The unit introduced her class to the Triangle Shirtwaist Factory fire in New York City in the 1911. Sonntag gave students an array of Web sites and resources where they could find evidence and information about the fire. Students then conducted their own interviews about safety regulations and crisis response in the trade areas at J.M. Wright. After researching the current state of sweatshops, they ordered their information using a technology tool called Spider Map. The project culminated in a written report about where sweatshops still exist today and what individuals can do to fight them.

The unit clearly identifies the core topic of workplace safety, the essential question of how workplace safety regulations changed after the fire, and the activities' alignment with the Connecticut Framework for Social Studies in grades 9−12. It connects students to the real issues they may face when they enter the workplace and it uses reading, interviewing, discussion, and writing to engage all students in the work.

"I find that each student can meet his/her own learning needs because embedded in the process are ways for the students to monitor and assess themselves," says Sonntag. "The Internet allows the use of a variety of mediums for learning, so those who are challenged by reading and writing can learn and express themselves in ways better suited to their learning styles. Those for whom English is a barrier can use the technology to assist them in communicating more clearly."

Sonntag says her toughest job was getting the kids to connect American History to their own lives. But the new strategies for learning included in the units and the increased options the students have in terms of finding and presenting information have inspired her students to dig deeper into a subject.

She cites a PowerPoint presentation by two students in her class about what event from American history they would change and how it would affect modern America:

> "They chose Martin Luther King's assassination and made a very cogent argument about how the Civil Rights movement would have changed if King had not died," says Sonntag. "They...proudly pointed out the computer techniques they used in the presentation and proceeded to discuss with other students their arguments regarding

> the Civil Rights movement. Their joy was contagious... they went beyond the assignment to discuss what Martin Luther King might have cared about if he were alive today."

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Changes in Teaching and Learning

Wright Tech's Peg Sonntag, Trevor Jones, the math and science department head at Wright, and Ken Anton, head of the electronics department at O'Brien Tech in Ansonia, agree that digital classrooms and Web−based learning units have breathed life into the Regional Vocational−Technical School System (RVTSS) classrooms.

"Students come to the table with diverse background knowledge and ideas," Anton says. "They become eager to exchange their thoughts, and even the most reticent eventually identify a gap to bridge. Eventually, all students have contributed something toward the solution."

Sonntag notes that discipline problems in her classroom have diminished. The only noise coming from her classroom is the sound of students collaborating and helping one another. And, the learning units are easily adaptable. Special education teachers have been able to download the units from the database and modify the objectives to suit the needs of their students.

Jones notes that his math students are learning a problem−solving process using real−world concerns. At the Dialogue Center, reciprocal teaching of the process between teacher and students, and among students, facilitates understanding of the concepts involved. Students find that there is more than one way to solve a problem. There is a shift of responsibility as students take active ownership of their learning.

"The learning units take advantage of the way technology can present information," says Mike Suntag, educational technology consultant for the RVTSS. "In essence, we revised content to take advantage of technology. Many others are attempting to fit technology into the existing instructional framework. That is bound to be a failure."

The RVTSS has scheduled 20 more digital classrooms for implementation during the 2001−2002 school year in the four basic academic areas (English, math, science, and social studies) and three major trade clusters (construction, service, and manufacturing). The success of the initiative lies in the fact that students are gaining technology competencies while pursuing a learning goal. And those competencies allow them to develop as independent learners.

Also, the superintendent of the RVTSS, Dominic Spera, enabled this initiative to succeed through his leadership and willingness to take on the risk of a very visible system−wide change effort.

"My expectations have definitely been exceeded," says Sonntag. "I have been awed by the quality of [my students'] work, their ability to collaborate, and their excitement in learning history. There were times when my passion and excitement for a topic ...was contagious. Now the students get excited by their own research."

Published learning units can be found at http://www.ctdlc.org/votech.

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Demographics

- Grades 9−12, vocational/technical schools
- 17 regional schools with racially and economically diverse recruitment areas.
- 39% minority population; 11.9% have a non−English home language
- Twenty−four trade and technology areas in addition to academic instruction
- System−wide student population: 10,605
- Teacher population: 964
- Five of the 17 schools are considered to be urban and priority schools

Background

The Connecticut Regional Vocational−Technical Schools System (RVTSS) had always kept up with the acquisition of high−tech hardware and software, but had not been able to fully integrate the use of new technology with instruction in the classroom. In 1998, when the Connecticut legislature expressed a desire to help the system build a first−rate technology infrastructure, the need arose for a new model of instruction centered around these changes. Once the 17 schools were completely wired for voice, video, data, and internet access, the system could concentrate on implementing plans previously developed by the Vocational−Technical Central Office Technology Committee and the Vocational−Technical School−wide Technology Committee. These included a student−centered plan for the use of educational technology in the schools.

The plan to integrate instruction with technology revolved around the state standards and preparation for the Connecticut Academic Performance Test (CAPT), which is administered to 10th graders and focuses on four areas−−math, science, reading across the content areas, and writing across the content areas. For the class of 2003, 75% of technical school 10th graders did not meet the state goal in any of the four areas. The technical system also includes five schools (Hartford, New Britain, Hamden, Stamford, Bridgeport) that the RVTSS has deemed priority schools, which means they have the highest percentages of students needing intervention on the test.

Design &Implementation

The Connecticut Regional Vocational Technical School System (RVTSS) administrators set out to design a model in which the use of technology would foster constructive, active, and project−based learning in academic subject areas as well as in the trade workshops, and where the student−computer ratio in the classroom would be 1:1. They also wanted the new instruction model and learning units to (1) address the needs of limited English proficient students and special education students, (2) prepare students for the Connecticut Academic Performance Test (CAPT) which is given in grade 10, and (3) align with the state curriculum goals and standards and the National Trade Standards.

The implementation process included:

1. **Audit of existing technology use:** Administrators found that most computers were in library/media areas or trade area workshops. They developed the digital classroom model to involve all students in technology use daily and to infuse academic subject area instruction with the options of new media.

2. **Assessment of technology competency levels for instructors and administrators:** Initiated at the onset of the reform, this assessment is now completed every year by schools' professional development teams or technology committees.

3. **Partnership with the Connecticut Distance Learning Consortium (CTDLC):** This partnership was necessary to develop a year−long staff training program for the new instructional model and a searchable database to make the Web−based learning units that teachers would develop available to teachers and students alike.

   Using David Jonassen's Good Models of Teaching with Technology (GMOTT) framework, CTDLC consultant Dr. George Cicchetti created an online course called "Designing Web−Based Learning Units." The online course and hands−on sessions helped the first round of teachers develop Web−based learning units that aligned with the Connecticut Framework, Curricular Goals, and Standards and the National Trade Standards when appropriate, incorporated the use of various kinds of media, presented clear indicators of success for students, and were flexible enough to meet the needs of all students, including those with special needs.

   The course also identified the strategies to be embedded in successful learning units. These included:

   - **Active Learning:** Students manipulate virtual and actual materials to complete the learning activities.
   - **Constructive Learning:** Building on what they already know, students construct their own understanding of the material.
   - **Authentic Learning:** Projects revolve around real−world problems or tasks that connect students to the world around them.
   - **Cooperative Learning:** Students work in groups and have specific tasks or roles within their group.
   - **Intentional/Reflective Learning:** Students are encouraged to generate their own questions and model and to explain their problem−solving strategies.
   - **Constructive reading and process writing strategies:** Literacy strategies for all students include scaffolding of instruction.
   - **Dialogue Center activities:** A time when students step away from the computers and discuss, clarify, and share the information they have gathered.

4. **Problem identification:** During the training, teachers encountered problems with technical issues, such as using HTML, and educational concerns such as building scaffolding for reading and writing strategies into the units or setting up rubrics for participation. Responding to these difficulties, Dr. Cicchetti wrote units addressing each problem and added them to the online professional development course for the new round of teachers.

5. **Field testing and teacher feedback:** Through field testing, the team determined that each learning unit should be completed in approximately a week and should contain three objectives or projects for students to complete. Teachers in the system said that piloting the program gave them the opportunity to learn what worked best for the students in their classrooms and to refine their lesson plans and rubrics to reflect this knowledge.

6. **Posting of polished learning units:** Using the searchable database designed by the CTDLC, polished learning units in all subject areas have been posted on the Web. The units can be found at http://www.ctdlc.org/votech. Because the units are available to everyone via the Web, parents can learn about what their children are doing in class, other teachers can investigate what students did in other classes or in previous school years, and special education teachers can access and modify the lessons and rubrics and tailor them to students with special needs.

Results

The Regional Vocational−Technical School System (RVTSS) continues to monitor the progress of the digital classrooms and the new technology instruction model. The state of Connecticut has issued a mandate that instructors get 15 education units over five years to build their technology integration skills. In keeping with this, the vocational technical schools will provide the central office with technology competency assessments for each instructor and administrator.

An initial round of teachers has completed the year−long professional development program that includes Dr. George Cicchetti's online course on designing Web−based learning units that integrate use of new media into academic subject areas, align with state and national standards, and provide students with the opportunity to take control of their own learning. The training is a combination of hands−on sessions and follow−up through an online course. A second round of teachers is now working through the training process.

The searchable database of learning units, designed and maintained with the help of the Connecticut Distance Learning Center (CTDLC), continues to post polished learning units for the use of teachers, students, and parents. Special education teachers can access the learning units and modify them to fit the needs of any child in their classroom, thereby facilitating collaboration among educators in the system.

The use of technology has also allowed the RVTSS to help bilingual students through the learning units as well. Links to online translators have been added to each unit enabling the student to paste parts of the unit into the translator to better understand the material. The Dialogue Center activities have also facilitated better understanding among all students. Because the students are expected to demonstrate their thinking, use of strategy, and research skills in the discussions, they learn from one another and collaborate to increase their knowledge. Students with stronger English skills frequently translate for others to enhance understanding of the current material.

Although it is still early in the piloting process (only one digital classroom has been operating for more than a year), schools in the system with digital classrooms have reported a lower occurrence of behavior problems. The students are interested in the work they are doing and excited by the prospect of creating individualized projects around specific topics.

The digital classroom model has also facilitated discussions among teachers about how to look at student work, assess its quality, and use it to demonstrate the effectiveness of the learning units.

The system expects student scores on the Connecticut Academic Performance Test (CAPT) to rise because the learning units are specifically designed to reinforce the skills and knowledge needed to excel in each area of the test. The process of writing learning units also has been simplified for the teachers by uploading the units as word documents rather than as HTML documents.

The RVTSS is also in the process of adding 24 new digital classrooms so that each of the 17 schools will have at least one digital classroom operating with trained staff and the ongoing support of mentors, peer trainers, and online support through the CTDLC.

Replication Details

School and district administrators hoping to integrate technology with instruction in a constructive way need to keep these tips in mind:

- **Have an action plan:** When the state of Connecticut agreed to help the Regional Vocational−Technical School System (RVTSS) with their technical infrastructure in 1998, the RVTSS administrators had already done some planning. They had created five−year action plans detailing work to be done in each of four areas regarding technology − administrative, instructional delivery systems, technical support and training, and classroom applications.

- **Create a solid technology infrastructure:** The RVTSS had to concentrate on this part of the development before they could put any other plans in motion. This includes not only the technology resources in the classrooms but also a trained staff at the school level who are qualified to coach teachers new to the process and troubleshoot issues. External support at the district level must also be in place to troubleshoot and assist teachers.

- **Devise a professional development plan:** The RVTSS administrative group assessed their staff capabilities at the beginning of the project. They then partnered with the Connecticut Distance Learning Center to create a training program that would prepare all staff to work in the digital classrooms. The administrative group decided to train the teachers in cohorts, sending an initial group through the one−year program early on in the process and following up with a second group shortly thereafter. This training program and the shape and scope of the learning units that the first round of teachers produced were constantly being refined to make the process smoother for the next round of teachers.

- **Central office support:** The superintendent of the RVTSS, Dominic Spera, gave his full support to this very visible, system−wide reform effort. His leadership helped make the project a success. The RVTSS also had to work within the framework of availability and immediacy of state funding in any given year. But they were dedicated to getting this project off the ground. They continued to develop their plans and make presentations at various technology conferences to attract new money to the initiative and more support from the state.

Costs and Funding

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Learning Units database: http://www.ctdlc.org/votech

Rating Criteria

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Multiple Learning Strategies

Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Whitson Elementary School

Whitson Elementary School

White Salmon, WA

School Type: Public

Level: Elementary

School Setting:

School Design: Traditional

Content Presented By:

Northwest Regional Educational Laboratory (NWREL)

Northwest Educational Technology Consortium (NETC)

Even before you step through the front doors at Whitson Elementary School, you know that this school is all about children. Handprints of all sizes and colors cover the wall near the door, each handprint labeled with a child's name. The children have literally made their mark on this school. Once inside the school you can see and hear how enthusiastic and involved the children are in their work. Diann Beseda's second grade classroom is alive with activity. Few of the children sit at desks. On the carpet a child sews up a paper quilt. At the computers, children try a new software program −− at one computer two children work together, one child using the mouse, the other the keyboard. In another area children are spread out on the floor using pattern blocks to build shapes with symmetry. They take pictures of each other's shapes using a digital camera. In the midst of all this activity, one of the guinea pigs in the center of the room (in a cage) lets out an excited squeal, and some children come over to see why.

