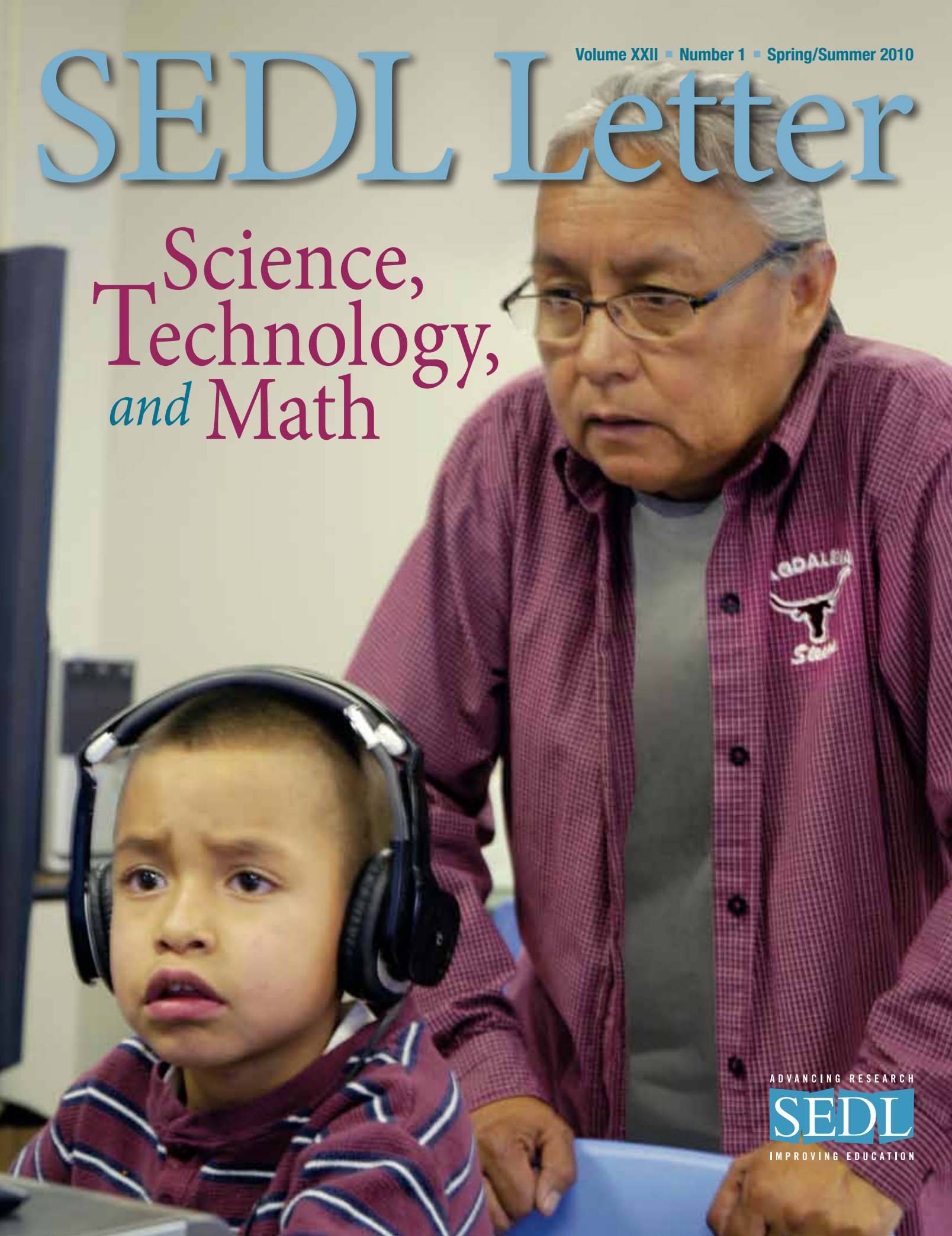
Volume XXII ■ Number 1 ■ Spring/Summer 2010

SEDL Letter

Science, Technology, *and* Math



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SEDL Letter

The Award-Winning Magazine of SEDL

ISSN/520-7315

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Cover photo: Violet Lucero and a student from Magdalena Municipal School District

STEM
Building a Strong Foundation

If you took high school physics, you may have learned about concepts like tension and compression by building balsa-wood bridges. Some of us enjoy the challenge of using nothing more than lightweight wood and glue to create a 3.5-ounce structure that can support an object more than 1,000 times its weight. Others find the task maddening or simply feel that the world would be better off if they left the job of building bridges to someone else.

Whether you love, hate, or are indifferent to math and science, our society needs people who know how to build bridges, conduct medical research, and lead space exploration. We are all hearing about the growing demand for people in science, technology, engineering, and math—or STEM—fields. At the same time, we hear sobering news of a persistent achievement gap in U.S. schools and concerns about whether enough students are graduating with the necessary skills to enter these fields and compete in the global marketplace. As educators, we have the opportunity to help more students take physics and build strong bridges where they otherwise might have opted out.

In this issue of *SEDL Letter,* we address challenges and solutions related to STEM instruction. We describe three different professional development projects, where SEDL content experts are helping teachers provide instruction in math, science, and technology—or some combination of the three—more effectively and in a more integrated way. We examine the importance of evaluation in helping educators identify and meet goals on STEM-related projects. We also review a research report on ways that instructors can engage students, especially those who are underrepresented in STEM fields.

Regardless of the role STEM plays in your life, we hope you will share your thoughts on this issue of *SEDL Letter.* E-mail us at sedl-letter@sedl.org or write a comment on our Facebook page.

A Plan for Success

Using Thinking Maps to Improve Student Learning in Georgia

By Laura Shankland

The close of a school year often brings rewards for the months of hard work that have come before. Students who had previously struggled to multiply fractions or calculate a percentage may at last be solving such problems with ease—or at least more easily than before. Carla McNeely, a math teacher at T. J. Elder Middle School in Sandersville, Georgia, recently noticed such an improvement in some of her students' work. A few students who had been struggling, especially some of her students with special needs, were showing signs of beginning to master mathematical concepts that had once eluded them. The students had not yet taken the state assessment, but McNeely had been closely monitoring their progress and was seeing signs that more students were "getting it."

