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A Time for Community

At a time when more demands are made on teachers and fewer resources are made available to them, we need to widen our perspective on how to provide the best education for our children.

Last year, I read a provocative article by David S. Seeley (author of *Education Through Partnership*, Ballinger, 1981) in *Education Week*.¹ It was about the need not for innovation, actually, but for a return to something quite old in education. We are “at the cusp of a crucial change in our basic attitude toward education,” he writes, one that will:

…make all the difference in our success: a shift from the current common assumption that education is a responsibility delegated to schools alone (the way firefighting, policing, and defense have been delegated to specialized agencies) to the concept that education must be accepted as a shared responsibility of home, school, and community.

Many—not all—parents and teachers already instinctively know this. But our institutional relationships for more than a century have moved in the opposite direction, toward bureaucratic schooling that de-emphasizes responsible roles for students, parents, and communities.

Mr. Seeley points out that holding schools solely responsible for children’s success is unfair, given that many out-of-school factors come into play; such as poverty, poor parenting, and health problems. But there is hope, and his article features some wonderful situations in which schools, parents, and communities come together with dramatic, positive results. “This particular change is one I believe our society is ready to make,” he states. We join him in that hope and offer this *Collaborating with Your Community* issue, presenting many examples of enriched and effective education across the nation.

—Heather Taylor

The Many Benefits of Community Mapping

by Jenny Mears

“T’s useless to just map the places that need attention and then not do anything!” wrote Paul, a sixth-grade student at Villa Academy, an independent Catholic school in Seattle, Washington. For weeks, he and his fellow classmates had drawn pictures, taken photos, and interviewed students, teachers, and other staff in order to map the neglected and the cherished places in his school community.

A Learning Tool

This student-centered, hands-on experience is called community mapping, a participatory, community engagement tool that gives students a way to learn about and document their physical surroundings while acquiring new skills and increasing connection to their community. People of all ages, socioeconomic, and demographic backgrounds come together to map places that are important to them. This process helps communities generate shared knowledge and identify valued and treasured places. Additionally, this type of mapping can stimulate community improvement and motivate environmental stewardship.

In the classroom, community mapping has many multidisciplinary connections to core curricula, from geography and math, as students learn to draw to scale, measure distance, and calculate area; and to communication, as students interview community members and work effectively in groups. Students use new technology and artistic skills to represent their community. Social studies can be reached through exploration of the community’s history of land and resource use. Ultimately, however, community mapping reaches across all disciplines as an inquiry-based activity that fosters problem-solving skills and experiential learning.

The Process

Community mapping can be done with a community of any size and can be modified throughout the process. Projects are often composed of several different components that teach new skills or further existing ones. Villa Academy’s community mapping project began with a discussion of how students defined community at their school, which helped broaden students’ perspectives of the people they encounter every day: teachers, fellow students, custodians, and even the chef who makes their lunches.

Students next created maps of their school from memory in order to record and signify the places most important to them, which at Villa Academy ranged from the quiet grotto ringed with trees to the overgrown trail leading to the lake. Children’s favorite places vary from child to child and are often different from what adults would choose for them; documenting these places on maps validates the child’s perspective and can be a first step in ensuring the preservation of these cherished spaces. The students themselves valued the chance to share their voices, and wrote in their evaluations:
Then, Villa Academy students took digital cameras around school grounds, photographing the places they had mapped from memory. Along the way, they looked for and documented places that were in need of attention, such as the Orchard, a former fruit and vegetable garden now choked with weeds. Using cameras as tools for documentation allowed students to understand new ways of utilizing familiar media. These images became the baseline of the current status of the school community, used both to document what should be preserved as well as to highlight that which needs attention. The Villa Academy students enjoyed the opportunity to visit their favorite places and make full use of the technology, writing on their evaluations:

- We got to show our favorite places.
- I felt like I got to participate a lot.
- We all get our opinion in.

In the next step of their mapping project, students interviewed a cross section of the school community. Their student-written questions focused on where people liked to spend their time at Villa, what their favorite places were, and what places needed attention. The experience of interviewing everyone from preschoolers to the head of the school not only broadened the focus of the final base map, but also gave the students an understanding and appreciation of perspectives other than their own. Through this process, students learned to work together as they decided whom to interview, what to ask, and how to compile the information. They also gained confidence in their interviewing skills as they modified the tone and the content of their questions to suit their audience. Their reflections on this activity included the benefit of broadening their perspectives:

- It was really fun to walk around Villa and try to take the most interesting pictures possible.
- You got to go around the Villa Campus and got to explore.
- We got to go outside and see our favorite places.

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- I thought that it was fun to see what other people thought about Villa.
- It was fun to learn what some of the teachers’ favorite spots were at Villa.
- I got to see how different grades answer our questions.

Finally, students collected all the information mapped from memory, the photographs they took of locations important to them, and the results of their interviews, and compiled them on the base map. Students used a satellite picture of their school grounds projected onto a large piece of paper as a guide to outline buildings, roads, and natural features. To make the map easy to read and visually stimulating, they used symbols, labels, and colors to represent places of importance and areas that need attention. Students hung the base map in the hall, attached their photos to the wall, and used string to connect the photos to their mapped locations.

This kind of mapping helps connect children to their environment and see themselves as part of the larger community. Villa Academy students were able to see the favorite places members of their community chose, as well as the cherished favorite places they had in common. The students enjoyed the ability to collaborate on such a large final project, as evidenced by their written evaluations:

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We all got to work on a big map of Villa. We were all involved.
It was fun to map with such a big scale.
It was fun to see the entire Villa Academy on a map and see what people’s favorite places are.
Everyone got involved and I liked how we were able to map Villa inside and out.