Whitson's principal, Vicki Prendergast, empowers the staff to use their enthusiasm and expertise to create this child−centered learning environment. The administrators and teachers have long understood the positive benefits that technology, if integrated wisely into the curriculum, can have as a learning tool. They are motivated to apply for grants that provide more resources to carry out their goals. A few years ago, the school received a TELDEC (Technology and the Essential Learnings Developing Effective Classrooms) grant. This grant provides a professional development model for using technology to support and integrate the state standards into teaching and learning. Last year, the school received a Gates Foundation Grant that will expand this model to further a child−centered, technologically−enriched educational experience in every classroom for every student.

The technology team includes the principal and five teachers. The team plans the direction the school wants to take, and provides leadership, inspiration, and support to other staff members in integrating technology into the curriculum.

The music teacher, Mary Orcutt, provides a unique role for the team −− because she teaches children in all grades, she can offer a perspective on what's appropriate for children at different levels. In her classes, Orcutt takes a unique approach in using technology. The students use a music software program's paint palette to create their own songs. The program generates different sounds as the user

"paints" on the computer screen. Learning how to compose music in this way is as much visual as it is auditory.

The students create songs that tie in with projects in their classrooms. For a third grade project on insects, Orcutt has the children choose an insect, and then asks the children, "What would the insect sound like? Do you want to create a sound like they make, or an impression of what they sound like?" After the children create their songs, she uses the large screen television to share each student's compositions with the class. Sharing the compositions with the class is very powerful for the students, says Orcutt.

The technology team models uses of technology for other teachers. Some staff members are uncomfortable with the idea of using technology, but the team encourages the staff to take their time, experiment, and observe others so they gradually become more comfortable with how certain technologies can benefit students.

Some of the teachers were concerned that the children are not working on oral communication, reading, and writing skills when they use computers. The technology team demonstrates how to integrate technology into writing, spelling, and oral communication, so that it can be more exciting and fun. Some teachers use software that first tells a story with the text on the screen, and then shows the pictures again, this time without the text so that children can retell the story in their own words.

Children use computer slide shows to present information, and are very eager to demonstrate their projects. The slide shows let children create their own drawings and accompanying text. The children can record their voices reading the text aloud. This enhances their literacy learning, and their verbal and written skills, as well as providing opportunities to create art. Electronic portfolios are used as an effective tool to document how well students have progressed with reading, writing, and oral communication skills. The children record samples of their reading at various times throughout the year. When they play them back, they can hear for themselves how much progress they have made. When parents hear these reading samples, says Beseda, they are excited about their child's progress.

One example of how a teacher saw firsthand how technology enhanced learning involves a boy who is bilingual and not a reader. The boy found one computer program with a book on it that became his favorite −− he read and listened to that program over and over again. His teacher was not quite sure if this was a good use of class time. One day the boy went to a box of books in his class and picked out the same book as the one on the software program and began to read it, the first book he had ever read. He was so excited, he went to the principal and read it to her. The teacher then saw how this technology inspired the boy to learn.

Whitson is evidently a place where children come first, where the staff are dedicated to giving students the freedom to explore, experiment, and grow. The phrase "all children learning" is not just a clich?here, it is a fact.

Demographics

Background

Design &Implementation

Appropriate acquisition and use of technology is guided by a technology team, including the principal and five teachers. The technology team models uses of technology for other teachers. Some staff members are uncomfortable with the idea of using technology, but the team encourages the staff to

take their time, experiment, and observe others, so that they gradually become more comfortable with how certain technologies can benefit students. The team also demonstrates how to integrate technology into writing, spelling, and oral communication, as well as other curricular areas related to learning standards.

Whitson's principal, Vicki Prendergast, empowers the staff to use their enthusiasm and expertise to:

- create a child−centered learning environment
- develop models where technology is integrated wisely into the curriculum
- acquire reources, including a grant from the Gates Foundation to expand the school's child−centered model and provide a technologically−enriched educational experience in every classroom for every student, and a grant from TELDEC (Technology and the Essential Learnings Developing Effective Classrooms). This grant provides a professional development model for using technology to support and integrate the state standards into teaching and learning.

Results

One example of how a teacher saw firsthand how technology enhanced learning involves a boy who is bilingual and not a reader. The boy found one computer program with a book on it that became his favorite − he read and listened to that program over and over again. His teacher was not quite sure if this was a good use of class time. One day the boy went to a box of books in his class and picked out the same book as the one on the software program and began to read it, the first book he had ever read. He was so excited he went to the principal and read it to her. The teacher then saw how this technology inspired the boy to learn.

Replication Details

The staff at Whitson Elementary School offers these tips for successfully carrying out a technology−use plan for young children:

- Incorporate technology into your classroom slowly. Don't worry about having to learn everything the first year −− use baby steps!
- Give yourself time to work with what you've already learned.
- Experiment! You will learn more by playing with something yourself than by someone else taking you through a step−by−step process.
- Remember that everyone goes through stages in learning to use technology.
- Make the in−service or training sessions special and rewarding for staff.
- Have staff members experience a variety of software so that they understand the difference between drill−and−practice and tools for enhancing learning.

Costs and Funding

Whitson Elementary School has successfully won two grants which have helped them attain some of their key technology−integration objectives:

- a grant from the Gates Foundation to expand the school's child−centered model and provide a technologically−enriched educational experience in every classroom for every student,
- a grant from TELDEC (Technology and the Essential Learnings Developing Effective Classrooms). This grant provides a professional development model for using technology to support and integrate the state standards into teaching and learning.

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Rating Criteria

The Diann Beseda's Second Grade, Whitson Elementary School story has been selected by the Northwest Regional Educational Laboratory (NWREL) as an example of a site in the Northwestern United States using technology to support early childhood learning. This is one of many excellent programs in the Northwest noticed by NWREL.

Educators at some sites have integrated technology into their classrooms for several years, others for a much shorter time. The scope of the use varies. Though each has a unique approach, all share the common philosophy that technology, used appropriately, can enhance children's learning. Included for each site profile is contact information, observed outcomes from the thoughtful use of technology, and tips from these educators for incorporating technology in schools.

This story is an excerpt from The Northwest Regional Educational Laboratory's (NWREL) June 2001 issue of their "By Request" series. NWREL publishes By Request quarterly. For a complete version of this By Request, titled Technology in Early Childhood: Finding the Balance, go to: http://www.nwrel.org/request/june01/

This story exemplifies the following practices:
Assessment
Each learning activity should be accompanied with well−defined indicators of success.
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

J.M. Wright Regional Vocational−Technical School, Stamford, CT

J.M. Wright Regional Vocational−Technical School

Stamford, CT

School Type: Public

School Setting: Urban

Level: High

School Design: Vocational

Content Presented By:

The Education Alliance at Brown University

By the fall of 2000, the Connecticut Regional Vocational−Technical School System (RVTSS) had already set the wheels of change in motion with respect to technology at the 17 schools under their control. They had developed, in conjunction with the Connecticut Distance Learning Consortium (CTDLC), a digital classroom model that would integrate the educational benefits of technology with the school's curriculum goals. The model showed promise in the pilot stage, and RVTSS administrators decided to expand the program in some of the lowest performing schools in the system.

The J.M. Wright Regional Vocational−Technical School in Stamford emerged as a prime candidate for across−the−board use of the new model with 10th graders during the 2001−2002 school year because approximately 71% of those students had scored at remedial level in reading on the state performance tests when they last took them in eighth grade. Teachers and administrators at the school agreed that they needed to focus on reading comprehension and problem−solving skills to help students boost their scores on the Connecticut Academic Performance Test (CAPT) when they tackled it in May of 2002.

"There was a need to raise the bar," says Diane Bauby, director of Wright Tech. "Connecticut is requiring that the class of 2006 meet graduation exit criteria. So our school improvement plan identified raising CAPT scores as an area for improvement."

Wright Tech had initially piloted one of the first digital classrooms in 2000−2001 and was lucky enough to have two master teachers fresh from that experience. Peg Sonntag and Trevor Jones volunteered to coach the cohort of teachers who would be using the model for this CAPT intervention. The six additional digital classrooms installed at Wright Tech each included 24 computers with Internet access arranged in a horseshoe shape around the perimeter of the classroom and a dialogue center in the middle of the room where students could share and clarify information, discuss their strategies for completing an assignment, and peer edit each other's products as part of the revising process. The instruction model revolved around the use of Web−based learning units, which were designed by Dr. George Cicchetti of the CTDLC and the teachers to allow students to research, build on their existing knowledge, and fashion innovative ways to look at real−world problems.

Administrators first discussed the rationale for the intervention with 10th grade academic teachers (math, science, social studies, and English), support staff, and bilingual teachers. The teachers then explained it to all sophomores on a class−by−class basis. All teachers agreed to participate in the

intervention, which lasted about 12 weeks, from late February until the students took the CAPT in May. For the first two months, students would concentrate on four learning units—mathematics, science, reading across the disciplines, and writing across the disciplines—specifically designed by Dr. Cicchetti to target skills necessary for the CAPT test (www.ctdlc.org/votech). With the remaining time, students would tackle Web−based learning units that were designed by the teachers, reviewed by Dr. Cicchetti, Sonntag, and Jones, and aligned with the Connecticut Curriculum Frameworks. Students were also brought together in focus groups periodically to elicit comments about the progress of the initiative.

"I focused on the students as an important part of the process," Bauby says. "I listened to their opinions and suggestions. As a result, we became partners in the process."

Both the teachers and the administrators hoped for more than just improved test scores from the intervention. The staff strove, through the program, to change instruction at the school from a teacher−centered style to a student−centered style. Many felt this change would engage the students in their own learning and cut down on absenteeism and the number of discipline referrals. They also hoped the independence and confidence the students gained from this style of learning would increase their motivation and effort, and that the metacognitive coaching they received would improve their planning and self−checking skills. The rubrics used for assessment, which teachers and students referred to throughout the learning process, also were an integral part of the program and gave students a clear path to improvement.

School staff knew they would have to work as a team to bring about the desired changes. Bauby and Assistant Director Dr. Maria Romero both observed classes and conducted debriefing sessions with the teachers at the close of each day; RVTSS administrators Mike Suntag, John Tarnuzzer, and Ann Sandagata made visits to classrooms and debriefing sessions to support the teachers; and Sonntag, Jones, and Dr. Cicchetti coached the teachers and helped model strategies for implementing the program.

"Being that this is a totally new concept in education, our ability to guide and coach teachers helped reduce the stress level and set them at ease," says Jones.

Cicchetti, who had designed the prototype web−based learning units for the pilot digital classrooms and trained the first cohort of RVTSS teachers to develop and use their own units, trained all the 10th grade teachers at Wright Tech to work with the research−based unit structure through a series of face−to−face and online workshops. He gave each teacher a template of the structure so that teachers could use the same framework for multiple units.

The units were central to the digital classroom model's success. They included rubrics for assessment, dialogue center activities, scaffolding, and online resources, and were always designed to align with the Connecticut Framework, Curricular Goals, and Standards. They were also easily adaptable for all levels, and the use of technology allowed any student to work productively.

"I like the electronic translator," noted one student. "It allows me to read and understand the information independently rather than having to ask the bilingual teacher for help."

Because the units were available to everyone through the online database designed by the CTDLC, bilingual, mainstream, and special education teachers could converse without confusion about students' work and their progress in the classes. Teachers also made it clear that each student was to respect the comments of others in the dialogue center, creating an environment where all students felt comfortable talking through their thought processes.

The strength of the digital classroom model is the embedding of multiple learning strategies in all the units and a connection to real−world problems in the framing of the questions. Elements of reciprocal teaching and a cognitive apprenticeship model eased students into taking more active responsibility for their own learning. Teachers would begin by modeling a task for the students and conversing with the students about different ways of framing the questions or exploring the topic. Students then independently researched their ideas and returned to the dialogue center to demonstrate their thinking. Teachers provided feedback and scaffolding as necessary, but urged students to compare their problem−solving strategies and help other students through a peer−editing process. This allowed students to reflect on their thinking and revise or clarify their products.

Originally armed with a print version of the unit, web links, and transparencies to review the processes expected for each project, the students soon became the "teachers," demonstrating, explaining, and carrying out the strategies for their fellow students. The gradual release of responsibility to the students depended on the teacher's assessment of the group's performance. But the students quickly became engaged in their own learning and, as a result, learning in the classrooms became active, cooperative, constructive, and reflective. The students shared their thinking and feedback with others but completed their projects independently.

"They were being challenged with real−life situations in their academic classes," Bauby says. "The information was now current and relevant to their lives. Students began to value their teachers, and teachers realized that students were eager to learn."

Although teachers initially struggled with adopting a student−centered approach in the dialogue center and with making smooth transitions from discussion to computer work, they worked with their coaches to improve these areas and modeled problem−solving processes effectively. Once the teachers became comfortable with the digital classroom model, they saw an increase in the amount of substantive feedback offered by students about one another's products. Teachers also noted that students were staying on task for the full 80 minutes and felt more confidence in their abilities to create products that exceeded expectations.