Georgia educators are hopeful that the progress McNeely is seeing in her students is part of a larger trend. Recently, 17 schools in the state were recognized for working their way off the Needs Improvement list, the status given to schools that do not meet academic standards under the No Child Left Behind Act of 2001 (NCLB). Perhaps most impressive about the accomplishment was that the schools had been under state direction, meaning they had been in Needs Improvement for 5 years or more.

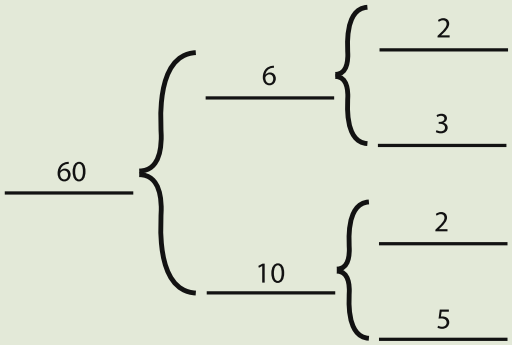
This year, the staff and students at Elder Middle School hope to join these schools in leaving the Needs Improvement list. The school is implementing changes intended to lead to lasting improvement. Teachers are aligning instruction and tests with Georgia standards and elements—parts of standards that identify specific learning goals. They are closely monitoring student progress to identify areas where students are struggling and to provide support, either in class or through an afterschool program. And with the assistance of SEDL's Southeast Comprehensive Center (SECC), school staff have begun incorporating Thinking Maps®, a mapping process that helps students deepen their thinking skills and improve their understanding of subject matter across content areas.

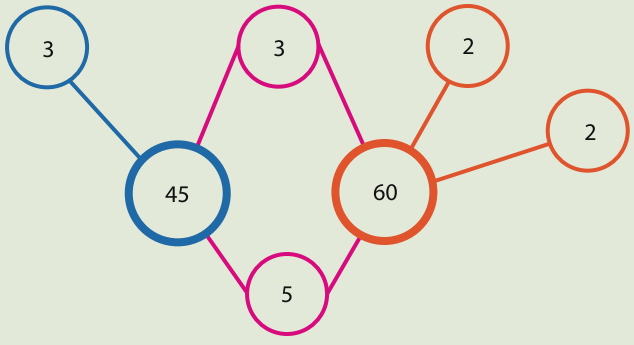
Thinking Maps

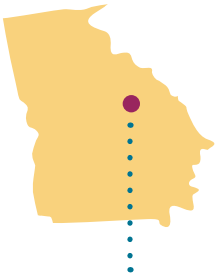
Elder Middle School is one of 12 Georgia schools implementing Thinking Maps, with SEDL's assistance, as a school improvement strategy. Thinking Maps are visual teaching tools, such as Circle, Bubble, Double Bubble, Flow, Multi-Flow, Brace, Bridge, and Tree maps. The maps create a common visual language to help students organize information and learn content in all disciplines. After a few principals and district leaders implemented Thinking Maps with what seemed to be a positive impact on student achievement, the Georgia Department of Education investigated using the program in Needs Improvement schools as a way to focus on students. "After seeing where the department was going and what its needs were, and especially with the emphasis on reaching classrooms, Thinking Maps were a way to further the goals of

Examples of Thinking Maps

In this example, a Brace Map (left) is used to find the prime factors of the number 60. A Double Bubble Map (right) is used to compare prime factors and find the greatest common factor of 45 and 60.







Elder Middle School, Sandersville, Georgia

the department and make an impact on classroom instruction, which is where you're really going to affect student achievement," says Glenda Copeland, who is the SECC's liaison with the Georgia Department of Education.

In Summer 2009, some 1,200 administrators and staff from 27 schools received training from Thinking Maps staff. Attendees included some of the 17 schools that recently came off the Needs Improvement list. After a brief review at the start of the school year, teachers introduced Thinking Maps to students in the fall. SECC staff have since been supporting state directors in 12 of these schools as the directors lead teachers in implementing Thinking Maps. For example, SECC staff have visited the schools three times during this school year to model Thinking Maps in different academic content areas, collect data, conduct classroom walk-throughs, and provide feedback—depending on each state director's needs.

Camille Chapman and Concepción Molina, both math content specialists with the SECC, have been helping math teachers use Thinking Maps. John Newman, state director at Elder Middle School, describes the process: "The first time was more of a pulse check: What are you doing? How is it working? That kind of thing," says Newman about Chapman's first visit. For her second visit, Chapman brought released items from the Criterion-Referenced Competency Tests, one of Georgia's mandatory assessments, and showed teachers how Thinking Maps can help students solve math problems that appear on the test. "That sort of thing was very, very helpful," says Newman, "because she brought something in that the teachers can actually use."

Teachers at Elder Middle School are still refining their use of Thinking Maps, but they are optimistic about the program's potential. "This year we're just trying to get our foot in the door," says Leslie Mathis, a math teacher at Elder. "But next year, it will be easier to incorporate Thinking Maps from the beginning." While the project is still new, both McNeely and Mathis have seen small victories. They describe using a Double Bubble Map to compare and contrast direct and inverse variations. "That really helped [students] put it all together," says McNeely. "They could see the main differences all on one sheet of paper, instead of having their direct [variation] notes here and their inverse notes there."

Teachers are integrating Thinking Maps with other activities as well. The math department recently acquired interactive whiteboards, which have been a boon to Thinking Maps' popularity. "We did the same Double Bubble with direct and inverse [variations] on our [white]board, and the kids came up and wrote on the board," comments Mathis. Teachers who double as instructors in the afterschool program are encouraging students to use Thinking Maps during tutoring. "[We do] anything we can . . . to get their understanding even deeper than it already is with the material we are covering in class," says McNeely.

Erin McCann, a SEDL Research and Evaluation program associate, is working with the Georgia Department of Education to develop a plan for evaluating the implementation and impact of Thinking Maps. With McCann's guidance, the group has outlined short-term, intermediate, and long-term outcomes. Because the schools have just begun using Thinking Maps, current evaluation efforts are assessing the degree to which teachers and students are using them. The State Department of Education is in the process of launching an online survey for teachers, administrators, school coaches, and state directors as one of the first steps in the evaluation. In August, McCann will help the department develop a plan for evaluating the impact of Thinking Maps. The evaluation will assess long-term outcomes, including improvement in students' classroom grades and standardized test performance. It will also look at whether there has been a long-term change in the culture of each school, with staff and students using the common verbal and visual languages supported by Thinking Maps.