The Impacts

The process of collecting and compiling this information onto a large-scale map allowed students to see both problems and opportunities at their school. They saw patterns such as the possible spread of English ivy from one problem area to the nearby, much-loved Grotto. This visual identification of problems in such proximity to cherished spaces can lead to stewardship action and can help students prioritize which challenged areas receive attention. In the case of Villa Academy, the sixth-grade teacher was excited to translate his students’ findings about their favorite places and places that need attention into class projects. The teacher appreciated how the community mapping project allowed his students to “process the world and their experiences in the world” and plans to do a community mapping project with his students every year.

The Villa Academy community has expressed interest in using findings from the map to identify places for class cleanup projects, such as invasive species removal and planting of native plants. This will improve and advance their connection to and affinity for their school community. They write:

- I love Villa and I want to make it a better place.
- I would feel sicker if I was a part of our school.
- Everywhere needs to be cleaned up in this world.
- There are places I like that need attention.
- I love Villa.

As final confirmation of the benefits and perspective gained through community mapping, one student remarked, “I think that we should help the community and the school by making it a better place.” This motivation through collaborative, hands-on experiential learning is a powerful result of community mapping.

Jenny Mears works in the Education Department of the Woodland Park Zoo, facilitating teacher professional development and community classes on creating backyard habitat. Jenny wrote this article as part of her coursework for Miami University’s Global Field Program, from which she graduated with her Master’s of Arts in Zoology in December 2011.

Acknowledgments

The author wishes to thank Roger Crafts and the Villa Academy sixth grade for their enthusiastic participation in and invaluable feedback on the community mapping process. The author also wishes to thank Steve Oswanski from the Toledo Zoo, Stephanie Stowell from Miami University, and Todd Paul from Warren County Career Center for their insights in revising this article.

RESOURCES


Connecting the photos they took of favorite places around their school, students add to the base map of their community.
“History,” Napoléon observed, “is the version of past events that people have decided to agree upon.” Local lore is no exception. Students are always surprised to learn that many of their childhood memories are, in fact, reconstructions of their parents’ recollections. Every community harbors anecdotal problems, many of which can be solved by even middle school students. This is especially true when answering the questions necessitates access to current technologies that can analyze and portray spatial patterns. Towns are laid out in grids, and buildings arise oriented to streets; artificial patterns are superimposed on the natural environment. Some of the most interesting puzzles are presented in our communities’ cemeteries. A touch of the unusual will intrigue anyone, as we shall see.

Uncovering a Riddle

In the fall of 2001, I introduced the study of geographic information systems (GIS) into the junior high school curriculum in an effort to create a foothold for spatial science. After assuring the seventh-grade students’ proficiency with the software, I designed a seemingly benign lesson to be delivered in a local cemetery. The city gave its permission for the fieldwork, as unaware as we were that the project would span the decade and require the assistance and cooperation of many professional entities—local, regional, national and international. As one student later remembered, “This project proved to be a riddle with many interesting twists.”

A fundamental management precept for success in field projects is to match the problem with the appropriate resources. We knew that the city had moved its cemetery in the 1890s. Was there a pattern to the reburials? The students used their first field tool—GPS units—fixing the position of the new locations of bodies exhumed from the old graveyard. It all seemed simple enough, even an adventure. “Be careful going in search of adventure,” wrote novelist William Least Heat-Moon. “It’s ridiculously easy to find.”

A pattern of graves did emerge, and its discovery garnered international recognition from ESRI, the world’s leading GIS software developer. However, every answered question generates a new query.

Inquiry Opens the Way

Asking the right questions opens doors to authentic experiences inside and outside the classroom, especially when the answers unearth a real mystery. We soon found ourselves with a new problem: What was done with the unidentified remains? An analysis of death records revealed that at least 400 people had been interred in the old cemetery. Only 128 reburials could be verified. The discrepancy was beyond the scope of the city or even GIS. The existence of an unmarked mass burial was based on hearsay, but the city was not about to let us sink a test shaft into the site to gather evidence one way or the other. New resources, new tools, and new mentors would be required. We needed to peer below the grass without disturbing it. Thus began...
our two-year partnership with the National Resources Conservation Service (NRCS), a branch of the U.S. Department of Agriculture. Working under the guidance of a technician based in Nebraska, the students conducted ground penetrating radar (GPR) surveys of the newer cemetery in July 2003 in an effort to conclusively locate the mass gravesite. The results were indisputable: No mass grave existed. Local lore was “more or less bunk,” as Henry Ford once described history set in tradition. I looked at my students; they looked at me. We asked the same question: Where were the bodies? Perhaps they were still buried in their original graves.

Strange circumstances arose within a few days of the radar surveys. When a sympathetic city official telephoned me with an offer to assist an out-of-state undertaker with an exhumation, a unique opportunity opened. It was totally inappropriate for my students, by crucial for my own understanding of what might be found in unmarked gravesites. It would turn out the bones would come to us.

The NRCS returned in October 2004, this time to the state’s oldest municipal park for work at the old cemetery site. Using a newer generation of GPR equipment, suspected sites were scanned with almost immediate results. The park contained graves, but handheld GPS units were not accurate enough for the purpose of surveying. Enter the Idaho Transportation Department, who answered our call for training with the use of a total station: an electronic theodolite (transit) integrated with an electronic distance meter (EDM) to read slope distances from the instrument to a particular point. We wanted to catalogue exactly where the graves were for future investigation without advertising their locations.