In 2003, when a second cohort of Wright Tech 10th graders received full instruction in digital classrooms every other day, the CTDLC added an electronic portfolio to its site where students could post their best work. Again teachers saw evidence that this validated the students' academic efforts and encouraged more discussion and revision of projects.

"My students have a real purpose for publishing work samples," says Wright Tech culinary arts instructor James Rizzo. "An electronic resume and portfolio will assist them with getting a job. They are revising and editing products before publishing and are proud of what they published…it's a great motivator."

Numerical, as well as anecdotal, data shows that students' increased control over the pace of their learning—and the collaborative nature of the digital classroom model—did indeed boost motivation to learn at Wright Tech. The school saw an 82% decrease in suspensions and a 7% increase in attendance. Detentions also decreased by 35% during the second cohort's intervention.

The rubrics included in the units gave students a clear path to improvement and allowed teachers to introduce high expectations for the quality of student work. This led to an approximately 70% decrease in the number of failing grades from the start of the 12−week intervention in 2002 to the end of the third marking period. During the second cohort's intervention, administrators looked at overall failure rates for 10th graders between 1999−2000 and 2002−2003 and found a 51% decrease in total.

"The school goal is that all students will exceed or meet expectations," says Jones. "Instructors see students who previously couldn't function [in an academic setting] now being able to function productively."

Perhaps one of the greatest testaments to the success of the program came out of the student focus group meetings after they had taken the CAPT tests: "We feel confident about how we did on the CAPT. Skills we learned in the digital classroom carried over to the CAPT."

The scores put an exclamation point on that statement, with only 49.4% of the 10th graders scoring at intervention level in reading on the May 2002 test as opposed to 71% on the eighth−grade test. That represents a 21.6% movement out of intervention.

"That indicated to us that a focused use of the digital classroom instructional model for as little as two intensive months was able to achieve significant growth in the target area," says Mike Suntag.

For the second cohort, administrators witnessed a 19.6% drop in students at intervention level on the CAPT reading test and a 5% drop in intervention numbers on CAPT math. The subgroups of this cohort also made major gains, including a 16.6% increase in the number of free and reduced−price lunch students attaining the proficient level in reading and a movement of 20.5% of these students out of intervention level in math. For bilingual students, 28% moved from non−literate to limited literate status on the Language Assessment Scales in just one year. (There is no breakout of CAPT performance for subgroups less than 20. Both the bilingual and special education groups at Wright Tech for 2003 contained less than 20 students.)

Administrators have now put a plan in motion to make Wright Tech a completely digital school by instituting the model with grades 9−12 and bringing trade/technical teachers in line with the program through the use of generic reading and writing units in their areas. The school is also working on bringing the math problem−solving processes in the units to science and trade classes. In addition, experienced digital classroom teachers from Wright Tech now collaborate with, coach, and run professional development sessions for teachers from other urban technical schools in the state.

"Much of what is built into the learning units is structured so students can use their strengths," says Jones. "This is an ongoing process."

Demographics

- One of 17 regional vocational−technical schools in Connecticut
- Grades 9−12, with 24 trade and technical areas in addition to academic instruction
- One of five urban vocational−technical schools in the state, drawing students from Stamford, Norwalk, and Bridgeport
- 2002 10th grade demographics: 85% minority; 21% bilingual
- 2003 10th grade demographics: 87% minority; 18% bilingual
- Designated a "priority school": high percentage of students needing intervention on the Connecticut Academic Performance Test (CAPT)

Background

When administrators and teachers at the J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut examined the eighth−grade state test scores of the 10th grade class of 2001−2002, they found that 71% were at the intervention level for reading. Teachers wanted to focus on reading comprehension and problem−solving skills specifically to boost students' scores when they

tackled the state tests again as 10th graders. Many teachers voiced the opinion that some students were overwhelmed with the reading demands on these tests and simply gave up, leaving many questions blank.

Administrators suggested an intervention centered around the digital classroom model that had been piloted a year earlier at Wright Tech. A digital classroom consists of 24 computers with Internet access arranged in a horseshoe shape around the perimeter of the classroom. Tables in the middle of the room form a dialogue center where students can discuss and share information. Instruction for the intervention program would revolve around Web−based learning units, designed specifically to teach the skills needed for the CAPT. These units would be available to all teachers and students through an online database which had been designed by the Connecticut Distance Learning Consortium (CTDLC) for the digital classroom model pilot.

The sophomore class of 2001−2002 was small (93 students), so scheduling and assigning students to digital classrooms would be feasible. The school also had two teachers, Peg Sonntag and Trevor Jones, who had experience with the model through the pilot phase and would be willing to serve as mentors and coaches for the 10th grade teachers.

Design &Implementation

During the 2001−2002 school year, administrators and teachers at the J. M. Wright Regional Vocational−Technical school in Stamford, Connecticut took a look at the eighth−grade state test scores of the current 10th graders. Approximately 71% of the class was at "intervention level"—the lowest level—in reading, prompting administrators to design a class−wide intervention.

Administrators started by explaining the rationale for the intervention to all 10th grade academic teachers, support staff, and bilingual teachers on a department−by−department basis. In the meetings, they discussed graphs of previous 10th grade classes' scores on the Connecticut Academic Performance Test (CAPT), the design of the learning units that would be the foundation of the strategy, and the training necessary to achieve the desired results. Teachers realized that it would take a team effort to effect change, and all agreed to participate.

Because the digital classroom model had been piloted at Wright Tech a year before the intervention, some of the teachers were familiar with its structure. In this model, computers with Internet access replace students' desks and long tables in the center of the room form a dialogue center where students can share information and peer edit. With the help of Dr. George Cicchetti of the Connecticut Distance Learning Consortium (CTDLC), teachers were trained to develop and use Web−based learning units that would promote research, independent study, improvement of technology skills, and articulation and reflection in the dialogue center.

For this intervention, Dr. Cicchetti designed six learning units that related directly to parts of the CAPT, including science, math, reading across content areas, and writing across content areas. He then trained teachers to implement the CAPT units and develop their own units using a template he had designed. The first phase of the intervention consisted of two months of intensive work with the CAPT units and engagement with the teacher−designed units thereafter. Rubrics embedded into the units became the means for assessing student work. All units were posted to an online database (www.ctdlc.org/votech), and as teachers field−tested units and suggested changes, the modifications were uploaded almost immediately.

Teachers attended debriefing sessions at the close of each academic day with Wright Tech School Director Diane Bauby and Assistant Director Dr. Maria Romero. They also received support from the

Regional Vocational−Technical School System administrators, Dr. Cicchetti, and peer coaches Trevor Jones and Peg Sonntag.

This first cohort of 10th grade students at Wright comprised the first phase of a longitudinal study. Students received twenty 80−minute periods of instruction in each subject area, and the design of the study attempted to control for maturation and to some degree, history. To measure the results, administrators used the class's eighth−grade test scores and baseline data on discipline, absenteeism, and failure rates. They also gathered students for periodic focus−group discussions and had them fill out a survey about the instruction in the digital classrooms.

For the second cohort in 2003, the 10th grade students received full instruction in the digital classrooms every other day. The school used not only eighth−grade state tests but also ninth−grade standardized tests as baseline data and broke out results for subgroups including bilingual students and those receiving free or reduced−price lunch. Administrators also compared the discipline, absentee, and failing grade numbers of this cohort to the previous cohort.

Results

As a result of a 10th grade, class−wide intervention in 2002 to improve CAPT scores using the digital classroom model, the J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut moved almost 22% of the students who had been at remedial level in reading in eighth grade out of the intervention classification on the 10th grade test. The success continued with a 10th grade cohort in 2003 that posted a 19.6% decrease in the numbers of students at intervention level in reading. The substantial gains made by students receiving free or reduced−price lunch were especially significant. In reading, 16.6% moved into the proficient category, and 20.5% moved out of intervention level in math.

But teachers and administrators were hoping for more than just raised test scores as a result of this intervention. The digital classroom model, which engages students in the use of technology through Web−based learning units, independent research of real−world problems, and articulation and reflection with their peers, unmistakably changed instruction at the school from a teacher−centered style to a student−centered style.

Teachers modeled certain processes for the students and then gave them support when necessary. However, they began to notice that students took more and more responsibility for their own learning, sharing information with others and reflecting on their own processes for completing a project. Stronger students became the teachers for those having trouble with particular parts of an assignment, and all students were able to proceed at a pace that was comfortable for them.

Because of this newfound responsibility and increased engagement with learning, Wright Tech saw a 7% increase in attendance and an 82% decrease in suspensions 35% decrease in detentions as compared to baseline data. As students got comfortable with the structure of the learning units, their motivation, confidence, and metacognition skills increased. They stayed on task for the full 80 minutes, and there was a 70% drop in failing grades from the beginning of the intervention to the end of the third marking period of 2002. When administrators looked at failure rates between 1999−2000, when no digital classrooms were in place, and the second digital classroom cohort in 2003, they found a 51% decrease in total.

More important, the rubrics gave students a clear path to improvement. Because the expectations were so clearly delineated, students could set goals for themselves and concentrate on reaching that level. In 2003, the CTDLC added an online portfolio of student work to its site (www.ctdlc.org/votech).

Teachers found that this chance to display work motivated students to revise, edit, and polish their work to a level of high quality.

Teachers also felt that the digital classroom model helped them attend to the special needs of students in their classes. Subgroups of students were not pulled out of the digital classrooms for instruction but given additional classroom help within the units. The technology involved, including the Internet, afforded multiple resources to aid these students. Bilingual students used electronic translators to fully understand the lessons' specifications and expectations, and special education teachers could modify the units to help their students achieve at a high level. During a study of the second cohort of 10th graders in 2003, administrators found that 28% of bilingual students had jumped from non−literate to limited literate levels on the Language Assessment Scales in just one year.

The Connecticut Regional Vocational−Technical School System (RVTSS) and Wright Tech administrators found the digital model to be so successful, they have begun implementing it school wide. All students in grades 9−12 are now being taught in this model. Ninth graders start the program with a focus on real−world concerns, including a unit about the student handbook. Administrators have also spread the intervention model to other urban technical schools in the state, including schools in Bridgeport and Waterbury. All the learning units designed at each school are added to the course management server.

"We are finding that instructors are modifying each unit at various schools as they test them out with students," says Mike Suntag, RVTSS consultant for educational technology. "They are sharing the new versions with other digital classroom teachers. This is beyond our wildest dreams. It means that teachers have taken over the process."

For more details about the effects of J.M. Wright's digital classroom model on student performance and engagement, click here to view a November 2003 evaluation report.

Replication Details

In order to implement a digital classroom model like the one used by the J.M. Wright Regional Technical−Vocational School in Stamford, Connecticut, a school would need to develop the following supports:

1. Provide training for at least two teachers and an administrator at the school: The training offered to the Connecticut Regional Vocational−Technical School System (RVTSS) through the Connecticut Distance Learning Consortium was a hybrid of two full days of hands−on training and a follow−up with an online course. Generally, it takes participants 8−12 weeks to complete the course and develop high−quality, Web−based learning units, which are the foundation of the digital classroom model.
2. Train teachers to serve as on−site coaches and mentors: Administrators and trained teachers should be able to provide support for new cohorts of teachers who are being trained. Debriefings are critical for success once teachers start using the learning units in the classrooms. This gives teachers the opportunity to share best practices, ways of assessing student work, and the general progress toward the goals of the learning units.
3. Provide technical support: Periodic visits and online support from the initial trainers must be maintained over the duration of the implementation. Teachers and administrators need an external source they can turn to for help with coaching, polishing of the teacher−designed learning units, and other instructional issues. Administrators found, throughout he pilot, that only some teachers become effective instructional designers, but all teachers should be able to teach effectively in the digital classroom.

4. Provide administrative support: There has to be strong support for the implementation from the central office through superintendents and district−wide technology staff. There are technology issues that require the district's help, and few schools have the in−house resources to deal with these situations.
5. Evaluate the implementation: Administrators and teachers can use debriefing sessions, week−by−week diaries, student focus groups and questionnaires, and direct classroom observation to evaluate the project. This is an ongoing process that will require tweaking, adjustments, and perhaps more training.

Costs and Funding

FUNDING
Because of the success of the digital classroom model at J.M. Wright Regional Vocational−Technical School in Stamford, Connecticut, the entire Connecticut Regional Vocational−Technical School System (RVTSS) is now adopting digital classroom instruction. To fund this massive undertaking the creation and/or maintenance of 25 digital classrooms in 17 different high schools each year the RVTSS has pooled funds from a number of different sources:

- FEDERAL
  - ♦ No Child Left Behind Act (educational technology provisions &Title I)
  - ♦ Individuals with Disabilities Education Act (IDEA)
  - ♦ Perkins Vocational and Technical Education Act
  - ♦ Legislative bonds for equipment
- STATE
  - ♦ RVTSS standard operating budget
- OTHER
  - ♦ Grant from the Connecticut Distance Learning Consortium (CTDLC)

COSTS
The costs associated with creating digital classrooms and training teachers to use the digital instruction model are listed below. The cost of the hardware, infrastructure, and software necessary to convert a traditional classroom to a digital classroom is about $31,100. Student−built computers can reduce this cost by $7500.