A Plan for Lasting Improvement

Newman hopes that Thinking Maps and the other strategies Elder has adopted will have both short- and long-term benefits. If Elder meets academic benchmarks for the second year in a row, the school will leave Needs Improvement status. Newman will then move on to work with other schools. He expects the strategies adopted at Elder to outlast him, though. "Building capacity is exactly what we try to do," says Newman of the state directors' work. "We bring in initiatives and show them working, like Thinking Maps, monitoring student attendance, student data on testing, formative and summative assessment. All of these strategies should become part of the environment by the time I leave."

Last year, students at Elder Middle School surpassed the math achievement benchmarks set for the state assessment. As this school year draws to a close, staff have high expectations. It is too early to know if they have met academic goals, but they have enjoyed small successes and adopted strategies—such as Thinking Maps—that they hope will bring about long-term improvement.

Laura Shankland is a communications associate at SEDL and the editor of SEDL Letter. *You may contact her at laura.shankland@sedl.org.*

Technology Training in Ysleta

SEDL's Researcher-Practitioner Relationships Pay Off

"SEDL helped us focus on what was important and helped us determine what areas we needed to do more work in. They gave us feedback in different ways: face to face, talking to people who were involved. . . . SEDL let us know if [training participants] were really getting it, if the training was purposeful and made a difference at their campus."

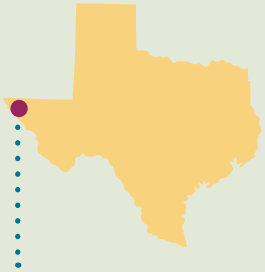
— Shelly Smallwood, Coordinator for Instructional Technology at Ysleta Independent School District

By Cheryl Harris

Since 2003, SEDL's Research and Evaluation work group has provided evaluation services for several technology projects at Ysleta Independent School District (ISD) in El Paso, Texas. With SEDL's assistance, Ysleta ISD has made great progress in integrating technology into instruction and administrative work. Teachers are now employing technology to enhance project-based learning, build Web-based networks, involve parents and community, and ensure that students have the skills to meet the challenges of a technology-based society.

As a SEDL evaluator, I worked closely with Ysleta ISD on two key projects: the Teaching Constructivism and Technology Integration (TCATI) project and the Integrating Technology, Leadership, Administration and Knowledge (iTALK) project. Both have helped Ysleta ISD's Division of Academics Instructional Technology (IT) meet its goal of improving student achievement by integrating technology within the regular curriculum at every level across the district. Through the implementation and evaluation of these projects, SEDL and Ysleta IT staff also discovered the value of an extended collaboration between researchers and practitioners.

Snapshot of Ysleta ISD



Ysleta ISD
El Paso, Texas

Established in the 1930s, Ysleta ISD is the second-largest school district in El Paso, Texas. The district has more than 3,000 teachers at 62 campuses that serve some 45,000 students. The student population is 92% Hispanic, 5% Anglo, and 2% African American, and 81% of all students are economically disadvantaged. As early as the 1990s, Ysleta operated at minimum achievement levels. But after launching significant improvement efforts, Ysleta became the first urban district in Texas to be a Recognized District for student performance on the state assessment. Today, half of the district's campuses are exemplary or recognized.

Teaching Constructivism and Technology Integration Project

Ysleta ISD first contacted SEDL when it began the TCATI project, funded by a Texas Education Agency (TEA) Technology Applications Readiness Grant for Empowering Texans. During the 3-year project, Ysleta IT staff aimed to improve technology integration at the campus level. The ultimate goal was to improve student achievement by enhancing students' ability to use technology to learn academic content. The TCATI project initially involved 150 teachers from 10 Ysleta elementary schools. SEDL technology experts modeled the Active Learning With Technology (ALT) program, a series of field-tested learning modules that help teachers effectively incorporate technology into classroom instruction. By the end of the project, Ysleta IT staff had provided professional development in curriculum integration, Web publishing, and multimedia to three-person teams of first- through sixth-grade teachers from most of the district's elementary schools.

Professional development was not limited to technology, however. True to the project's name, teachers also learned how to base technology activities in constructivist principles—the idea that students generate knowledge based on prior experiences. For example, teachers might facilitate collaborative, problem-solving projects like using computers, digital cameras, and presentation

software to research and create an electronic presentation about their community.

Evaluation was a key component of the project. SEDL's Research and Evaluation work group collaborated with Ysleta IT staff to develop an evaluation plan. We focused on both formative evaluation—through assessments occurring throughout the project—and summative evaluation—with an assessment of the project's impact once it was completed. We also determined which evaluation activities would be conducted by SEDL and which ones SEDL would complete in cooperation with Ysleta IT staff. The evaluation plan included identification of evaluation questions; specification of evaluation audiences; identification of data sources and methods used to collect data; and a timeline of evaluation activities including surveys, focus groups, and interviews.

One of the challenges of a smaller, district-level evaluation is that sufficient resources are not always available to pursue every question of interest. Instead, the evaluator must focus on the essential aspects of the evaluation. The TCATI evaluation plan prioritized the ALT professional development sessions to gather information about teachers' perceptions of their ability to use technology in instruction and to support students. Evaluation questions focused on the following: to what extent were TCATI project activities implemented as planned; did participants find the ALT workshop activities to be helpful; and did participants practice and learn to use the recommended instructional strategies?

Data were collected from surveys distributed at the end of the professional development sessions and from a general survey administered at the end of the first project year. We used the data to provide formative information to project staff about participants' perceptions of the professional development activities, technology resources, and support. This information provided ongoing feedback for making adjustments to improve the project as needed. In the second and third years of the project, we also conducted interviews with a sample of teachers to obtain information about their successes and challenges using the knowledge and skills they had acquired through the TCATI project. The evaluator included results of these interviews in the summative project reports.