Help from Fellow Explorers

Anecdotal history can be useful at times. A conversation with a local metal detector enthusiast opened the door to extraordinary discoveries. He told me that on several occasions he had come across what seemed to be small white bones in the park. He dismissed the findings. I could not and set my students to an unusual task.

Using our GIS map of grave locations produced by the GPR, we began probing the top...
3–5 inches of soil over the sites with wire rods. In no time a fragment was unearthed. When bodies decay and the skeletons disarticulate, the bones of the hands and feet percolate upward as rainwater descends.

But was this fragment human? We would need an anatomist and found a national expert visiting a nearby university. The bone was human, the second metatarsal from a right foot. The graves were active sites.

In January, 2005, we were able to excavate in the park. The playground equipment was due for replacement, and we wanted to dig. City officials had followed our work closely and agreed to fund the services of a professional archaeologist and his graduate assistant from the University of Idaho to supervise our work.

We had wondered why the graves discovered by the GPR were so deep. When the concrete pilings for the old playground equipment were removed and the soils examined, the answer presented itself. When the park was created 110 years ago, landscape architects had imported at least a meter of topsoil, effectively burying the graves even deeper—too deep for safe exhumation.

**The Archaeological Field School**

The popularity of the archaeological work among my students moved me to design yet another layer to the project and network with even more resources. Partnering with the Idaho State Historical Society and the University of Idaho, and with the financial support of a regional pathology laboratory, I developed a field school for eight students in grades seven to ten to train them in the protocols for investigations at a pre-Columbian site, working side by side with professional archaeologists. Those skills in hand, the students could progress to the next level of investigation, in which chemical laboratory analysis would follow their fieldwork.

In June, 2008, after reading a report on the status of pioneer cemeteries in Iowa, I petitioned the city for permission to extract soil cores from the city park at points identified in 2004 as likely candidates for unmarked graves. The goal was to identify the residual effect of embalming with arsenic, a common practice during the period when the old cemetery was operational. A regional testing laboratory underwrote the fieldwork and spectroscopy analysis for the sample the students gathered from the cores. One sample produced outstanding results: spikes in arsenic and zinc. We had struck a zinc-lined coffin. Four months later, I drew regional foresters into the professional network with a field exercise collecting cores from mature trees at both cemetery sites. Why? Trees concentrate soil contaminants. Working under the guidance of a PhD in microbiology, high school students processed the samples using testing kits specific to arsenic contamination. Only normal background levels were found.

As these project components unfolded, work with GIS expanded to include more than 400 seventh- and eighth-grade students every term in regularly scheduled seminars featuring historical geography and life sciences, complemented by two college courses for their faculty. Three elementary schools introduced their sixth graders to GIS.

In May, 2010, an outdoor kiosk was placed in the park to commemorate the old cemetery and the work done by the students. Underwriters included fraternal organizations from two states, funeral homes, and health care facilities. Over nearly ten years of work, more than a dozen organizations volunteered their professional services or funded activities. We
never lacked for support. All I had to do was make a sound and compelling case for what we wanted to do. The ultimate beneficiaries were the students. “It is one of the few projects where I think I have done something that has significance,” noted one student. “It was the ultimate project,” said another. The first participants are now college graduates, festooned with awards from The History Channel, the Society for American Archaeology, and the American Association for State and Local History, to name but a few.

The network is still intact, awaiting yet another adventure.

Steven Branting retired in 2009 after thirty-three years as an award-winning consultant for gifted and innovative programs. He resides in Idaho. sbranting@lewiston schools.net

Archaeological field school, Red Bird Beach, Idaho

Tree coring, Normal Hill Cemetery

For nearly 30 years prior to statehood, this park served as Lewiston’s cemetery. While the exact number of burials is unknown, records indicate that more than 300 graves could be found here by 1885. The earliest burial was not recorded nor has any plot map surfaced. However, at least one source states that in 1864 the fragmentary remains of Lloyd Magruder “were decently buried in the cemetery at Lewiston.” The earliest burial associated with an extant headstone was that for Rebecca Newell in 1867. The official 1874 city survey allocated eight acres as burial grounds, and the area is still known as the “Cemetery Addition.”

Church records indicate that three distinct graveyards shared this park: City, Masonic and Jewish. The Masonic plots were located where the old Carnegie Library building now stands. The City section was found in the area where you are now standing, while the Jewish graves are thought to have been to the east, across the park road. Chinese burials took place on Prospect Avenue.

In 1879 the city council called for bids to build “a good substantial picket fence,” five feet high, with posts of good cedar at least five inches in diameter. “The whole thing shall be finished with a good coat of white wash.” However, plagued by a lack of water and ice, the cemetery fund to cover the expenses of proper upkeep, the graveyards soon became eyesores and the subject of frequent public complaints. “Gates in bad repair—cemetery frequently get in and destroy and knock down graves and the tomstones.” (Lewiston Teller)

In December 1888 the city council forbade any further interments within the city limits and permanently closed these burial grounds. Workmen began exhuming bodies in the Masonic graveyard in March 1889 and transferred the remains for reburyal at the then-new Normal Hill Cemetery. Exhumations continued until 1895, but the lack of proper record keeping and a paucity of grave markers prior to 1860 seriously hampered the work. Many headstones were moved without disturbing the bodies beneath them. The 5th Street Cemetery Necrogeographical Study (2001-2009) reported substantial historical and scientific evidence that as many as 200 people still be buried in Pioneer Park.