CAPITAL ITEMS	QUANTITY	AVERAGE COST PER CLASSROOM	TOTAL COST FOR YEAR ONE (25 CLASSROOMS)
Hardware	Ê	Ê	Ê
Student Computers	25 x 25 classrooms	$800 x 25 = $20,000	$500,000
Teacher Computers	25	$1200	$30,000
Printer, Scanners, other Peripherals	25	$1400	$35,000
Audio/Visual/Multimedia	25	$3500	$87,500
TOTAL	Ê	$26,100	$652,500

HARDWARE COSTS			
Ê	Ê	Ê	Ê
Infrastructure	Ê	Ê	Ê
Electrical &Parts	25 classrooms	$1500	$37,500
Switches	25	$900	$22,500
Air conditioners	2 x 25 classrooms	$700 X 2 =$1,400	$35,000
TOTAL INFRASTRUCTURE COSTS		$3800	$95,000
Ê	Ê	Ê	Ê
Furniture	Ê	Ê	Ê
Tables	8 x 25 classrooms	$150 x 8 = $1200	$30,000
Chairs	25 x 25 classrooms	$99 x 25 = $2475	$61,875
Student computer stations	13 x 25 classrooms	$149 x 13 = $1937	$48,425
TOTAL FURNITURE COSTS	Ê	$5612	$140,300
Ê	Ê	Ê	Ê
Software	Ê	Ê	Ê
Instructional(New &Upgrades)	Ê	$600	$15,000
Teacher/Administrator(New &Upgrades)	Ê	$600	$15,000
TOTAL SOFTWARE COSTS	Ê	$1200	$30,000
Ê	Ê	Ê	Ê
Professional Development	Ê	Ê	Ê
Food, materials &trainers from the state's Regional Resource Centers for school districts.	Digital Classroom: 3 days during summer &2 follow−up days Whole School: 14 schools − 1 full day &3 half days	$800	$20,000
Contracted Professional Services	Stipends for teacher trainers &teacher trainees	$788	$19,700

Office Supplies	Disks, paper, folders	$200	$5,000
Substitutes	25 subs x 2 days	$80 x 2 = $160	$4,000
TOTAL PROFESSIONAL DEVELOPMENT COSTS	Ê	$1948	$48,700
Ê	Ê	Ê	Ê
Support Services	Ê	Ê	Ê
Learning Unit Development	On−line Course (CT Distance Learning Consortitum) &Maintenance of Electronic portfolios	$600	$15,000
Consultant	Planning, Training, Curriculum Development, quality control	$1000	$25,000
Conferences for teachers &administrators	Travel, Registration	$400	$10,000
TOTAL COST OF SUPPORT SERVICES	Ê	$2000	$50,000
Ê	Ê	Ê	Ê
GRAND TOTAL	Ê	**$47,260**	**$1,181,500**

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Learning Units database: http://www.ctdlc.org/votech

Rating Criteria

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Assessment
Each learning activity should be accompanied with well−defined indicators of success.
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Arlene Brown and Chris Rose's 4th Grade, Mary Fisk Elementary School

Arlene Brown &Chris Rose's 4th Grade, Mary Fisk Elementary School

Salem, NH

School Type: Public

School Setting: Suburban

Level: Elementary

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

The Education Alliance at Brown University

Fourth grade students at the Mary Fisk Elementary School are always excited when they find out they are going to be in Chris Rose's class. From the time they enter the first grade, Mr. Rose shares his love of literature with them, reading stories in their classrooms, at school assemblies and gatherings, and even at the local bookstore. Though he is not as well known for his science lessons, he usually makes science just as exciting for his students as literature−−except for his unit on living things; this is one area that Rose hasn't enjoyed teaching and feels that his students haven't enjoyed learning about. When the school's media specialist, Arlene Brown, asked Rose if he would like to try integrating technology into this unit, he jumped at the chance. Though he had recently been trained as a technology mentor for his school, Rose had not yet put his new knowledge into practice. "I hadn't used technology very effectively," Rose explains, "and I thought the opportunity to use it in my science unit would be a great benefit for me."

Brown had already worked with many Fisk teachers in the library and the classroom to integrate information skills into their curriculum. She had also brought many useful educational technology tools into the library. However, in recent years she had begun trying to increase the use of technology in her school's classrooms as well. Before beginning her collaboration with Rose, Brown had participated in a Designing for Technology Integration (DTI) workshop sponsored by The Northeast and Islands Regional Technology Consortium (NEIRTEC), which provided her with some additional insights about how best to use technology as a teaching and learning tool. She was eager to share these insights with Rose during their planning. "The most effective way of integrating technology into the curriculum is to find a teacher with a problem and solve it with technology," she explains. Having previously collaborated on several research projects with Chris Rose, Brown thought that this would be an excellent opportunity for both teachers to work together effectively−−this time focusing on technology!

Brown and Rose began their work on this unit by identifying what science and information skills they wanted the students to learn, and then fine−tuning these expectations after consulting the New

Hampshire Frameworks and their own district's list of fourth grade proficiencies. First, they decided, students should be able to identify living things by their characteristics as plants or animals. Then they should be able to compare and contrast life processes in plants and animals. Finally, they should be able to use research techniques to locate, evaluate, and synthesize information.

Brown and Rose decided that the first lesson of the unit should involve brainstorming with students to determine what they already knew about what makes something alive. Then students would need to compare plant and animal cells and determine how they are alike and different. Following the principles of constructive learning, they determined that the best way for students to learn the parts of cells was for them to make models of both plant and animal cells and compare them. Working in cooperative learning groups, Brown and Rose's students will spend time in the library researching organisms and finding examples of the five basic life functions: growing and developing, using energy, reproducing, responding to the environment, and getting rid of waste. Finally, students will use what they have learned in these activities to discover the similarities and differences between plants and animals.

Armed with these initial plans, Brown set to work finding the best technology resources for this unit. Her first step was to network with colleagues. She was concerned about integrating technology appropriately. "Think of using technology as you would a pencil. It's just another tool you use to teach and learn," explained her district's Director of Media and Technology, Arthur Berlin. Kathy Gallo, the district's software integration specialist, suggested attending one of her workshops on Inspiration, a software product that is perfect for classroom brainstorming activities. Gallo also introduced Brown to interactive CD−ROMs that enhance the use of the students' science textbooks. Brown then spent some time reviewing Web sites on cells as well as sites students could use for their research on organisms.

At their next meeting, Rose and Brown evaluated each component of the unit and discussed which technologies would work best. They decided that brainstorming answers to the question "How are you like a tree?" using Inspiration would make an effective pre− and post−unit activity. Working with a projection system, Brown plans to use Inspiration to quickly type in students' ideas. Inspiration facilitates the organization of these ideas and shows commonalties among them.

As a precursor to the cell model activity, Brown and Rose decided to use an animated cell Web site that helps students learn the parts of plant and animal cells. They plan to display this site on the school's projection system and lead students through it. Students will then visit other Web sites to research their individual organisms. Since Rose's classroom has only one computer, students can use the library computers as well as other resources to complete their research.

Assessment is always a critical part of the planning of a new unit. Brown and Rose wanted to use a variety of assessment methods on this project, and they used technology to help them. Brown has always used a rubric to evaluate student research in the library; it helps her to assess students' time on task, their use of resources, and the quality of information they've gathered. For this unit, however, Brown and Rose decided that they would also use a rubric to assess students' cell models. For help in creating this new rubric, they turned to the rubric creation tool "RubiStar," available for free at http://rubistar.4teachers.org. This was the first time that either teacher had used this versatile tool to create a rubric. "I was amazed at how easy it was to customize a rubric that works perfectly for our assessment needs," says Brown. In addition to evaluating their students' work with these two rubrics, Rose and Brown will also read their students' daily entries in their science journals for additional insights into what and how students are learning. Finally, the students themselves will be able to assess their own knowledge by comparing the Inspiration chart they complete at the beginning of the unit to the one they complete at the end. These charts from the pre−unit and post−unit activity will provide students with tangible proof of what they have learned.

Now that the plans are complete for their newly adapted science unit, Brown and Rose look forward to testing it out in a real classroom. They hope that integrating technology into a formerly lackluster unit will not only grab the attention of their students but also help to develop their content knowledge and research skills. Brown and Rose's goal is a unit on living things that truly makes the subject come to life.

Click here to download a PDF version of Brown and Rose's new unit.

Demographics

The Mary Fisk Elementary School is located in Salem, NH. The population of this suburban community is predominantly white and middle class. Chris Rose's fourth grade class has 25 students. There are two special education students, both of whom are integrated into his science class. The classroom has one computer with Internet access. The school has one projection system. The library seats 30 students and has four Internet−accessible computers.

Background

In the library at the Mary Fisk School in Salem, New Hampshire, technology is well−integrated into the information skills curriculum. Students use technology tools daily to access information, locate materials, and read for enjoyment. The school's use of technology is gradually extending to the classroom, mostly through collaboration between the media specialist, Arlene Brown, and teachers interested in planning research projects. Fourth grade teacher Chris Rose, recently trained as a technology mentor for his building, was anxious to use his new technology knowledge to spice up what he felt was historically a dull science unit on plants and animals. Brown helped him to put this knowledge into practice, working with him to adapt the unit so that it used technology to enhance student engagement and learning.

Design &Implementation

At the Mary Fisk School in Salem, New Hampshire, fourth grade teacher Chris Rose and media specialist Arlene Brown collaborated to integrate technology into a science unit on plants and animals. Their main activities consisted of the following:

- Developing the essential question "What forms does life take?"
- Planning the science unit, which involved determining what information they wanted students to learn
- Matching their goals to NH frameworks and district proficiencies
- Attending a workshop on "Inspiration," software for brainstorming and graphic organizing
- Reviewing web sites relevant to the unit
- Determining which technologies best fit into their instructional plan
- Developing assessment strategies
- Scheduling class periods, library times, and use of the school's one projection system

Click here to download a PDF version of Brown and Rose's new unit.

Results

Concerned that his science unit on plants and animals was not capturing his students' interest, fourth grade teacher Chris Rose partnered with media specialist Arlene Brown to adapt the unit. Together, these teachers at Mary Fisk Elementary School in Salem, New Hampshire, integrated technology and

research skills into the unit to improve student learning and engagement.

This newly adapted unit on living things has not yet been taught to students. The one noticeable result so far is the enthusiasm Rose now has about teaching it. Before adapting the unit, Rose felt it was too dull to generate much student interest. Now, however, Rose is confident that he and Brown can bring the subject matter to life for their students.

Of course, the primary goal of adapting the unit is to improve student learning. Brown and Rose will assess this improvement in a number of ways. First, they will read students' science journal entries to evaluate how and what they are learning. Next, they will use research and cell model rubrics to assess students' research practices and their grasp of the differences between plants and animals. Then, both teachers and students will assess the growth in student knowledge by comparing the Inspiration chart the class completed at the beginning of the unit to the one completed at the end. These charts−−the results of a brainstorm about the question "How are you like a tree?" from the pre−unit and post−unit activity−−will provide students with tangible proof of what they have learned. Finally, to determine how technology integration might have affected his students' learning of science content, Rose will compare unit test scores from this year's students to scores from the previous year's students.

Replication Details

Arlene Brown, Media Specialist at Fisk Elementary School, offers these tips for integrating technology into an instructional unit:

- Share your ideas with as many of your colleagues as possible and solicit their feedback. Your best resources are the teachers you work with every day.
- Rather than thinking of integrating technology into your curriculum as a problem, think of it as the solution to a problem.
- Since your main goal is to improve student learning, make sure that you've identified clear and accurate ways of assessing learning and of assessing the impact of technology on learning.

Costs and Funding

N/A

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Rating Criteria

Media specialist Arlene Brown participated in a Designing for Technology Integration (DTI) workshop sponsored by the Northeast and Islands Regional Technology in Education Consortium (NEIRTEC) and conducted by TERC, a NEIRTEC partner organization. The story of her work with Chris Brown at Mary Fisk School was selected by Knowledge Loom editors as an exemplary success story for implementing two of the GMOTT best practices: Standards and Assessment.

The DTI course gives participants the opportunity to learn how technology can be used as a teaching and learning tool that supports student and teacher inquiry, problem solving, and higher order thinking skills and extends creative thinking processes. It guides them through the design of a unit of practice that can be used in their school or district.

NEIRTEC is the Regional Technology in Education Consortium for the Northeast and serves the six New England States, New York, Puerto Rico, and the Virgin Islands. NEIRTEC focuses on helping educational leaders at the state, district, and school levels address the many challenges involved in linking technology to student achievement in the core academic areas, with a particular emphasis on the needs of schools in underserved urban and rural communities. To view its online resources, learn about other online courses it offers, or to find out more about NEIRTEC, see http://www.neirtec.org

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Assessment
Each learning activity should be accompanied with well−defined indicators of success.