The data collected during the TCATI project consistently showed that teachers perceived the professional development to be of high quality and useful in helping them plan, prepare, and implement standards-based lessons using technology in a student-centered learning environment. Similarly, Ysleta IT staff thought the entire project benefited from SEDL's evaluation. "You get a better product at the end . . . out of the feedback," says Micha Villareal, director of instructional technology at Ysleta ISD. "The informal feedback, along with the formal feedback, has been good."

Integrating Technology, Leadership, Administration and Knowledge Project

Whereas the TCATI project focused professional development on integrating technology into instruction, the iTALK project provided district and school leaders with professional development for using technology in their everyday work and for supporting the use of technology across the curriculum. Funded by a Schools, Teachers, Administrators and Regions (STAR) grant from the TEA, the project lasted from 2007 to 2009 and made new hardware and software available to district professional development staff, principals, assistant principals, counselors, and instructional specialists. Ysleta IT staff provided technology professional development to the staff that received the equipment. The project also used teams of leaders and teachers at each of the then 61 campuses to build campus-level capacity for technology professional development.

SEDL Research and Evaluation staff again consulted with the Ysleta IT department on the project evaluation. The team collaboratively developed an evaluation plan to obtain information that would address the most critical questions for documenting progress toward the project objectives. We used a variety of methods to collect evaluation data from multiple sources, such as workshop surveys, observations of professional development sessions, and interviews or focus groups with project participants. As consultants on the project, SEDL evaluators reviewed data that the Ysleta IT staff collected from end-of-session surveys and provided guidance for collecting additional project data that would be useful for interim and annual summative project reports. We scheduled regular phone calls with the Ysleta IT staff to discuss project events, share evaluation data and results, and plan data collection opportunities. In addition to keeping each other updated on the progress of the evaluation, these monthly conversations gave the SEDL and Ysleta IT staff ongoing opportunities for reflection and input on project activities.

The Advantages of Formative Evaluation

While small evaluation projects bring unique challenges, they also offer many benefits. One of these is the opportunity for the evaluator to work closely with program staff—asking questions, providing insights, and reflecting with staff about how to make small adjustments to their project. Ysleta ISD's experienced IT staff learned from our formative evaluations that their technology sessions already had many of the characteristics of high-quality professional development.

During the TCATI project, for example, we observed sessions where participants engaged in hands-on learning experiences that integrated technology. Teachers also reported that they appreciated opportunities to work in small groups, ask questions, and get actual experience with projects they could use in their own classrooms. We noticed, however, that not many of the teachers were making connections with the constructivist principles that served as the basis of the technology-integration activities. After providing this feedback to the IT staff, we later observed that trainers were more direct in leading teachers to identify the constructivist principles that were inherent in the technology activities.

Ysleta IT staff also found formative data useful during the iTALK project. After observing an iTALK professional development session and conducting several focus group discussions with project participants over a 2-day period, we met with Ysleta IT staff to discuss our preliminary findings. We provided a general overview of what the data indicated about project strengths. For example, iTalk participants reported that the project was a good fit with district and individual goals for technology use. The participants also appreciated the grant's scope, which included administrators, counselors, and professional development specialists across the district in the initiative. In addition, they thought they could share a common language, get ideas from each other, and help one another because everyone was involved and knowledgeable.

We were also able to give IT staff feedback on participants' challenges in achieving project goals. For example, some participants mentioned that iTALK professional development sessions were sometimes a lot to digest at one time and found it difficult to keep up with the instructor. "Sometimes it's just too much, too fast," explained one participant. In response, we worked with the IT staff to brainstorm ways of making sure that participants with different levels of experience would have their needs met at the same professional development session.

As part of the TCATI project, Ysleta ISD staff attended professional development where they learned to use new computers and software. SEDL evaluators helped Ysleta IT staff identify and meet project goals.

During the two projects, Ysleta IT staff said they appreciated working with SEDL evaluators because of the perspective that outside observers brought to the projects. "SEDL was able to provide an external perspective based on best practices to improve processes, improve services, and thus . . . what students get in the classroom," says Villarreal.

Ysleta IT staff continue to envision ways to broaden the impact of integrative technology practices across their region. They recently invited SEDL to join with them on a grant proposal to continue the lessons learned through their district-wide, grant-funded technology projects in a collaborative relationship with two neighboring school districts. Although that project has yet to be funded, the IT staff continue to look for innovative ways to help administrators, teachers, and campus personnel maximize the use of technology to enhance student learning and achievement.

Currently, SEDL is working with Ysleta ISD to evaluate the Ysleta Virtual School project, a TEA Vision 2020 Cycle 2 grant that involves developing virtual learning courses, teacher professional development for virtual courses, and student online learning support.

Cheryl Harris, PhD, is a program associate with SEDL's Research and Evaluation work group. She has led SEDL's evaluation work on Ysleta ISD's technology projects. You may contact her at cheryl.harris@sedl.org.

On the Road *With Technology*

By Danny Martinez and Joni Wackwitz

The roads are lonely. The land stretches out for miles on end, some of it flat and open, some high desert broken only by occasional peaks. The towns are small and isolated—separated by vast ranches and reservations. In this remote, rural region of western New Mexico, students and teachers travel great distances to reach the nearest school. But with SEDL's help, four districts in the region are using technology to connect schools and students to each other and the larger world through the New Mexico Rural Partnership for Technology.

A Road Map for Using Technology

Students at Magdalena Elementary School, one of the schools participating in the New Mexico Rural Partnership for Technology

The partnership aims to integrate technology into instruction to build students' 21st century skills, with a focus on literacy. Using technology in classroom instruction can help boost student achievement in core content areas like reading, writing, math, and science. The benefits are not limited to academics, however. Through the use of technology, students are likely to improve problem-solving skills and enjoy higher motivation and a better attitude about learning (Waddoups, 2004).

SEDL has been providing professional development and follow-up technical assistance to help teachers understand the role of technology and use it effectively in the classroom. The results are already evident, with students using technology for self-expression, problem solving, and even world exploration.

Telling Stories

One of the first professional development sessions that SEDL staff provided to teachers was on digital slide shows. Teachers learned to use applications like Microsoft® Photo Story, which enables users to create customized slideshows with digital photos. After mastering the software, teachers learned how to use digital slideshows to support literacy and writing in a creative, project-based way. Most teachers found that they could quickly and easily learn the application.