Underwriters:

Photo sources:
Andrews Collection, Nze Posse Masonic Lodge No. 19 A.F. & A.M.

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Connect • PAGE 7
Let’s Go Outside…
and Learn Science!

by Regina Barrier

Can’t you just hear your mother saying, “Go outside and play”? Now, we ask that students go outside and learn more about their environment. Science is the study of the world. So why not use the world around you to teach science content? Do you want to make sure your students realize the connection between the curriculum and the real world? Are you ready to start teaching through content application and merge your classroom with the world outside the school doors using your community as a learning laboratory?

Geocaching

Just imagine outdoor science classrooms, community parks, and school campuses in which students regularly use technology to collect and analyze data in the environment while learning science. The Science House, an outreach program of the College of Physical and Mathematical Sciences (PAMS) at North Carolina State University, is working to achieve such a vision. Outreach Coordinators from The Science House in six offices across North Carolina work closely with local schools and communities to involve students in STEM (Science, Technology, Engineering, and Mathematics) opportunities and research. Through a series of professional development opportunities, Michelle Benigno and I, working as Outreach Coordinators for The Science House, train k–12 science and math teachers in the use of geocaching, hand-held data collection technologies, and inquiry-based pedagogy to teach science content.

Geocaching is a form of treasure hunting in which participants find hidden containers (caches) filled with “treasure” at particular GPS coordinates. A geocaching enthusiast herself, Michelle Benigno saw an opportunity to use this exciting hobby as a means of teaching or reinforcing science and math curricula. The obvious concepts of direction, mapping, Cartesian coordinates, longitude, latitude, and parallel and perpendicular lines can be explored, but the environment itself can also be used as a teaching tool. Rather than “treasure,” caches contain science questions or activities to be conducted at particular coordinates. Caches hidden at strategic points in the environment allow students to investigate and interact directly with science concepts. Teachers provide students with coordinates for an invasive species scavenger hunt; key caches to identify trees, leaves, rocks, or minerals; or question caches near geologic formations, chemical processes, pollution sources, or areas of erosion and deposition. GPS sensors are also used to determine area and calculate runoff from impervious surfaces or determine the speed of a car from its skid marks. By working with real tools in the real world, students see the relevance and application of science concepts.

Gathering Data

Students can use hand-held data collection technologies, such as Vernier LabQuests and sensors, to collect and analyze data around the school or community. Long-term inves-
tigations involve temperature, light, UVA/UVB, anemometers, relative humidity, and barometric pressure sensors. Students monitor air quality at schools throughout the community to study microclimates or collect water quality data at particular sites along a stream to determine point and non-point sources of water pollution. After they import data into Vernier’s LoggerPro software, a Google map depicting a satellite view of the area displays testing sites as well as the data they have collected at each site. The availability of the satellite view of the area in conjunction with data allows students to explore aspects of the environment they may have missed while they were outside. For example, if a student tests water temperature along a stream and finds that the temperature at a particular site is several degrees higher than sites upstream, the map may reveal a source of pollution such as stormwater runoff from a nearby parking lot that could not be seen from the actual testing site. This mapping technology serves as a valuable tool as students across Caldwell and Burke counties test water quality along sites in the Catawba River basin to evaluate the effectiveness of the area’s local stormwater management plan. Teachers and students develop a better understanding of the interconnectedness of our environmental resources as they share data through such collaborative projects.

Discoveries on Campus

In a short-term investigation, I directed students to find the hottest or coldest spot on campus. They collected temperature and light reflectivity data on various surfaces such as asphalt, concrete, grass, or mulch. After analyzing the data on the map, students “discovered” the relationship between the amount of light reflected from or absorbed by a surface and its resulting temperature. In setting up a solar panel on the school campus for experimentation, students used a light sensor to determine a location near the ground for easy access that received maximum sunlight for an extended time. In building a small wind turbine to harness wind energy, students measured wind speed with an anemometer throughout the day at various sites to determine the best location.

A student can use the LabQuest GPS sensor to collect distance, velocity, and acceleration data as he or she rides a bicycle around campus, tests a soapbox derby car, or rides a roller coaster at the amusement park. Students can investigate how speed bumps in the school driveways change speed. Provided the speed bump is on an incline, a LabQuest and GPS sensor can be strapped to the top of a skateboard that rolls down the road and over the speed bump. Different speeds are investigated by altering the starting point of the skateboard. The higher the point of release, the higher the speed of the skateboard when it reaches the speed bump.

Data may also be collected using indirect methods such as video analysis. When sensors cannot be used directly, students may use digital cameras and analyze videos with Vernier’s LoggerPro software. For example, motion in two dimensions such as tossing a basketball into a goal, or side-to-side motion, such as a car traveling on the highway, cannot be measured directly with motion sensors. However, distance, velocity, and acceleration can be determined from the video of a passing car, flying bird, or a rocket launch.

National Science Education Standards stress the importance of inquiry-based pedagogy in the science classroom. “Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world.”

When teachers enroll in the series of workshops offered with The Science House’s S3 model (Sustained STEM Support), they receive many learning opportunities to enhance their content knowledge and inquiry skills. After each session of the yearlong model, teachers practice these skills in the classroom, then meet to share successes and identify stumbling blocks.

Inquiry isn’t always an easy strategy to implement in the classroom because in many cases, students are accustomed to being told what to do. With inquiry-based learning, students have more freedom to develop their own investigations. However, they must also utilize critical-thinking skills to be successful in developing procedures or analyzing results. A National Research Council report entitled “How People Learn” (Bransford et al., 1999) details the close relationship between inquiry-based pedagogy and increased student learning. Providing experiential learning opportunities for students to interact with their environment, collect and analyze data, and communicate their findings enhances process skills and leads to a deeper understanding of the content.