Char Soucy, First Grade Teacher, Fernan Elementary School

Char Soucy, First Grade Teacher, Fernan Elementary School

Coeur d'Alene, ID

School Type: Public

School Setting: Urban

Level: Elementary

School Design: Traditional

Content Presented By:

Northwest Regional Educational Laboratory (NWREL)

Northwest Educational Technology Consortium (NETC)

Appropriate use of technology to support learning is taken seriously at Fernan Elementary. Principal Jim Gray says in his welcoming remark on the school's Web site: "Implementing all of our available technological resources is exciting. It does not, however, displace Fernan's commitment to provide the highest quality education possible; it only enhances our efforts. As a professional educational team, we will use any tools within reach to more efficiently promote the school and hook our kids on the power of education."

This philosophy is evident in the school's focus on literacy and character education. Char Soucy, a first grade teacher, is concerned about the negative influences that children receive daily, and envisions her students "productive, caring members of society." In line with this vision, she teaches her students to use technology responsibly, and how to decide when technology is appropriate to use for a given purpose. She notes that technology is now part of our world and is here to stay. Her role is to teach them the best uses of technology to support communication, build community spirit and as a tool for learning.

When using technology, Soucy keeps her focus first on the curriculum and on her purpose. She uses technology with her students to help meet the curricular goals by providing resources and saving time. The children learn that sometimes technology, such as the Internet, can make information collecting faster and at other times it is less appropriate. Generally, students work at the computer collaboratively and are often encouraged to explain the "how" and "why" of their tasks. When they are collecting data as part of a science unit, they look up information on pre−selected web sites. Technology can be used during every stage of the inquiry−based learning model. In the data analysis stage the children create slide show pages by using a template set up by the teacher. They also import their own artwork to the slideshow by either using a draw and paint program, or scanning in drawings for their final presentation. As the children work on the pages, each can decide individually which facts to highlight about the animal they studied. They use word processing to add text to the pages.

Technology supports the focus on literacy in other ways as well − social and communication skills are developed when children use technologies together. The children work together on computers most of the time. She finds the conversation and problem solving that occurs during their work to be valuable for students. As Soucy's students learn to use scanners or other technologies they teach others how to use them. "When children have to explain how to do things to someone else," says Soucy, "it reinforces the task for them. It also reinforces their verbal communication skills to have to explain it to someone else." Soucy teaches the children to explain without using their hands, relying on their words to communicate.

Soucy researches software programs to determine which are most appropriate for her students. Soucy has found that some educational programs have components that provide little educational benefit, such as coloring games. "A lot of technology isn't beneficial for children's development," she says. "Children, especially at the first grade level, need to manipulate objects to have a concrete model form which to develop abstract concepts," adds Soucy. Sometimes a computer simulation can do a better job, such as showing the way the heart pumps blood around the body, but sometimes it is a poor substitute for the real objects. The trick is to know which to use and when.

At the beginning of the year most of her students' experiences with computers are limited to computer games. Soucy broadens her students' view by showing them that computers are more than games, that computers can be valuable tools for learning, depending on how one uses them. Soucy likes to use this analogy with her students: The computer is a tool just like a pencil. "I tell them explicitly − it's a tool to learn and help present what you know. The way you use it is what counts." She adds, "At first, learning how to use the computer may be the object of the lesson, but after a while, the computer should fade into the background just as a pencil and paper do.

As the year progresses and her students learn what computers have to offer, Soucy has seen a shift in her students' attitude as they are becoming independent thinkers. While the four classroom computers are very popular with some children during "choice time," many children opt to create artwork or join writing groups. Recently, when it came time for children to choose how they wanted to present their learning, instead of choosing to create a multimedia presentation, their choice was to put on a performance for their families with songs and dances. Soucy counts this as evidence that her students are no longer viewing computers as the "best game in town," but one of many options for learning.

Fernan's school motto is "Spread Your Wings and Soar." Because of Soucy's ability to integrate technology use that enhances her student's social, character, emotional, and language development, the children are indeed soaring!

Demographics

Background

Both critics and proponents agree on the importance of the early years in a child's physical, social−emotional, language, and cognitive development. Much of the controversy revolves around the specific needs of young children, and whether technology can support those needs, or will take away form essential development experiences.

Knowledge of children's development and studies of children and technology use can guide understanding and inform decisions. Recent research on brain development has focused attention on the capabilities of young children, the stages and styles of learning, social−emotional development, and successful educational practice. A National Research Council study (Bransford, Brown, &Cocking, 1999) reports, "Children lack knowledge and experience, but not reasoning ability" (p.

xiv). Appropriate stimuli, such as close interaction with caring adults and engaging hands−on activities, enhance the brain's development (Healy, 1998). The National Research Council study states that "early learning is assisted by the supportive context of the family and the social environment, through the kinds of activities in which adults engage with children" (p. xii). It also suggests that "a number of the features of the new technologies are consistent with the principles of a new science of learning." (p. xviii).

Two key conclusions are:

- New interactive technologies make it easier to create environments in which students can learn by doing.
- Technologies can help people visualize difficult−to−understand concepts.

These are the types of uses that early childhood experts recommend as being developmentally appropriate, allowing children to create and explore. Children can now compose and record music using synthesizers, write programs that draw mathematical shapes on the screen, and use on−screen manipulatives to deepen mathematical understanding. Talking word processing software provides immediate spoken feedback on letter names and letter combinations to novice reader/writers as they experiment with written language. These are examples of the promise of these new tools and resources.

Design &Implementation

Results

Char Soucy, first grade teacher at Fernan Elementary School, made these observations about how technology affected relationships and communication in the classroom and with parents:

- Children realize the value of computers to find information and enhance their learning; they no longer think of them as just games.
- When students show others how to use the tools of technology they gain confidence in their abilities.
- Communication skills improve as children articulate to classmates how to do things at the computer.
- Children need to negotiate as they work together on projects using technology, encouraging cooperation skills and consideration for others.
- Children learn to think critically and evaluate the source of information.

Replication Details

Char Soucy, first grade teacher at Fernan Elementary School offers these tips for successfully carrying out a technology−use plan for young children:

- Software and other technology should support your educational goals, not define them. It is too easy to let the available software influence and drive your instruction, when it should always be the other way around.
- Research and preview software to cull out "time wasters" that students do not need to spend precious school time on.
- Start small. Teach a few students how to use a particular piece of software and then have those students train the next group and so on. This decreases the teacher's role as "provider of answers" and students learn to rely on each other and work together.

- Just because it can be done with technology, doesn't mean it should be. Young children in particular need to perform certain physical tasks for normal brain and body development.

Costs and Funding

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Rating Criteria

The Char Soucy's First Grade, Fernan Elementary School story has been selected by the Northwest Regional Educational Laboratory (NWREL) as an example of a site in the Northwestern United States using technology to support early childhood learning. This is one of many excellent programs in the Northwest noticed by NWREL.

Educators at some sites have integrated technology into their classrooms for several years, others for a much shorter time. The scope of the use varies. Though each has a unique approach, all share the common philosophy that technology, used appropriately, can enhance children's learning. Included for each site profile is contact information, observed outcomes from the thoughtful use of technology, and tips from these educators for incorporating technology in schools.

This story is an excerpt from The Northwest Regional Educational Laboratory's (NWREL) June 2001 issue of their "By Request" series. NWREL publishes By Request quarterly. For a complete version of this By Request, titled Technology in Early Childhood: Finding the Balance, go to: http://www.nwrel.org/request/june01/

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Janis Friesler's 8th Grade at Frank Lloyd Wright Middle School

Janis Friesler's 8th Grade at Frank Lloyd Wright Middle School

West Allis, WI

School Type: Public

School Setting: Suburban

Level: Middle

School Design: Traditional

Content Presented By:

The Education Alliance at Brown University

In 1997, language arts teacher Janis Friesler was given an opportunity that changed her teaching and her students' learning dramatically. Friesler's principal at the time, Conrad Farner, believed that if his school's technology labs were put in academic classrooms, the technology would be used on a daily basis. Friesler and two other teachers at Frank Lloyd Wright Middle School in West Allis, Wisconsin, volunteered to test his theory . In recent years, Friesler had developed an interest in educational technology, so having a computer lab as a classroom was a dream come true.

But Friesler's classroom transformation came with three major challenges. She had used technology in the classroom before, but in fairly superficial ways; her first challenge, then, was to integrate it more deeply into her curriculum to further support her instructional goals and state and national standards. Second, she suspected that her students would need to become more adept at cooperative learning in order to reap the full benefits of educational technology. Finally, she wanted to determine how the new technology in her classroom could support her efforts to improve her students' writing skills a central goal of the district.

Before her classroom became a computer lab, Friesler had already begun participating in an extensive staff development program focused on project−based learning. However, when she and two colleagues had their classrooms transformed into high−tech learning centers, they decided to transform the curriculum accordingly. These three teachers agreed that their labs should be used to complete technology−infused, project−based units planned with their team colleagues in social studies, science, math, and language arts. The house structure of the school and the teachers' common preparation times facilitated the design and implementation of these multidisciplinary units. Therefore, in a remarkably short period of time, the teachers had their structure in place.

After brainstorming with her colleagues, Friesler decided to begin this curriculum transformation by expanding an old social studies and language arts project into a six−week multidisciplinary unit heavily supported by technology. The old project had given students a glimpse of the horrors of the Holocaust and allowed them to discover how some seemingly ordinary individuals had behaved heroically during this time. Small groups of students were given pictures of Holocaust survivors and rescuers with corresponding stories cut up into sections and put in five envelopes. Each day, they would read part of the story and write reflections in a journal. As a culminating activity, the groups browsed the Internet for information on the person's life and were asked to make the person famous

through a presentation and a poster.

Friesler was pleased with the original project, but she wanted to expand it in order to deepen her students' understanding of the issues it raised, to connect these issues more directly to their own community and concerns, and to address more language arts and social studies standards in the process. She saw technology as a valuable tool in this expansion and also as a means of developing the research and presentation skills her students would need in their later studies and in the workforce. Friesler explains that before creating this expanded unit, "I had always done projects [that used technology], but they did not have the structure that they have now, and they weren't as in−depth. They were more superficial, and the organization wasn't as real−life oriented. Now I look for ways to give kids deep skills."

In the new version of the unit, *An Investigation of Heroism through the Holocaust and Underground Railroad*, Friesler provided her students with the time and the resources to consider carefully the questions "How do the events of history turn ordinary people into heroes?" and "In what ways is our community today being shaped by unsung heroes?" After reading the play *The Diary of Anne Frank* and the biography *Harriet Tubman: Guide to Freedom*, Friesler's students used computer technology to support their investigation of the unsung heroes of the Underground Railroad, the Holocaust, and the current age.

Although Friesler's students were expected to perform a number of traditional social studies and language arts tasks during this unit reading and responding to primary and secondary source materials, writing clearly and effectively to share information, collecting data and using statistics to define an issue, speaking clearly and effectively they also became Internet researchers, e−mail collaborators, sound editors, and PowerPoint presenters. Each time she asked them to use a particular technology tool, however, Friesler provided a careful introduction and plenty of ongoing support.

For example, to aid the students in their online research, Friesler showed them a short film entitled "Internet Searching Skills" and had them work through an online tutorial on Internet searching strategies. She also adapted activities from Purdue University's Online Writing Lab http://owl.english.purdue.edu/handouts/research/r_paraphr.html to help students learn the difference between paraphrasing and plagiarism. Finally, she developed a guide laying out specific research tasks for the unit and a page on the school Web site with helpful links.

While Friesler's own clear expectations and ongoing support for technology use were critical to the success of the new unit, she knew that her students should not rely solely on her. They could learn a great deal about the issues raised in the unit and the technology skills required by the unit from and with each other. Friesler also knew that effective cooperative learning was not simply a matter of putting students into groups. "I don't believe in just sitting groups of students in front of a computer and letting them take turns on a task. That leads to lots of off−task behavior," Friesler explains. "Students need to learn how to divide up a project and work cooperatively."

To build their students' cooperation skills, Friesler and her teaching team began taking them on an overnight trip to an outdoor learning center each fall. There, the students participated in team−building activities and began to develop relationships with peers and teachers based on trust and cooperation. They learned strategies for enhancing communication, improving decision making and problem solving, and leading and collaborating effectively. These strategies were later applied to group work and conflict resolution within their cooperative groups in the classroom.

When the students in Friesler s classroom began working on their main project for the *Investigation of Heroism* unit, they quickly discovered the necessity of collaboration; there was simply too much

work for one student to do in the allotted time frame. In addition to their individual work journal entries, a biographical poem, and a film review students were expected to create a group PowerPoint presentation based on their research about unsung heroes.

Generally, Friesler's students work in small groups of no more than three. For large projects like the PowerPoint presentation, students are allowed to pick their own groups, but they must participate in a different group for each project. According to Friesler, when students choose their own groups, their work improves. I find peer pressure is greater when the students are comfortable with each other," she says. "The students are not afraid to light a fire under a friend. However, to help with disagreements, I select one person in the group as the coordinator and tie breaker.

For the PowerPoint presentation, Friesler put a few other supports in place to assist students with the cooperative learning process. First, she reinforced her expectation of full−group participation by instructing her students to initial each of the slides for which they were responsible. Second, she instructed the designated coordinator of the group to e−mail her if someone in the group was having trouble completing a task. Friesler could then talk one−on−one with this student and have the special education teacher, aide, or a student who had completed the work provide help. (Friesler notes that this arrangement has been effective for both English language learners and students with a history of poor performance).