By starting off with a simple activity, teachers and students enjoyed a quick win that built confidence and encouraged them to find additional ways to incorporate technology. Students are now taking pictures with digital cameras, writing and narrating stories, and then putting slides in order to tell their stories. Because many of the students are English language learners, digital slide shows provide an effective and engaging way for them to improve their communication skills.

Traveling the World

Virtual field trips were the focus of another professional development session. In rural New Mexico, students travel up to 70 miles one way to attend school. Activities like online trips to museums in Paris can reduce isolation, open the world to students, and help them understand their place in it. Using videoconferencing technology, SEDL staff conducted the session remotely, from SEDL headquarters in Austin, Texas, while teachers participated at their individual school sites.

During the session, teachers visited a series of Web sites that provide virtual field trips. Excursions ranged from clicking through the hallways of the Louvre to using videoconferencing capabilities to interact with others. Jim Sauer, a teacher at Magdalena Elementary, and his fifth-grade students participated in a virtual field trip with NASA on aerodynamics. They joined students from across the country as experts in Florida provided an online demonstration and then answered questions. "My kids did not know where Florida was before this—

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and now they [are] interacting with other kids who live in Florida," says Sauer. "This gave them a real sense of where they are geographically."

Solving Problems

Some of SEDL's professional development sessions showed teachers how to use technology more effectively. Teachers at Quemado Independent School District, one of the participating districts, already had access to interactive whiteboards. These tools can be used for a variety of instructional activities: displaying Web sites, running educational software, or giving multimedia presentations. Moreover, they can be connected to a projector, allowing students to use them for group activities and to improve language and presentation skills.

Teachers were unsure how to integrate the interactive whiteboards into their lessons, however; so SEDL provided professional development showing them ways to use the equipment. "I don't even know what I would do now without them—my camera, my projector, my whiteboard," says Tracy Williams, a Quemado teacher. "There are so many things I can do with them that keep the kids interested."

Support for Going the Distance

SEDL staff are now focusing on providing follow-up technical assistance. They have visited teachers in their classrooms, answered questions, and helped them find resources and troubleshoot problems. They have also provided guidance on additional ways to integrate technology beyond what was provided during formal professional development sessions.

One of these follow-up sessions was billed as, "Bring me your problems, and we'll find a solution." For example, one teacher said she had a cart full of AlphaSmarts, portable word-processing devices similar to laptops, that had been sitting in her classroom for several years. No one at the school knew how to use them. SEDL staff helped the teacher get the AlphaSmarts working and then taught her how to use them to enhance teaching and learning. The teacher now provides a setting where each student can use a device to write stories and then, using wireless technology, send the stories to a classroom printer. With SEDL's support, the teacher learned a new way to integrate technology to improve students' literacy skills.

The four districts, by partnering with one another and with SEDL, are investing in technology tools and professional development to ensure that students, though isolated in rural areas, learn the skills they need for the 21st century. Teachers and students in the districts are proud of what they have accomplished. Several schools are planning technology nights for parents and the community to spotlight students' work. And the districts are already planning future technology projects.

In western New Mexico, the roads may be lonely and the schools may be isolated, but educators and students are now connected to people, places, and information from around the world. They still have a distance to go, but the districts in the partnership have come a long way in using technology to improve students' literacy skills and understanding of the world.

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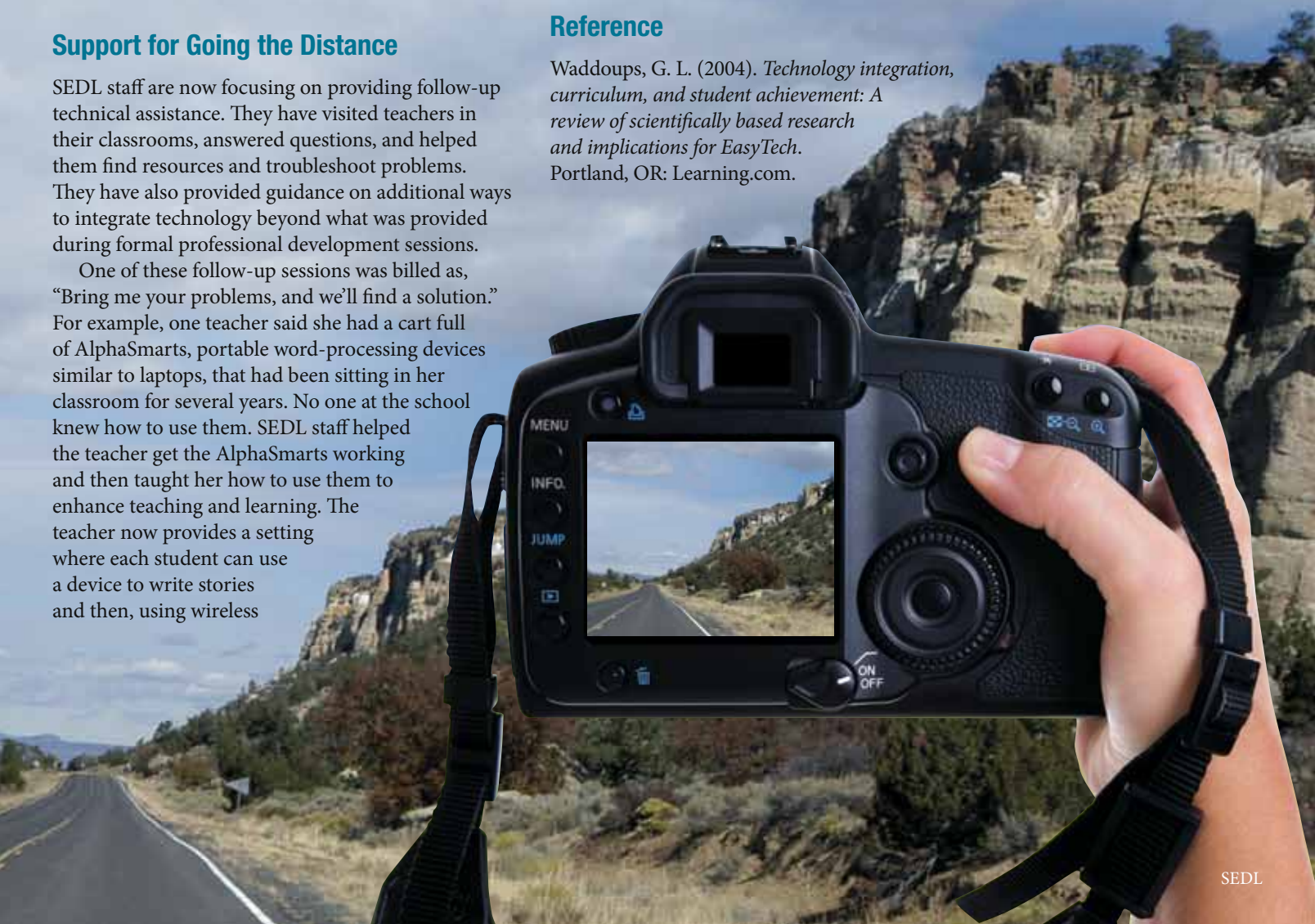
Reference