The Science House programs link the research university to the needs of k–12 education and have a tremendous impact on the community. Teachers become more effective in their teaching of science concepts through inquiry-based strategies. They also become more efficient through the use of data-collection technology. Investigations that took hours can be done in minutes, leaving more time for data analysis. Students learn to investigate and analyze the world through technology. Analyzing and understanding their own data is more interesting than using data from a textbook. Students are engaged in the learning process and are able to conduct further investigations quickly when questions arise. Stewardship practices are enhanced as students collect and map data over time revealing changes in the environment caused by human or natural forces.

Parents often receive both technology education and a better understanding of science concepts from their children. By educating students, we can also help parents understand the benefits of new technologies. The Community desires a world-class education system in which teachers assist students in developing technology, critical-thinking, problem-solving, collaboration, and communication skills necessary for a productive labor force. As students share their data with local governments and other organizations, they see the value of their work and may just find an exciting STEM career!

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RESOURCES
Geocaching: Visit this site for program descriptions, merchandise and tools, and a forum for sharing.
Vernier: This site includes the Vernier catalog, activities and programs, and support.
Historical Forensics
WHERE HISTORY, SCIENCE, AND COMMUNITY INTERSECT

by Jennifer Manwell

“What is it?”
“How does it work?”

This winter, I investigated technology with middle schoolers at Putney Central School in Vermont. This was not just any technology, but the cutting edge of technology: nineteenth-century innovations. Two days a week, I joined Connie Bresnahan in her classroom and we traveled back in time to nineteenth-century Putney.

The students lived dual lives. Within a simulation that I created as part of a Historical Forensics curriculum, the students each adopted a nineteenth-century persona who lived in a representational town. The students, working in small groups, were each assigned a local family from 1850 and 1860 census records. Each group created a backstory for their family using the information they gathered from the census. Then each student chose one particular family member to represent.

While creating a historical fiction narrative, students also worked within the nonfiction world as present-day historical forensic scientists whose mission it was to piece together clues from primary sources and artifacts to better understand what life was like for their historical alter egos. In our classes, we spent time poring over inventories (catalogue of every item in a deceased person’s estate), census information, letters, advertisements, books on farming, images from the Library of Congress, and photographs of artifacts from Billings Farm & Museum and The Henry Sheldon Museum.

Household Tools Reveal Nineteenth-Century Details

What can be learned about a nineteenth-century family based on the tools they owned?
How were the tools used? How have farming and household tools changed over time?
What effects did these changes have on rural New Englanders? As we proceeded with this unit, the students came to realize and appreciate the huge changes that took place in that era and the stream of resulting innovations.

We started the inquiry-based Historical Forensics unit by analyzing inventories. As we tried to decode the spidery handwriting of the time and translate names of objects into images and functions that we could understand, a gallery of actual artifacts took over the classroom. First was a niddy noddy I had borrowed from an octogenarian friend. Intended as a hook to pique the students’ curiosity, the unfamiliar tool did just that. Two boys were particularly intrigued. They kept asking probing questions to gather clues about the possible uses of the mystery tool. Having successfully figured out the function of the tool, they proudly announced their discovery to the class. Little did they know, they had just modeled for their peers the value of the inquiry process and how their own curiosity drew them to collect, analyze, and synthesize clues until they had created a new understanding.

This led to two wonderful outcomes. Discovering that a niddy noddy offered a way to make skeins of yarn led us backwards into an investigation of spinning and spinning wheels. This gave a new meaning to the inventory items: “large wheel” and “small wheel.” Additionally, once hooked, the “niddy noddy boys” continued the circle by bringing in artifacts of their own to share: horseshoes of various sizes. This inspired another student to bring in a horseshoe that had been used during winter.
ice harvests. Next, ice tongs, used for harvesting huge blocks of ice, were added to the collection as was a photograph of an icebox.

The very nature of inquiry learning transforms learning away from a linear, top-down approach confined to the classroom into a student-centered approach that draws upon the experiences of a larger community. The children were intrigued by all these gadgets and were asking their parents and grandparents about tools. The family members, in turn, were eager to share their ancestral stories. Several of them directly thanked Connie for offering this type of learning experience to their children.

As our artifacts gallery grew; so did the stories that children were hearing and sharing from their families about their local community. One of the “niddy noddy boys” discovered that his great-grandfather had been an iceman in Putney!

**Simple Machines**

There was clearly an interest in ice. Using a set of Ice Harvesting Tool Cards designed by *Historical Forensics* co-creator Beth White from photographs taken at the Billings Farm & Museum and from photographs archived at the Library of Congress, the middle schoolers investigated the process of harvesting ice. The first step was for the students to analyze and attempt to sequence the cards within small groups. Luckily we had an expert in our midst. One of the students had helped with the ice harvest on Squam Lake and had reaped the benefits during the summer when large blocks of ice were delivered to his cabin to preserve his family’s food. Next, we used an ELMO document camera to project the sequenced images and discuss them as a whole group. We marveled at the simplicity of using spiked shoes for both men and horses to provide traction on the ice and revisited our own spiked horseshoe in our artifacts gallery. We noticed that the vast number of ice tools could be boiled down to a collection of simple machines including levers, pulleys, inclined planes, screws, and wheels. Ice harvesting was a community event, requiring a carefully choreographed sequence of events. While it was a well-paid job, it was also very dangerous! The workers had to know, inside and out, the physics of working with ice and they had to use the tools to their fullest potential.