These safeguards to support cooperative learning seem to work well for Friesler's students. I don t have a lot of trouble with collaboration," Friesler explains. "Once the project starts taking shape, the students...feel a sense of accomplishment because the finished products especially PowerPoint presentations look so polished." In fact, Friesler sees a commitment to group work even in students whose individual work is consistently weak. This commitment has contributed to steady improvements in the cooperative learning process in Friesler's classroom. The more practice the students have at collaborating, she says, the better they do at it.

While project−based learning was a key component of Friesler's unit, individual written work also played an important role. A major focus of Frank Lloyd Wright Middle School is on teaching students how to apply what the district has identified as six traits of effective writing in every content area: ideas and content, organization, voice, sentence fluency, word choice, and conventions. Friesler sought to incorporate most of these traits into the assignments for the *Investigation of Heroism* unit.

The first trait ideas and content was addressed in the unit's initial lessons on Internet research, described earlier. In order to teach the second trait organization Friesler designed a graphic organizer using Inspiration software to help students evaluate a movie about the Holocaust or the Underground Railroad. After watching *Life is Beautiful*, *Schindler's List*, or *Follow the Drinking Gourd*, students used these graphic organizers to help them write movie reviews, honing their persuasive writing skills.

Friesler finds that including required writing in a project is more relevant and meaningful to students than assigning the writing as an isolated task. There is so much you can do with projects in the classroom, she says. Teachers just need to be comfortable making [assignments] standards−based, and students can learn things they don't even realize they are learning. I look for how much curriculum I can get into a project so that learning is fun but meaningful.

To address the last three writing traits sentence fluency, word choice, and conventions and to revisit the second trait (organization), Friesler enlisted the help of some computer software and a group revision process that her students use throughout the year. Before completing their first drafts, students review sentence structure using a computer program provided with their Prentice Hall

writing book. The program introduces different types of sentences and lets the students practice writing them.

When students are done with their first drafts, each paper makes its way through a series of revision groups. In the first group, students read the paper aloud to catch run−ons and fragments. Then they evaluate the introduction, transitions, main ideas, and supporting details for clarity and consistency. After this stage, the author gets the paper back and makes corrections on the computer. In the next group, students evaluate the author s word choice and sentence fluency. Again, the author is given the feedback and makes appropriate changes. Finally, the last group looks at the body of the paper in terms of the specific type of writing and suggests any further revisions. I believe in taking a lot of time with revision, Friesler says, because that is where students learn the most about writing and collaboration.

This revision process is repeated from the first writing assignment of the year to the last. The use of technology makes the process more efficient, because students can easily enter changes using a word processing program. Technology also adds an extra incentive to revise well, because Friesler always chooses a few exemplary papers from each assignment to post on the school's intranet or the Internet.

Friesler's integration of technology with her writing program has proved very successful. Since her classroom became a computer lab, Friesler's students have made steady improvements in the organization and clarity of their writing improvements borne out by strong scores on the Terra Nova writing test. (See the Results section for more details.)

To Friesler, applying project−based learning in a computer lab setting was a natural extension of her previous experience. She was able to expand the Holocaust project into a six−week unit that used technology to support students' exploration of unsung heroes in three different historical periods. Through units like this, Friesler's students gained a set of practical technology skills and an aptitude and appreciation for cooperative learning; they also improved as writers and thinkers. According to Friesler, the technology available to her students helped to deepen the learning process, allowing them to explore topics from a variety of perspectives and through a variety of methods. Carefully structured use of the Internet has opened up a bigger world for Friesler's students; as they explore this world, tools like Inspiration and PowerPoint help them to organize and present their thoughts about it.

To view Friesler's unit plan for *An Investigation of Heroism through the Holocaust and Underground Railroad*, click here.

Demographics

Frank Lloyd Wright Middle School in West Allis, Wisconsin serves students from both urban and suburban neighborhoods. The community has a strong German and Polish heritage. The school population consists of 744 seventh− and eighth−grade students who come from low−income, blue−collar, and middle−class families. Approximately 19% are eligible for free or reduced−price lunch, and 2% are English language learners. Most of the staff members at Frank Lloyd Wright Middle School are veteran educators, predominantly Caucasian.

Ethnic composition of students:

- 1.6% Native American
- 2.4% Hispanic
- 2.6% Asian

- 4.6% African American
- 88.8 % Caucasian

Background

In 1997, at her principal's suggestion, language arts teacher Janis Friesler was given a fully equipped computer lab as a classroom. Friesler had experimented with technology in the classroom before, but she suspected that more systematic technology integration could greatly enhance her eighth−grade students' engagement and learning and provide them with marketable, real−world technology skills. She was especially concerned about improving the quality of their writing and hoped technology might help her with this as well. With the help of her colleagues at Frank Lloyd Wright Middle School in West Allis, Wisconsin, Friesler re−invented her curriculum to meet these goals, creating a series of technology−infused, multidisciplinary units built around cooperative, project−based learning.

The structure of Friesler's school makes it easy to implement multidisciplinary, project−based learning in technology classrooms. Because of its use of academic teams or "houses" and common prep periods, there is open communication among teachers and a willingness to collaborate. Also, each house within the school has flexible scheduling to accommodate the time requirements of project−based learning. For example, since two of Friesler's units are integrated with science, the science teacher and Friesler frequently block their classes so the students can work for two periods (88 minutes) instead of just one. With these organizational supports, Friesler was in a good position to begin transforming the learning experience for her students.

Design &Implementation

When you walk into Janis Friesler's language arts classroom at Frank Lloyd Wright Middle School in West Allis, Wisconsin, you do not see the traditional arrangement of rows of desks. Instead, her classroom is arranged with seven long computer tables. On these tables are 28 computers and monitors with Internet access. The room is also equipped with two laser printers, an electronic projector linked to a computer for demonstration purposes, and a scanner. Groupwise software is used throughout the district so every teacher, administrator, and student can have his or her own e−mail account as well as a network file to store work. This enables students to save large files such as graphics when developing their projects. It also allows Friesler to create shared files through which students can access information or directions. Other software accessible in Friesler's classroom includes Microsoft Word for word processing, PowerPoint and HyperStudio for presentations, Excel for creating spreadsheets, Inspiration for creating graphic organizers, supplemental software for language arts and science textbooks, and A+ tutorials for reading, language arts, math, and social studies practice.

Friesler has taken advantage of all of these resources in redesigning her curriculum. To access one part of this curriculum, her unit plan for *An Investigation of Heroism through the Holocaust and Underground Railroad*, click here. This unit won first prize in Co−nect Schools' 2001 National Project Contest. To see samples of student work for the unit, click on any of the links below:

- Heroes of the Holocaust and Underground Railroad
  Êhttp://www.Co−nect.net/Schools/ProjectBank/Heroism/laudot.htm
- Dark History Gives Rise to Heroes
  http://www.Co−nect.net/Schools/ProjectBank/Heroism/zeke.htm
- Heroes of the Underground Railroad and Holocaust
  http://www.Co−nect.net/Schools/ProjectBank/Heroism/ravi.htm

Another unit Friesler has created, in conjunc tion with science and social studies teachers at Wright Middle School, revolves around the Iditarod sled dog race in Alaska. After reading Jack London's *Call of the Wild*, her students use Internet resources to research the history of this race and learn about the dogs, the equipment, the terrain, and the human participants, or "mushers." This unit was awarded first place in Co−nect Schools' 2003 National Project Contest. For information about the unit and samples of student work, visit http://home.wi.rr.com/friej/.

Results

When Janis Friesler's classroom at Frank Lloyd Wright Middle School in West Allis, Wisconsin became a computer lab, she knew her eighth−grade language arts students were in for a change. Through multidisciplinary, technology−infused projects, Friesler helped her students master software they can use in the real world and improve their writing skills, engagement, and behavior in the process.

Before Friesler's classroom became a fully equipped computer lab, the technology skills of her students were very limited. Some had computers at home, but few were savvy enough to do more than send e−mail messages or browse aimlessly through the Internet. However, after a year in her computer lab/classroom, her students became skilled users of their school network and of a variety of software programs, including Microsoft Word for word processing, PowerPoint for presentations, and Inspiration for organizing ideas graphically. They also learned how to evaluate Web sites when doing research and how to sharpen their reading and writing skills with CD−Rom tutorials.

Their intense, year−long exposure to technology not only gave Friesler's students a new set of marketable technology skills, but it also helped them to improve as writers. This improvement is borne out by strong test scores on the Terra Nova standardized test used by the district. Unfortunately, because the state's criteria for the test ratings changed around the time Friesler's class became a computer lab, it is difficult to compare her students' test scores before and after this change. However, on the writing portion of the Terra Nova test, Friesler's students earned the following ratings in 2001−2002:

Scale	Learning Disabled Students and English Language Learners	Regular Education Students
Minimal Basic (2.5)	1	
Basic (3.0)	6	
Basic+ (3.5)	5	6
Proficient (4.0)	5	73
Advanced Proficient (5.0)		7

Friesler attributes the improvement in her students' writing skills to her consistent use of the district's Six Trait Writing Model and the support she's given this model through technology. For example, in her technology−enhanced unit *An Investigation of Heroism through the Holocaust and Underground Railroad*, Friesler taught her students how to organize their thoughts about a Holocaust film using Inspiration's graphic organizer software. She also provided them with grammar tutorial software and a

collaborative structure for revising the film reviews they wrote on Microsoft Word. Friesler notes that this consistent framework for teaching writing has been especially helpful for the English language learners and learning disabled students mainstreamed into her classes. Before Friesler's classroom received a technology infusion, the students in these categories had very little success in expressing themselves clearly on paper, but with the Six Trait Writing Model and the support from peer reviewers and grammar and organization software, they made steady gains.

Aside from strong test results, Friesler's computer lab students had fewer discipline problems than her earlier students. At Frank Lloyd Wright Middle School, teachers give out blue slips that allocate points for discipline infractions. In the two years before the lab was in place, Friesler gave out 118 and 107 blue slips, respectively. In the two years after Friesler starting teaching in the computer lab, she gave out 50 and 60 blue slips, respectively, most of which were for chewing gum. Once her students were exposed to meaningful, technology−supported project−based learning, they became engaged to the point that discipline problems were rare.

According to Friesler, the technology available to her students helped to "deepen the learning process," allowing them to explore topics from a variety of perspectives and through a variety of methods. For example, in her unit on unsung heroes of the Holocaust and the Underground Railroad, Friesler's students took a virtual tour of a concentration camp, an experience that led most students to a more profound understanding of the Holocaust than that which they could gain from reading about it in a textbook.

Access to technology also improved the work ethic of Friesler's students. For example, because they could produce polished, professional−looking slides using PowerPoint, students took pride in their work and invested more time and effort in making the actual quality of the work match its appearance.

Friesler is extremely pleased with the results of her technology−infused group projects. "Through the use of collaboration and technology," she explains, "my students began to have a genuine interest in learning. They were excited and enthusiastic. I was able to integrate the Six Trait Writing Model, teach the necessary standards, and keep my students motivated and on task. I found that my classroom atmosphere drastically changed."

Replication Details

Language arts teacher Janis Friesler, from Frank Lloyd Wright Middle School in West Allis, Wisconsin, offers the following tips on effective technology integration in a project−based classroom:

- Arrange the classroom to facilitate the use of technology; this might mean that you have to teach from the back of the room sometimes so you can see all of your students.
- Be flexible and always have a Plan B when using technology. Machines do break down, so be prepared to troubleshoot problems or to keep things moving if you can't solve the problems immediately.
- Form academic teams of teachers so that you can design projects that articulate across content areas and meet state and national standards. These teams of teachers must have open lines of communication in order to develop projects and collaborate.
- Use rubrics to guide and evaluate your students' work.
- Make students comfortable with cooperative learning and facilitate training on the dependence of team members.
- Balance the curriculum so that academic learning is integrated with the learning of new software tools.
- Don t forget the objectives of the project when using technology; they should be the focus of

student learning.

Costs and Funding

West Allis, Wisconsin language arts teacher Janis Friesler had her classroom at Frank Lloyd Wright Middle School transformed into a computer lab that she uses to support project−based learning. She estimates that the current cost of creating a computer lab from scratch would range from $30,000 to $35,000. This estimate includes wiring, furniture, cables, and the following hardware and software:

Hardware

- 28 computers and monitors with Internet access
- 2 laser printers
- 1 electronic projector
- 1 scanner

Software

- Groupwise, for e−mail and file sharing
- Microsoft Word, for word processing
- PowerPoint &HyperStudio, for presentations

- Excel, for creating spreadsheets
- Inspiration, for creating graphic organizers
- Supplemental software included with language arts and science textbooks
- A+ tutorials for reading, language arts, math, and social studies practice

Investments in the hardware and software for a computer lab should be accompanied by investments in professional development so that teachers can use these resources effectively. Luckily for Wright Middle School, Friesler's master's degree in Computer Science Education equipped her to provide most of the staff development in technology for her colleagues interested in using one of the school's new computer labs. Her school also benefited from its partnership with Co−nect Schools, a comprehensive school reform model that provided staff development in project−based learning and technology.