Waddoups, G. L. (2004). *Technology integration, curriculum, and student achievement: A review of scientifically based research and implications for EasyTech*. Portland, OR: Learning.com.



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MyMoon

Engaging a New Generation in Lunar Science and Exploration

By Andy Shaner and Stephanie Shipp

Visit the MyMoon Web site, and you'll find a hip, downtown scene from your favorite city. Instead of links, visitors click on posters that plaster the outside wall of a building. These posters advertise the site's interactive exhibits, contests, polls, and semimonthly webcasts. A squirrel, perched on a power line next to the building, calls to visitors. People are encouraged to share their experiences and ideas. "If you find MyMoon too graphically gritty for your taste," explains the About section on the site, "or get annoyed by its über-schizophrenic navigation or snarky tone, well, you just may be too old!" If the graphics, content, and tone haven't already made it clear, the developers of MyMoon want to interest GenY in lunar exploration.

A New Moon

MyMoon was created by the Lunar and Planetary Institute (LPI), part of the Universities Space Research Association, in collaboration with SEDL's Research and Evaluation work group. The project is funded by NASA's Science Mission Directorate and has three objectives: (1) develop a dynamic, social media learning portal that will engage the general public in lunar science and exploration, with a focus on adults ages 18 to 35; (2) host a growing audience of lunar enthusiasts that becomes involved in NASA's lunar exploration by sharing their ideas about lunar topics, creating their own materials, and participating in events and experiences; and (3) create a model for online engagement of audiences ages 18 to 35 and provide detailed evaluation data about best practices and strategies for success.

Why this approach? For years, NASA and other science organizations and agencies have successfully informed the American public about science and space exploration activities through traditional mass media. However, adults 18–35 years old, known as GenY or the net-generation, do not get their news and information from these traditional outlets. Not surprisingly, a study conducted by Dittmar & Associates of Houston, Texas, found that GenY is largely not accessed by or accessing NASA. They believe that this is due in large part to an absence of social media and communication styles that appeal to this age group. NASA increasingly recognizes the value of social media and is embracing its use in communicating the excitement of its science and exploration. The MyMoon site is a test case for this new style of connecting with an audience.

Not Your Father's NASA Web Site

Both MyMoon's site and content differ from that of a typical NASA Web site. Instead of providing detailed updates on lunar science and exploration, MyMoon focuses on "big picture" news items and encourages conversations about the Moon. Interactive exhibits allow visitors to explore Galileo's office desk, complete with postcards from Rome, or learn that not every culture sees the "Man in the Moon." (Some see a frog.) Another exhibit highlights the history of lunar exploration. Semimonthly webcasts allow participants to interact with lunar scientists, authors, and artists. For example, Amanda Stiles of Google Lunar X PRIZE recently presented a webcast on the $30 million international competition to safely land a robot on the Moon's surface. MyMoon staff share their opinions on lunar-related topics on the Web site's blog, "The Rover." Visitors are invited to join the conversation and leave comments on the blog. To draw visitors back to the site, new contests, polls, and blog postings appear regularly.

MyMoon also strives to engage—and involve—the GenY audience through the social networking platforms Twitter, Facebook, Flickr, and YouTube. Are you addicted to Twitter and Facebook? You can follow MyMoon on Twitter and join its Facebook group. MyMoon uses both social networking sites primarily as a way to inform followers and friends about upcoming events, contests, and new additions to the Web site. Tweets also provide lunar science and exploration news and sometimes just a random thought: "*Platypus* is a funny word." On Flickr, you can join MyMoon's group, Lunr. The Lunr group page includes lunar-related images and artwork submitted by MyMoon community members. To date, two contests have been held through Lunr. Most recently, users were asked to submit Moon or Apollo images that had been rendered in the style of Andy Warhol. MyMoon's YouTube channel, MyMoonLPI, is home to lunar-related videos. With time, LPI hopes to populate this channel with its own videos as well as those created by members of the MyMoon community.

http://mymoon.lpi.usra.edu

MyMoon is an experimental, evolving, participatory portal for engaging 18- to 35-year-olds in a conversation about all things lunar. We encourage you to visit MyMoon at http://mymoon.lpi.usra.edu—and while you are at it, why not tell your 18- to 35-year-old friends about it?

Help From SEDL

SEDL is providing evaluation support for the MyMoon Web site. So far, staff have hosted a series of focus groups with GenY members to assess their lunar interests, Web design preferences, and motivations for visiting the site. The current MyMoon community is composed largely of individuals older than the target audience—more the "Apollo generation" that remembers the lunar landing. More evaluation and changes are planned to better target the intended 18- to 35-year-old demographic, and SEDL will also host additional focus groups. The results will enable the MyMoon team to more effectively direct its marketing

Throughout the project, SEDL will continue to analyze data collected from visitor feedback on the MyMoon site and hold focus groups in Houston and Austin. The evaluators will focus on drawing a representative cross section of 18- to 35-year olds based on gender and ethnicity, including both "space enthusiasts" and "space and lunar science neutral" members. Ultimately, SEDL will help provide NASA with strategies for successfully connecting with the elusive GenY audience—and maybe even future audiences.