We then launched into investigations of storing ice in icehouses and insulating it with hay and sawdust. The innovation of the railroad, and later insulated railroad cars, were used to ship ice to cities, thus changing a community resource into a cash crop. As historical forensic scientists, we had collected artifacts and stories maintained by modern day community members to better understand daily life for our nineteenth-century villagers.

Beth White and I have been creating *Historical Forensics: Investigating Untold Stories from Nineteenth-Century New England Through Primary Sources* (largely supported by a grant from the Library of Congress) as a three-tiered project incorporating à la carte activities, a simulation, and five different sets of tool cards. Our goal is to make American history personal, taking it beyond the generic distilled lists of dates and names of famous white men that all too often dominate history books. We want children to see how their own families, neighbors, and communities were important parts of history and therefore that they themselves will be important players in the future.
The students were fascinated to learn firsthand from the 1860 Putney census that their town was home to African Americans as well as people who had moved from Ireland, Canada, Scotland, Georgia, Illinois, and California. They learned that in addition to farmers, there were also people earning a living as mill workers, railroad workers, doctors, lawyers, blacksmiths, wheelwrights, and papermakers.

Taking Apart and Building Together

Using modern day media literacy techniques, we deconstructed advertisements from the 1860s. The students were curious about this rise of advertising and, along with it, the shift for many rural families from making and trading for just what was needed to purchasing what was wanted. Through a historical lens, the students learned about technological innovations that directly impacted their town: changes in power (water, steam, coal, natural gas, electricity), changes in transportation (trains and canals), and changes in household tools (clothes washers, cast iron cookstoves, portable sawmills, and sewing machines).

The day after discussing the New Home sewing machine, a student came to class with photographs he had taken of an old sewing machine that had been serving as a table for his fish tank. He had evicted the fish (and their tank) to get a better look at the sewing machine. He described to us how the machine was foot-powered with a pulley that engaged gears in the machine and ultimately set the needle in motion.

To pull all these ideas together, each student created a narrative from his or her nineteenth-century character’s point of view. The goal was for students to synthesize the knowledge they had gained by analyzing multiple primary sources and then to piece together all the clues to tell the story of a nineteenth-century community. They used Google Docs as their writing platform to share their stories with classmates. Through a peer review process, they took advantage of their learning community by sharing affirmations and suggestions as a means for improving their writing. Thanks to the modern innovation of “cloud” computing, students could openly share online the challenges and successes of their nineteenth-century community and its inhabitants: a marriage of technology, history, and community.

Students tend to think of technology as the culmination of electrical gadgets they have at their fingertips. However, through their nineteenth-century personas, they experienced a broader view of technology as creative innovations that solved real-life community problems.

Jennifer Manwell has taught for many years in multi-aged classrooms using inquiry-based strategies. She is co-creating a history curriculum, Historical Forensics: Investigating Untold Stories from 19th Century New England through Primary Sources. The project is sponsored in part by the Library of Congress Teaching with Primary Sources Eastern Region Program, coordinated by Waynesburg University. Jennifer lives, teaches, and researches in Hanover, New Hampshire.
Technology for Learning

Mapping Community History

by BOB COULTER

Technology opens many ways to enhance connections with your local community. Video recording devices can capture stories from community elders or interviews with local environmental experts. Websites like YouTube allow sharing of your students’ perspectives with the community and the world. For that matter, making a basic website has become so easy that students can quickly share their work and invite collaborators. In addition to these resources that allow your kids to link outwards, there are also opportunities to link backwards, forging a historical link to your community’s past. As they do so, students can build their mathematical and critical thinking skills. While this work has been possible for a while with geographic information system (GIS) software, the increasing capacity of Web-based tools allows online mapping of how your community has changed. Even better, these maps can be converted quickly into slide shows for easy sharing with parents and other community members.

Starting with the Census

To start, navigate to the Social Explorer website, managed by Queens College and the City University of New York. While you can subscribe to the site’s premium features, all of the work done here uses the “Free Edition” of the website. As of this writing (February, 2012), the default map that appears shows the population density for the United States at the level of a Census Tract (a geographic area that contains a few thousand people). Data are also available at other levels of detail (such as county-level) as far back as the first United States census in 1790. Before jumping into a historical look at your community’s past, you can use this map to assess your students’ map reading and data analysis skills. For starters, can your students identify your community on the national map? Do they understand what “population density” measures? (How is density different from a total count of the population?) It may be helpful to zoom in and study your nearest metropolitan area. Density will likely become lower as you move away from the urban core.

You can also probe students’ understanding by asking questions such as how the population density in your community compares to the rest of the United States.

After you have a handle on the kids’ geographic and mathematical skills, it’s time to get in your metaphorical time capsule and travel back into your community’s history. What your students
find to be of interest may vary. A good way to find out is just to give them time to explore and see which maps received the most attention.

**Tracking Change in Your Own Community**

One possible avenue for investigation might be the international context of your community: What is the percentage of people who are foreign-born? For any of these studies, it may be helpful to conduct some research within your school to provide some comparative data. In this case, how many of your students or their parents were born outside the United States? What percentage of the total number of people in your study would that be? A quick look at data for the St. Louis, Missouri, area shows that in 1970 very few were foreign-born, with almost all areas coded as 1–5% foreign-born and most of the outlying areas at less than 1%. While the region is hardly as cosmopolitan as New York or San Francisco, there have been notable increases across the area including some pockets now showing over 30% foreign-born.