Contact Information

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Rating Criteria

Janis Friesler recently retired after teaching in the West Allis−West Milwaukee Schools since 1968. She has a B.A. in English from the University of California and a B.S. in Computer Science Education from Cardinal Stritch Unversity in Milwaukee. Ms. Friesler started her teaching career as an elementary teacher before moving to Frank Lloyd Wright Middle School to teach language arts. She also served as an adjunct faculty member at Cardinal Stritch University, teaching educators how

to integrate technology into their curriculums.

Ms. Friesler has presented projects and best practices in education at conferences for many years. These conferences include the National Technology Conference in Nashville, the International Reading Conference in Toronto, and the Co−nect Annual Technology Conference in Toronto. She is a regular presenter at the Wisconsin State Reading Conference and The Wisconsin Conference of Teachers of English. Last year she presented, by invitation, at the Governor's Conference on Educational Technology. She has won four national contests for her units, including first prize in Co−nect Schools' 2001 National Project Contest for the unit featured in this story, *An Investigation of Heroism through the Holocaust and Underground Railroad*, and first prize in 2003 for an interdisciplinary unit on the Iditarod sled dog race.

Although retired from teaching, Ms. Friesler continues to collaborate with teachers and former students from Frank Lloyd Wright Middle School on the design of new multidisciplinary units. She also consults on whole−school reform, integrated project−based learning, her district's Six Trait Writing Model, and the integration of technology into the classroom.

This story exemplifies the following practices:

Standards

All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.

Multiple Learning Strategies

Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

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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"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.

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:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Becky Baun's 6th Grade Social Studies Class − Manchester Memorial School

Manchester Memorial School

Manchester−by−the−sea, MA

School Type: Public

School Setting: Rural

Level: Elementary

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

The Education Alliance at Brown University

Sixth grade teacher Becky Baun learned last year that she, along with the other 6th grade teachers, would be responsible for teaching World Geography. Faced with a new subject area, time constraints (she also teaches Language Arts and Math to her homeroom), and the prospect of dry textbooks and a few old videos, Baun and her colleagues decided to use technology to liven up their lessons. Baun had already participated in a professional development course conducted by the SEEM Collaborative that followed the Good Models of Teaching with Technology (GMOTT) approach to using technology in instructional design. As part of the course, Designing for Technology Integration (DTI), she created a unit that integrates technology, reviewed the units of two other participants, and revised her own unit based on feedback. Aside from a two−day face−to−face seminar, the entire seven−week course was conducted online using an online template to plan the project, read the work of other participants, and offer constructive feedback.

Baun was able to apply what she had learned in the DTI course to her 6th grade World Geography class. She began by limiting the continents the class would study to Europe, Africa, Western Asia/the Middle East, and Australia. Using the five themes of geography (location, place, human interaction with the environment, movement, and regions) as a base, she developed a multi−purpose unit on each continent. That is, each unit had to, in some way: 1) tie into the Massachusetts State Social Studies Frameworks; 2) employ multiple learning strategies such as cooperative learning, independent research, and reflective learning; 3) promote technological skills in line with the Massachusetts state technology instructional standards; and 4) build upon skills learned in the last unit, challenging students to explore increasingly difficult and varied activities.

In accordance with state frameworks, the class started their study of world geography with ancient river valley civilizations to build a foundation of knowledge. The school librarian took students through the steps of researching an essential question using texts and limited Internet sources. Particularly important was helping students to determine how to identify appropriate and authentic online sources. Students learned the process of conducting research, creating a timeline, developing and answering questions, and citing sources.

After this overview, the class began their first major unit on Europe. As a class, they broke the continent into separate regions and Baun assigned each student a specific country. To help them become engaged with the material, she incorporated a creative technology project into the unit, asking each student to design a travel brochure for his or her assigned country. Students loved the activity because it allowed them to use a range of skills, including artistic ability, creative and persuasive writing techniques, and research skills. The class used both the school's computer lab as well as laptops in the classroom to conduct research, type content, and illustrate and design the brochures, following a checklist and rubric distributed by Baun. Each student presented his or her brochure to the class upon completion.

As part of the next unit on Africa, students were again assigned a specific country to research and present to the class. This time, instead of travel brochures, students worked independently to create a PowerPoint presentation on their assigned country. In order to gain a better understanding of economic issues, as required by the state standards, students had to determine if their country was developing or developed and support that assertion with thirteen facts. They then created PowerPoint slides highlighting each of these facts, based again on a checklist and rubric provided by Baun. Students built upon the computer skills they had learned during the unit on Europe to create elaborate slide presentations with animation, photography, and other graphics. In addition, each student practiced his or her public speaking skills by presenting the PowerPoint to the class. This activity, while also creative, drew on different strengths from the previous project. Creating the PowerPoint required students to conduct careful research to support an essential question, distill a large amount of information into key points, and a have a clear organization for their ideas.

For their study of Western Asia (The Middle East), the class tried out yet another form of technology: the I−movie. Students were assigned a region, as they had been for the past two projects, and worked in groups to research the county, write a script conveying their findings, and videotape a final presentation. Because this activity required close collaboration, students learned about group dynamics and decision making in addition to gaining new social studies knowledge and technology skills.

The last unit, on Australia, doubled as Baun's final project for the DTI course. Australia was particularly interesting to Baun's students because their school district had hosted several high school students from Australia earlier in the year. She decided to capitalize on the enthusiasm and momentum from the Aussie visitors by asking students to do a "webquest" on the continent. Students collected information and cited it in daily journals, created postcards, and conducted research on the continent using what they had learned about essential questions. This project asked students to draw upon the technology skills they had been developing all year, including Internet research and navigation, on−screen design work, formatting, typing, and use of a variety of software applications. In addition, the success of this last project was dependent on students successfully working in small groups. This group work provided numerous natural opportunities for peer teaching, leadership, collaborative decision−making, and distribution of roles. For example, those students with artistic or creative abilities did the formatting and layout while those who were more technologically savvy helped guide the technical aspects of the project. Likewise, those with leadership skills facilitated their groups' process while those with excellent research and content skills contributed their expertise.

Baun has been thrilled with the success of her technology integrated World Geography units. Not only did students learn new skills that are applicable to other classes, they seemed to genuinely enjoy the work. While completing these technology−infused geography projects, Baun reports that he never had to remind students to "pay attention," or "get back on track." They were energized and engaged from the very beginning and were excited about the opportunity to try new skills. These projects made learning about various regions of the world fun and interesting because each student was directly

involved in the learning process, was given license to be creative, and, as a result of the variety of activities, could draw upon his or her greatest strengths.

The technology skills students gained during these interactive projects are in line with the Massachusetts Instructional Technology Standards for which all teachers are responsible. As a general guideline, students must graduate from high school with basic proficiency in the use of computers. More specifically, under the third standard, students are to: demonstrate an ability to use technology for research, problem−solving, and communication; to locate, evaluate, collect, and process information from a variety of electronic sources; and to use telecommunications and other media to interact or collaborate with peers, experts, and other audiences. Baun's 6th grade projects allowed students to develop all of these skills.

In addition to gaining new knowledge about key geography topics and enhancing their computer skills, students also developed both their social/emotional competence, through cooperation, decision−making, and leadership, and their academic skills, through public speaking, researching a topic, writing in a variety of genres, and citing sources. All of these skills are transferable to other classes and will help students as they transition into 7th and 8th grade, and later into high school.

Now in her second year of technology integrated World Geography instruction, Baun is happy with the progress she sees in her students. She feels that the changes she has made to allow for these projects in her teaching have been positive ones, and she is looking forward to seeing the results from this year's class!

Demographics

Manchester Memorial School is located in Manchester−by−the−Sea, Massachusetts, a rural town approximately 40 minutes North of Boston. The 417 students enrolled in grades K−6 are predominantly white, middle or upper−middle class, and native speakers of English.

Background

Technology Lab

Every student in the Manchester Memorial School visits the school's technology lab at least once per week. The lab, staffed by a full−time computer teacher, is designed to enrich the classroom curriculum. In that spirit, classroom activities and technology are regularly integrated. The technology lab has 22 student workstations, four servers, a demonstration station with a SMARTBoard, and a multimedia set up. In addition, there are three projectors, a scanner, three CD−towers, three digital cameras, five digital video cameras, two Web cams, three DVD players, a 32" monitor and a 27" monitor with a VCR, three laser printers, and two digital microscopes to provide classes with the latest equipment to enhance their academic activities. Recent additions include a wireless laptop lab consisting of 22 iBooks and two 30−station AlphaSmart carts. The lab is networked throughout the school as well as with the high school, and all the computers have Internet access (Source: http://www.memorial.mersd.org/techlab/lab.html).

DTI Institute / NEIRTEC

The Designing for Technology Integration (DTI) institute (a hybrid model of a seven−week online course and a two−day, face−to−face seminar) is conducted regularly for educators from districts

located throughout the Northeast region. It focuses on refining educators? knowledge of instructional design principles using the concept of Good Models of Teaching with Technology (GMOTT). The series of DTI institutes has been developed and refined by TERC, a member of the Northeast and Islands Regional Technology in Education Consortium (NEIRTEC). NEIRTEC serves the six New England States, New York, Puerto Rico, and the Virgin Islands. It focuses on helping educational leaders at the state, district, and school levels address the many challenges involved in linking technology to student achievement in the core academic areas, with a particular emphasis on the needs of schools in underserved urban and rural communities. To view its online resources, learn about other online courses it offers, or to find out more about NEIRTEC, see http://www.neirtec.org.

Massachusetts Instructional Technology Standards for students

1. 1) Demonstrate proficiency in the use of computers and applications as well as an understanding of concepts underlying hardware, software, and connectivity.
2. 2) Demonstrate responsible use of technology and an understanding of ethics and safety issues in using electronic media.
3. 3) Demonstrate ability to use technology for research, problem−solving, and communication. Students locate, evaluate, collect, and process information from a variety of electronic sources. Students use telecommunications and other media to interact or collaborate with peers, experts, and other audiences.

Design &Implementation

At Manchester Memorial School in Manchester−by−the−sea, Massachusetts, sixth grade teacher Becky Baun developed a series of technology integrated units for her World Geography class. Her main activities in planning the units included the following:

- Attending the Designing for Technology (DTI) professional development workshop
- Identifying the continents her class would study during the course of the year
- Identifying technology skills she wanted students to learn (e.g., software applications, internet research, formatting/layout)
- Developing a unique technology project to accompany each unit −− one that would allow students to learn and demonstrate new technology skills as well as explore different strengths and academic learning strategies
- Aligning technology components with state instructional technology standards
- Aligning lesson plans with state social studies frameworks and the five themes of geography
- Scheduling time to use computer lab and school laptops as well as have the librarian explain the research process to students
- Introducing students to the units, providing technical assistance, and answering questions

Results

Becky Baun was worried when she learned that she and the other 6th grade teachers at Manchester Memorial School in Manchester−by−the−sea, Massachusetts would now be responsible for teaching World Geography. Often these units are plagued by boring and outdated materials that leave students and teacher alike frustrated with learning. To combat this problem, Baun and her colleagues decided to upgrade the World Geography curriculum to include a series of technology integrated lessons.

Although Baun did not conduct any formal assessment or evaluation with her students, what she has

noticed in her two years of using these projects is that students are engaged and enthusiastic about learning. She never has to remind students to keep their focus or stay on task, even when they are working in small groups, which are typically prone to gossip and chatter. She also notes that students developed their technology skills over the course of the school year, allowing them to perform increasingly sophisticated tasks. Each unit built upon skills they had developed during the previous project or activity.

Replication Details

Costs and Funding

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Rating Criteria

The Knowledge Loom learned of Becky Baun's classroom projects because of her participation in the SEEM Collaborative's Designing for Technology Integration (DTI) course, offered by NEIRTEC partner TERC. Baun, a sixth grade teacher at Manchester Memorial Elementary School in eastern Massachusetts, submitted a description of the technology projects she had integrated into her World Geography lessons. Knowledge Loom editors felt her classroom presented an exemplary success story for two of the GMOTT best practices: Standards and Multiple Learning Strategies.

The DTI course gives participants the opportunity to learn how technology can be used as a teaching and learning tool that supports student and teacher inquiry, problem solving, and higher order thinking skills and extends creative thinking processes. It guides them through the design of a unit of practice that can be used in their school or district.

NEIRTEC is the Regional Technology in Education Consortium for the Northeast and serves the six New England States, New York, Puerto Rico, and the Virgin Islands. NEIRTEC focuses on helping educational leaders at the state, district, and school levels address the many challenges involved in linking technology to student achievement in the core academic areas, with a particular emphasis on the needs of schools in underserved urban and rural communities. To view its online resources, learn about other online courses it offers, or to find out more about NEIRTEC, see http://www.neirtec.org.

This story exemplifies the following practices:
Standards
All technology−enhanced activities should be deliberately and consciously aligned with local, state, and national standards.

Multiple Learning Strategies

Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

Eulalia Texidor Ortiz's English Language Arts Class at S.U. Bartolom Javier Petrovitch School

S.U. Bartolomé Javier Petrovitch School

Cabo Rojo, PR

School Type: Public

School Setting: Rural

Level: K−9

School Design: Traditional

Content Presented By:

NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

The Education Alliance at Brown University

Eulalia Texidor Ortiz has been 'in love' with technology for many years, which is why for the middle school English language arts teacher, being selected to be a Lead Teacher with the CENIT program at the S.U. Bartolomé Javier Petrovitch School in Cabo Rojo, was an honor.