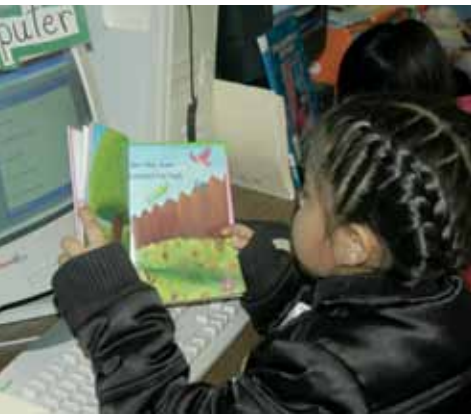
Andy Shaner is an education specialist at the Lunar and Planetary Institute. He leads the MyMoon team and is responsible for coordinating the site content. You may reach Andy at shaner@lpi.usra.edu.

Stephanie Shipp leads the Education and Public Outreach team at the Lunar and Planetary Institute. An Earth scientist by training, she oversees the content of MyMoon, leaving the graphics and "spin" to the Gen Y members of the MyMoon team.

A screen shot of the MyMoon Web site

Research Update
Encouraging Girls in Math and Science

Women are attending and completing college at higher rates than ever. Despite these gains, women are still underrepresented in the fields of math and science. At the bachelor's level, women account for nearly half of the math degrees awarded and the majority of degrees awarded in health-related fields. In the areas of physics, computer science, engineering, and chemistry, women earn a much smaller percentage of degrees. As students move on to the graduate level, the percentage of women earning degrees in these fields declines even more. These disparities continue in the work force. Although women make up nearly half of the total U.S. work force, they compose only 27% of the work force in science and engineering (NSF, 2010). With the high demand for workers in math and science fields, and because these fields usually pay more than the social sciences or humanities, some researchers are focusing on why fewer women pursue degrees and professions in math and science. *Encouraging Girls in Math and Science* (Halpern et al., 2007), a practice guide released by the U.S. Department of Education's Institute of Education Sciences (IES), examines the reasons women don't pursue these fields and what educators can do to encourage them to do so.



Girls who have a strong belief in their math and science skills are more likely to choose courses and careers in these fields.

Encouraging Girls in Math and Science

The authors begin by examining assumptions about differences in men's and women's abilities in math and science, noting that "experts disagree among themselves on the degree to which women and men differ in their math- and science-related abilities" (p. 3). Concluding that women's and men's choices in areas of study and professions cannot simply be attributed to natural ability, the authors examine the influence of previous course work, ability, interests, and self-confidence in women's decisions. Their findings show that, although some gender difference among secondary course preferences exists, girls complete high school math and science courses at roughly the same rate as boys. The authors suggest, however, that high school graduation requirements may contribute to the gender parity in course completion. Studies also show that girls generally outperform boys on high school homework assignments and course grades, while young men tend to "outscore girls when tested on the same content in high-pressure situations, such as standardized tests with time limits" (pp. 4, 6). The authors assert that the difference in standardized test scores is not always reflected in college performance. For example, young women are likely to perform just as well in college math courses (p. 6).

Where consistent gender differences have emerged, the authors argue, are in students' beliefs about their abilities and their interest in math and science. They note that researchers have found that girls and women have less confidence in their abilities in math and science. In addition, from early adolescence on, girls show less interest in pursuing careers in math and science. This trend is not universal, however. Girls who have a strong belief in their math and science skills are more likely to choose courses and careers in these fields. The authors thus conclude that the key to encouraging girls to pursue these fields lies in boosting their confidence in their skills (p. 6).

Recommendations

Based on this conclusion, the authors outline five recommendations for encouraging girls and women to choose career paths in math- and science-related fields. To accompany each recommendation, the authors provide an explanation of the level of evidence that supports it. This evidence includes experiments, trends in the National Assessment of Educational Progress data, and correlation and longitudinal studies. Below is a summary of the authors' recommendations and suggestions for implementation. (For the full report, go to http://ies.ed.gov/ncee/wwc/publications/practiceguides.)

Recommendation 1: Teach students that academic abilities are expandable and improvable.
The authors encourage educators to share with their students that "math and science abilities—like all abilities—can be improved through consistent effort and learning" (p. 11). Indeed, research shows that students' positive or negative views of their capacity to improve their academic abilities can determine whether they encounter success or increased frustration. To carry out the recommendation, educators may want to share and discuss neuroscience research with students, explaining how the brain grows new synaptic connections when new material is learned and practiced. Teachers may also want to use sports analogies to illustrate how practicing free throws in basketball or serves in tennis improves an athlete's performance (pp. 11–13).

Recommendation 2: Provide prescriptive, informational feedback.
When providing prescriptive, informational feedback, teachers typically focus on strategies, effort, and the process of learning. This type of feedback, explain the authors, can often prove more effective than simply giving students a grade or test score. Providing prescriptive feedback that acknowledges learning strategies that students use and the effort they put forth can have a greater impact on how students perceive their learning abilities and, ultimately, their academic performance. Educators can provide this type of feedback by creating an environment where they treat students' mistakes as learning opportunities and where children can reflect on and correct problem-solving strategies. Teachers can also emphasize effort over innate intelligence for completing difficult tasks (pp. 15–17).

Recommendation 3: Expose girls to female role models who have succeeded in math and science.
Negative stereotypes can have a negative impact on young women when they complete tests of mathematics and spatial reasoning. At the same time, exposure to positive role models has been found to have a positive impact on young women's math performance and can help dispel negative stereotypes. To help students find positive role models, the authors suggest that teachers assign biographical readings about women scientists, mathematicians, and engineers. Educators can also draw students' attention to current achievements of women in math and science and possibly invite women or older female students to speak to classes about their experiences in these fields (pp. 19–22).