As you and your students observe these changes, pose questions about what might be causing those changes. In this case, the St. Louis region received an influx of Bosnian refugees in the 1990s. Once that tidbit of information is in play, challenge your students to test whether this had an impact on the population that would be reflected in the maps. How could they do this? Creating a map for 1990 and comparing it to the 2000 data shows dramatic change in certain neighborhoods. Is this where many Bosnians settled? While the free version of the website won’t allow the students to pursue this line of questioning further, perhaps other local resources can be called upon. A good quest will draw on a wide range of information.

Another area I have found accessible and interesting to students is the racial composition of their community. While we are often hesitant to discuss race issues with kids, they live with race-based messages every day. A well-managed classroom discussion can be enlightening for kids and adults alike. A couple of years ago I worked with a sixth-grade student who extended a class study of change in her community by tracking fifty years of racial change, from a time in the 1960s—when Blacks were essentially not welcome—up to today, when her school district is about \( \frac{7}{8} \) African-American. Currently, the city is very divided, with higher levels of education and income in the “White” neighborhoods. By using mapping tools and looking at the underlying demographic data, she was able to come to a strong, data-rich understanding of how her community has changed since her grandparents moved there.

Throughout, there is a strong mathematical dimension to these studies that should not be overlooked. A recent *New York Times* article noted how even the liberal arts are becoming saturated with data. Here is your chance to bring math into community history. Using the identify button (the green “i”), your students can quickly grab the data from each map. Using whatever spreadsheet or data analysis tools you have, they can make a graph showing the change over time. For example, the impact of reduced segregation in St. Louis over the past fifty years can be seen clearly in graphic form. What do the data say about your community?

Linking back to the possible investigations noted at the beginning of this column, interrogating the past with data can bring an added dimension to your studies. Talking with community elders gives a very human perspective on change; the data give another way to see the past. How do they complement each other? Likewise, as you partner with a local professional on an environmental study, you might note that suburban sprawl has had a large impact on water quality. What do the data show? When and where was the greatest change? What might have caused it?

There is never a shortage of good questions in a rich data set. As you and your students explore, you will be helping them to forge a connection to your community’s past.

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Literature Links

*Guess Who?*, by Margaret Miller (Greenwillow, 1994), is a picture book for very young readers. Bright photos and very simple text are set in a question and answer format: “Who cuts your hair? A chef? A tailor? A gardener? A polar bear?” (Turn the page) “A barber!” This book can be used in a discussion about the people who comprise a community or neighborhood, and the kinds of roles that are filled by the people in our communities. Many different climates and environments are shown. The people pictured doing different activities are diverse, with a nice balance of men, women, people of color, etc. This book could also serve to help children to imagine themselves pursuing different interests; for instance, as a pilot, teacher, dentist, or mechanic.

*Be My Neighbor*, by Maya Ajmera and John D. Ivanko (Charlesbridge, 2004), portrays different kinds of neighborhoods around the world. The text describes elements that many neighborhoods have—schools, homes, people, places to play and worship, markets, and transportation. Families and children in various settings are pictured in brilliant photographs. Students ages five through eight will enjoy the text as it is read aloud or independently. This book could serve as a model on which your class could build its own book about the communities near you.

What are the qualities most neighborhoods share? Are there different qualities between rural, suburban, and urban neighborhoods? Neighbors are also discussed.

*The Curious Garden*, by Peter Brown (Little, Brown, and Company, 2009), is a fictional story, but based on an intriguing truth. Liam is a curious little boy who notices a tiny garden struggling amidst concrete and asphalt. He decides to help the garden along and over time, it thrives. Others notice the beautiful plants and cultivate their own small patches of dirt until there are flowers and trees sprouting up and beautifying the whole city. While the illustrations depict fanciful blankets of green and color, the story is based on an abandoned but very real, elevated railway track in Manhattan. In 1980, “the High Line” was closed to traffic and slowly nature reclaimed the area. Now flora populates the old tracks. Sharing this story with your seven- to twelve-year-olds can inspire reclamation efforts in your own communities.

*The Streets Are Free*, by Karusa (Annick Press Ltd., 1995), is based on the true story of the children of the barrio of San José de la Urbina, who wanted a place to play. The shift in Venezuela from exporting mostly coffee to oil resulted in many farmers moving into urban areas. By the 1950s, thousands relocated to Caraca and Maracaibo. This very personable story relates from the
children’s perspective what it is like to live surrounded by buildings and paved lots. A librarian encourages the children to take their concerns and their ideas to City Hall. When they are turned away, adults get involved by returning to City Hall to pursue a city park. The story talks about politicians eager to win people over in an election year, and the sometimes disappointing experience of working with city government. This is a good story to discuss with students ages nine through twelve.

*Spaghetti Park*, by DyAnne DiSalvo (Holiday House, 2002), tells the story of a neighborhood park that has been taken over by vandals and troublemakers. Community children and their grownups resolve to take back their beloved place for playing, strolling their babies, and most importantly, for playing bocce. Bocce is the favored game of the “old-timers,” and one of the main characters is learning to play from his grandfather. After community meetings, people commit to helping out in different ways. Ultimately this is a story of a few brave people being willing to step outside of their usual behaviors—whether it’s confronting a peer or asserting one’s individual likes even though they are different from the group—and a community coming together to create a place for everyone. Children eight through ten will appreciate the storytelling in this book.