Texidor Ortiz, who teaches sixth, seventh, and eighth grades at the school, acknowledges that participating in CENIT has truly opened her eyes, giving her the opportunity to learn to develop challenging activities that integrate technology into the curriculum and promote learning through a different system, one that expects and encourages students to be more involved in their learning. She is now more than a teacher; she's a facilitator, a role she accepts wholeheartedly.

"Through CENIT I have learned the importance of involving the students in their own learning process in a way that is more participatory. But at the same time, I have learned that our traditional teacher role changes to that of a facilitator," Texidor Ortiz said.

At the beginning of each school year, Texidor Ortiz sits with the students in her classes and has candid conversations with them about what they would like their writing assignments to be about and how they think technology should be used in each assignment.

"Because many of the students don't like to write, it's very important for me to give them this opportunity, and to use different methods to keep them motivated. But I always have a condition: whatever topic they choose, they must make sure to integrate technology into it, whether it be through the use of video cameras, digital cameras, computers or other technology based mediums. And I remind them that once their work is finished they must turn in a written report and make an oral presentation of their work before the entire class using Power Point," she added.

With this kind of support and encouragement, students in Texidor Ortiz's class feel comfortable taking charge of their learning development, so much so that one of the last ideas they suggested for a writing assignment was making a field trip to an ice skating rink not too far away from the school so that they could explore it and write their observations.

"One of the activities we decided to participate in as a group was visiting an ice skating rink that was recently built in the area. The students had to work on practicing how to write descriptive paragraphs using different verb tenses, and since they wanted to learn more about this kind of activity, we decided that it would be a good topic to write about. I agreed and asked them to think about how they would incorporate the use of technology," she said.

With that topic in mind, Texidor Ortiz set out to try to make the field trip a reality, but given the lack of resources at the school, she knew they would need help to pay for the trip. That's when she sought the support of AlACiMa (the Spanish acronym for The Puerto Rico Math and Science Partnership), a local project that focuses on science and mathematics and is run and supported by the four major universities on the island, the Department of Education, and other organizations. AlACiMa agreed to pay for the field trip as long as she and her students would incorporate science, physical education, and industrial arts into their study of the rink. Now the students would also focus their attention on these other issues; from the science angle, they would look at the friction of the bodies on the ice as people skate; from the physical education point of view, the students would look at ice skating as a sport; and to meet the industrial arts requirement, they would focus on analyzing the way the ice rink was built. For the writing part of the assignment, the students would have to focus on describing what happened before, during, and after the field trip; this would allow them to use verbs in different tenses.

Texidor Ortiz also increased the use of technology in the assignment by having the students use the Internet to find information about the topic of ice skating. The final components of the assignment required the students to turn in a written report, in English, and make an oral presentation before the entire class using Power Point.

"The day of the field trip, some students took with them video or digital cameras to document their trip. This trip was not only fun for all who participated; it was also an experience in learning," she added, citing the success of the trip.

"After we returned to the classroom all students received rubrics, a good way for them to understand what would be expected from their investigation and from their projects. The students began writing their descriptive paragraphs in English with my help by using Microsoft Word, and later those who had videos or digital photos of the trip integrated them into their writings; other students used Clip Art," she added.

She said the activity, which took the class about a month and a half to complete, proved to be successful from all aspects. It had the added benefit of having AlACiMa involved, which allowed the students to experience the activity from the standpoint of science and mathematics.

For those students who didn't participate in the ice skating writing activity, Texidor Ortiz developed an alternate writing project. Students completing this project focused on a problem or a situation in their communities they felt could be improved somehow.

"That group of students worked on the activity with the community by using the software Inspiration, which helps students create conceptual maps. These students decided to identify a situation in their community that concerned them. For this they went out and took pictures of those things they were concerned about. Later they identified one person in the community whom they thought would be able to help them find a solution to the problem, and they wrote that person a letter expressing their concerns. At the end of this activity, students were also required to hand in a written report and present their findings to the entire class with a Power Point presentation," she added.

While the use of technology in Texidor Ortiz's class may seem like second nature to her and the students, things didn't always run so smoothly in the classroom or in the school, for that matter.

She said that before the arrival of CENIT, the school's computers were all very old and outdated. They were only used to present certain concepts to the students, and not meant for the kind of uses she is now able to provide to her students.

"We had nine computers in the school, but because they didn't meet our needs, I got the school administration to buy us tape recorders which would allow the students to record themselves reading, ultimately improving their diction in English. I would divide the class into groups, some students would use the computers, others would use the tape recorders, and the rest would use other materials. Everyone would take turns, and for three days the students would rotate from one thing to the other, until finally all of them had used all the equipment. This was okay, but it was much too difficult and less constructivist," she added, reflecting about the past.

"Now all of the students can take advantage of the technology that is available and participate at the same time; it's excellent."

Demographics

The S.U. Bartolomé Javier Petrovitch School in Cabo Rojo, Puerto Rico is a public school located in the southwest region of the island. The school serves grades K to 9 and has over 800 students. Now, due to space constraints, the school is working on an alternate hours schedule, with a group of the students attending classes in the morning hours and another group attending classes in the afternoon. This school has a mobile computer laboratory, which was equipped and funded by the Puerto Rico Department of Education through the CENIT program.

Background

The Center for Integration of Technology (CENIT) program, established by the Puerto Rico Department of Education in 2001, is an island−wide initiative designed to help teachers integrate technology into their academic curriculum. For the past three years the PR Department of Education, with support from the Northeast and Islands Regional Technology in Education Consortium (NEIRTEC), has identified various groups of high−need or low−performing schools to participate in the program for a year. To date over 170 schools have participated in the program. Each group of participating schools begins the program in January by receiving funding and support from the Department of Education to order and install a computer lab. For each school, CENIT staff members then select a lead teacher to work with other participating teachers in the school to get them up to speed on using the new computers and software programs. In June teachers attend a five−day Authentic Task Academy to get more acquainted with the CENIT program and gather ideas for how to integrate technology and real−world problems into the classroom. When schools open in August, teachers participating in the program begin to introduce their students to the new technology, giving them the opportunity to learn with the new programs by taking part in technology−rich lessons in subjects such as social studies, science, literature, and math. Teachers meet throughout the rest of the semester, get further training, and in December give presentations outlining their experiences during their participation in CENIT. Teachers who participate in the CENIT program have access to an Internet−based program called Blackboard, where they can find information about the program and are able to communicate with each other and express concerns or share ideas about the program.

At the S.U. Bartolomé Javier Petrovitch School of Cabo Rojo, the challenge of participating in the CENIT program was getting used to a shift in teaching modalities. Now teachers would have to serve

as facilitators, not just designing lessons that use technology but actually involving the students in deciding which technology tools would best support their goals for a project. As part of the technology integrating process, students are encouraged to use the computers provided to search for information on the Internet and to use digital and video cameras and a myriad of software programs that enhance the learning experience.

Design &Implementation

At each CENIT school participating in the program, CENIT staff chooses a lead teacher who ultimately serves as a guide for other teachers in the school to work on integrating technology into the curriculum. The lead teacher, along with other participating teachers, attends workshops and seminars to get better acquainted with the new computer systems and all the different software programs used to enhance the students' learning experiences.

At the S.U. Bartolomé Javier Petrovitch School in Cabo Rojo, the lead teacher, Eulalia Texidor Ortiz, after having participated in CENIT workshops and other training, takes to the task of integrating technology into the school's curriculum following the vision of the program.

To determine what writing assignments her students would benefit most from, Texidor Ortiz first looks at what English language art concepts the students need to be focusing on at any given time. Then she consults with the students to get a feel for what their interests are and how their ideas, combined with the integration of technology, could make for the perfect activity for the entire class. Once a topic is selected for the writing assignment, Texidor Ortiz and her students determine how to integrate technology into it; whether it be through the use of video cameras, digital cameras, computers or other technology based mediums. She further adds to this integration by having the students use the Internet as a research tool to find relevant information about the topic at hand. Once the students finish this activity, they must turn in a written report and make an oral presentation of their work before the entire class using Power Point. In some cases, as in the ice skating project described in the success story section, Texidor Ortiz also works with the students to integrate other disciplines, such as science and math.

Results

Teachers who participated in the CENIT program in Puerto Rico schools credit the program with improving their students' general achievement. They add that not only are the students learning and becoming more advanced with the use of technology, but they are also more motivated and interested in being in school.

One teacher says, "CENIT has meant a change of attitude in schools. The students now want to learn. Now they want to be in the classrooms. Students now lean more towards completing homework because they want to include their work in an electronic portfolio."

According to data collected in an external evaluation report conducted by the Evaluation and Research Group of Puerto Rico, 85% of teachers participating in the CENIT program credit the program with having a positive impact on their students' achievement. In general, the report also shows an increase in grade point average for those students involved in the program.

A student survey conducted by the evaluators found that students agree with their teachers. Of those students surveyed, 90% said that they consider the new technology a useful tool to help increase their general knowledge. Furthermore, the report shows, 88% believe that taking classes that integrate the use of technology is good for their overall achievement, and 82% of the students credit the use of

technology in the classroom with improved grades in tests.

CENIT Director Frank Maldonado Font adds that the program has surpassed everyone's expectations.

"I believe that the project has been and continues to be an absolute success, and now it's even better," Maldonado Font said. "We have been showing teachers how to integrate technology into the curriculum and everything has been improving."

"You can definitely tell the difference between a classroom where there's a CENIT teacher present and the classroom without it. The teachers and the students are very different now, and this change shows," he added.

Replication Details

English language arts teacher Eulalia Texidor Ortiz attributes the success of the CENIT program at the S.U. Bartolomé Javier Petrovitch School in Cabo Rojo to the commitment and dedication of the teachers and the students. She adds that as with everything else in life, teachers at the school have had to have a lot of patience, and an open mind, to be successful at integrating technology into the curriculum. To other teachers trying to do the same in their classes, she recommends setting clear goals with the students and making sure that they have a clear idea of what is expected of them in regards to the use of technology in the classroom. She also suggests making sure that students are familiar with software programs being used in the classroom before they are asked to use them to support their learning of content.

Costs and Funding

The Center for Integration of Technology (CENIT) program, established by the Puerto Rico Department of Education in 2001, is an island−wide initiative designed to help teachers integrate technology into the academic curriculum. For the past three years the PR Department of Education, with support from the Northeast and Islands Regional Technology in Education Consortium (NEIRTEC), and funding from DOE, has identified various groups of high−need or low−performing schools to participate in the program for a year. Participating schools receive computer equipment, including printers, scanners and other supplies, in addition to ongoing professional development.

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Rating Criteria

Eulalia Texidor Ortiz is always interested in finding ways of improving the educational experience for students at the S.U. Bartolom Javier Petrovitch school in Cabo Rojo, and wherever else she can. While most of her 27−year career as a teacher has focused on teaching English, she has also been

actively involved in creating a link between the classroom and technology.

Prior to being selected to participate in CENIT, through her interests in technology, Texidor Ortiz had been involved in writing technology−centered proposals for her school and in offering technology workshops to other teachers as a Resource Teacher with CITeD, the Spanish acronym for the Centers for Technological Innovation for Teaching. For these reasons, she says, when the time came to select a Lead Teacher for CENIT, she was chosen for the job.

In addition to serving as the Lead Teacher of CENIT at her school, Texidor Ortiz is a coordinator for the SUNBEAMS (Students United with NASA Becoming Enthusiastic About Math and Science) project in Puerto Rico, where she offers workshops to teachers interested in incorporating lessons developed by NASA staff into their teaching. She is also a mentor with the program Living With a Star (LWS), also through NASA. She has collaborated with the Department of Education in the development of English lessons that are aligned with technology standards.

CENIT Director Frank Maldonado Font is proud of the success the program has had over the years at all the participating schools in Puerto Rico. He is quick to point to the dedication and the commitment demonstrated by each teacher participating in the program. He further adds that when CENIT staff interview teachers for the Lead Teacher positions at each school, they look for someone who is full of enthusiasm and the desire to work hard to lead the rest of the team in the right direction. The success currently taking place at the S.U. Bartolomé Javier Petrovitch school in Cabo Rojo is something Maldonado Font attributes to the ultimate overall success of the project.

This story exemplifies the following practices:
Multiple Learning Strategies
Technology−enhanced lessons and activities should represent a variety of learning strategies that include active learning strategies, constructive learning strategies, authentic learning strategies, cooperative learning strategies, and intentional/reflective learning strategies.

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) NEIRTEC, Northeast &Islands Regional Technology in Education Consortium

NEIRTEC, a collaboration of Education Development Center, Inc. (EDC), TERC, Learning Innovations at WestEd, and the Education Alliance at Brown University, is one of the ten regional technology in education consortia funded by the U.S. Department of Education. NEIRTEC serves the six New England States, New York, Puerto Rico and the Virgin Islands. NEIRTEC focuses on helping educational leaders at the state, district, and school levels address the many challenges involved in putting technology to effective use, with a particular emphasis on the needs of schools in underserved urban and rural communities.