Recommendation 4: Create a classroom environment that sparks initial curiosity and fosters long-term interest in math and science.
When students are interested in a subject, including math and science, they are likely to earn better grades, take advanced courses, and ultimately select college majors in that field. By piquing students' curiosity in a specific activity or topic, teachers can begin cultivating long-term interest in a subject. To pique curiosity in math and science, the authors recommend that teachers provide word problems and science activities in contexts that are interesting to students. For example, elementary students might solve math problems to discover the location of a buried treasure. Middle school students might enjoy the challenge of figuring out how to build an effective skateboard ramp on a limited budget. Project-based learning, group work, innovative tasks, and technology are all ways to spark students' interest in math and science (pp. 23–25).

Exposure to positive role models has been found to have a positive impact on young women's math performance and can help dispel negative stereotypes.

Recommendation 5: Provide spatial skills training.
The authors cite research associating spatial skills with performance on math tests and note that practicing certain tasks can improve a person's spatial skills. Educators can help girls work on their spatial skills in the following ways: encourage young girls to play with toys that require the application of spatial knowledge; and ask students to provide answers in both words and spatial representation; and provide opportunities for specific training in spatial skills (pp. 27–29).

References

Halpern, D., Aronson, J., Reimer, N., Simpkins, S., Star, J. R., & Wentzel, K. (2007). *Encouraging girls in math and science: IES practice guide* (NCER 2007–2003). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Available from http://ies.ed.gov/ncee/wwc/publications/practiceguides/

National Science Foundation. (2010). Science and engineering labor force. In *Science and engineering indicators 2010* (p. 3-6). Retrieved from http://www.nsf.gov/statistics/seind10/pdf/c03.pdf

Connecting Kids to Mathematics, Science, and Technology

CONNECTING KIDS TO MATHEMATICS, SCIENCE, AND TECHNOLOGY

According to the National Science Foundation, underrepresented minorities made up 25% of the U.S. population but only around 10% of all scientists and engineers in business and industry in 2006 (NSF, 2009). While minority representation has increased, there is room for improvement. The place to begin is in the classroom, where students can be inspired by teachers who spark their interest in science and math, and who are comfortable with project- and inquiry-based teaching strategies.

This spring, teachers in Austin, Texas, began discovering new ways to use technology to teach their students math and science. SEDL is leading this discovery through the Connecting Kids to Mathematics, Science, and Technology project, which is funded by the Educational Foundation of America and the KDK-Harman Foundation. Specialists from SEDL are working with teachers from Austin Independent School District to pilot a professional development process for integrating math, science, and technology instruction. The project is grounded in scientifically based research, particularly that reported in the Institute of Education Sciences practice guide *Encouraging Girls in Math and Science* (see "Research Update" on page 12.)

Forty teachers from the participating schools—Norman Elementary, Overton Elementary, Garcia Middle School, and the Ann Richards School for Young Women Leaders—are taking part in the project. All of the schools are high-need, high-minority upper-elementary and middle schools. "Adolescence is often a turning point for many students," says Haidee Williams, a project director who leads science enrichment activities. "They begin opting out of math and science classes, thereby limiting education and career opportunities in these fields. With this project, we hope to keep more kids interested in math and science."

The Connecting Kids project will help teachers learn to provide rich and challenging hands-on experiences in math and science and integrate the two content areas. Professional development sessions will also show teachers how they can collaborate on planning and executing integrated math and science lessons. The collaboration will not be limited to teachers; students will have access to a protected social networking site so they can collaborate on projects and share problems and solutions. Concepción Molina, a SEDL program associate who is leading math work on the project, wants to teach a new generation of students that they can excel at—and enjoy—math. "It is imperative that students truly believe that success in mathematics is based on effort and persistence, not on ability," he explains.

The Connecting Kids project will help teachers learn to provide rich and challenging hands-on experiences in math and science.

Teachers are also learning to incorporate technology tools such as digital cameras, digital microscopes, graphing calculators, and portable GPS units to boost students' engagement and achievement. "Students bring a range of experiences to the classroom," says SEDL project director Danny Martinez, who leads the project and provides technology support. "Technology can provide a way to connect all the pieces of their education and add a new level of understanding to what they learn." As the project progresses, SEDL staff will conduct classroom visits to observe teacher practices and provide follow-up support. Once the professional development has been refined, SEDL will share it with other schools and educators working to improve student engagement in math and science.

Reference

National Science Foundation, Division of Science Resources Statistics. (2009). *Women, minorities, and persons with disabilities in science and engineering: 2009* (NSF 09-305). Retrieved from http://www.nsf.gov/statistics/wmpd/

SEDL News

Center for Professional Learning Summer Sessions

Enrollment in SEDL's Center for Professional Learning is now open. We will be offering three professional development sessions at our headquarters in Austin, Texas.

June 22–24	Adolescent Literacy: How to Access and Comprehend Text
July 26–28	Active Learning With Technology II
August 3–5	Response to Intervention in Secondary Schools

Go to www.sedl.org/cpl/calendar.html to register.

SEDL to Begin Two New Randomized Controlled Trials

Everyday Mathematics

SEDL is conducting a national, large-scale randomized controlled trial assessing the effectiveness of McGraw-Hill Education's *Everyday Mathematics,* a curriculum for students in preK through sixth grade. In partnership with other nationally recognized researchers, SEDL will conduct a rigorous study of *Everyday Mathematics* to determine whether the curriculum affects student math achievement over 3 school years. Researchers will also investigate whether the effects of the program vary significantly for particular students, schools, and districts across the United States.

Louisiana Striving Readers

In October, SEDL began a 4-year independent evaluation of the Voyager *Passport Reading Journeys* program with striving adolescent readers in Louisiana. The state was one of eight to receive a Striving Readers grant from the U.S. Department of Education through the latest competition. The Striving Readers program targets adolescents who are reading 2 or more years below grade level. In addition, the program seeks to build the research base by identifying the best strategies for increasing adolescent literacy. *Passport Reading Journeys* is a supplemental reading program developed by Voyager Expanded Learning, Inc., and now owned by Cambium Learning Group, Inc.

Under the Striving Readers grant, Louisiana will introduce *Passport Reading Journeys* to approximately 1,400 students in grades 6 and 7 in 10 middle schools across 4 districts. SEDL's study will evaluate whether students using the curriculum show greater advances in reading than students who participate in other elective course offerings. In addition, SEDL will evaluate whether the program's impact varies according to factors such as students' grade, gender, race/ethnicity, and reading level.

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