*Ghetto Cowboy*, by G. Neri (Candlewick, 2010), is a young adult fiction about a troubled teen who is dropped off in Philadelphia to live with his estranged father. He is introduced to the urban cowboys of Chester Avenue—men who spend their lives racing and raising horses on the streets. This fiction is based on the actual cultures in Philly and Brooklyn, and the website for the book, gregneri.com, provides background information including a video about the topic. The text is written in dialect throughout and shows an unflinching picture of life on the streets, hard times among family, and fighting for what’s right. The city confiscates several horses and when Coltrane’s is taken, he and other youths come up with a plan for getting the horses back. Their actions end up inspiring hundreds of others to become involved in civil disobedience for the sake of preserving their community. This is a stunning novel for ages ten and up.

*Dear Mr. Rosenwald*, by Carole Boston Weatherford (Scholastic Press, 2006), is a stylized, painterly picture book that tells the story of Julius Rosenwald (president of Sears, Roebuck and Co.). Because of his generous donations of money in the early twentieth century, many schools for African American communities were built in the South. People came together to sweat, pound nails, and donate time and goods, so the children would have places to learn. Part of the stipulation for donating funds to this cause was that the communities needed to raise a portion of the funds themselves, from both white and black donors. Told from a child’s perspective, the book includes historical information but on a personal level. This important story is especially well suited for seven- to ten-year-olds.

*More Good Community Stories* that we have reviewed in past *Connects* are *Roxaboxen*, by Alice McLerren; *Secret Place*, by Eve Bunting; *Letting Swift River Go*, by Jan Yolen; *Pennies for Elephants*, by Lita Judge; and *Harriet the Spy*, by Louise Fitzhugh.
Resource Reviews

**Questing**, by Delia Clark and Steven Glazer, is a guide for creating and exchanging treasure hunts in order to collect and share your community’s distinct natural and cultural heritage. Each Quest focuses on a community story, environment, or character. Examples of successful rural and urban Quests are given. Your class will engage in relevant science, math, and technology activities, such as mapping, research of primary historical documents, and field identification, as well as meeting with local government or networking with community groups.


**Wild Play**, by David Sobel, is a new book which examines how to support children’s organic development in connecting with the natural world. Written also as memoir of the author’s journey raising two children, there are many important lessons here for any educator or adult spending time with children. Exploration, storytelling, sense of place, and rites of passage are some of the themes. The frank reflections on his own decision-making during of various experiences is particularly refreshing. This book is an excellent reminder to watch, engage with, and learn from the children we teach.


**Healthy Neighborhoods, Health Kids Guide**, by Tiffany Tillman, is a wonderfully complete guide to investigating the health of the students’ neighborhoods. Use this clear guide to conduct a study, define quality of life features, explore, assess the neighborhoods and make recommendations to local organizations or officials for improvements, and implement a plan to act on the recommendations. Throughout, helpful background information, resources, reproducible masters, logistics, and suggestions for working with volunteers are provided. The book draws on the work of environmentalists and educators such as Roger Hart, David Sobel, and Grant Wiggins and Jay McTighe.

*Healthy Neighborhoods, Health Kids Guide. Shelburne Farms’ Sustainable Schools Project*, 2007. 169 pages. This is a free download from the website above. 802-985-8686.

**Big Science for Growing Minds**, by Jacqueline Grennon Brooks, is an outstanding guide that makes a strong case for the importance of science education in the early grades. Following sound practices that are supported by research, the book describes constructivist learning environments, teaching that supports inquiry, and fundamental concepts that can be taught with everyday objects. The author does a wonderful job of placing constructivism in the current age of standardized testing and little time for science instruction. This is a vital resource for any teacher of young children.


**WEBSITES**

**Community Works Institute** is dedicated to supporting educators in creating curriculum with place as the context, service-learning as the strategy, and sustainability as the goal. They offer summer institutes as well as a journal and other excellent publications for teachers.

**Promise of Place** immerses students in local heritage, cultures, landscapes, opportunities and experiences; uses these as a foundation for the study of language arts, mathematics, social studies, science and other subjects; and emphasizes learning through participation in service projects for the local school and/or community.
Collaborating with Communities to Support Children’s Curiosity and Achievement

by Grace Dávila Coates

“We’re here because I want my child to have a positive attitude toward math.”
—FAMILY MATH participant

What happens when families come together for events designed to create an evening of fun explorations and activities in mathematics, science, or engineering? If they are anything like FAMILY MATH (FM) families, they may go away with new ideas to ponder and perhaps some answers. Mostly they leave pondering bigger questions of things often taken for granted. The following stories are examples of my experiences as a classroom teacher, a community volunteer, and as the director of FAMILY MATH.

A Lesson in Collaboration

I had already successfully conducted Family Literacy classes when I attended my first FAMILY MATH class. I came away from it with a renewed commitment to bring more learning experiences to my students and their parents.

I began by creating a timeline similar to the one provided in the FAMILY MATH book. Since April is Mathematics Awareness Month, we would conduct the sessions in April as a series of four classes. I invited two parents to help me make a few stations. As we created the stations and collected materials, we assigned ourselves roles for the first class. The principal approved a small budget for refreshments. In class, I asked each child to write an invitation to their parents or caregivers to attend our first class, Tuesday at 6:00 p.m. in the library.

On the first night of class, everything was ready. At 6:00 one parent and her child arrived. At 6:15, three parents and four children joined us. We asked them to try out the math stations and have some refreshments while we waited for the others to arrive. At 6:30 we started our first directed activity with exactly five parents in attendance. We kept our chins up and continued the evening. At 7:30 we sent home the extra pizza and fruit with the few that had shown up.

Needless to say, I was so disappointed! At first I blamed the parents. I thought I knew my students’ families, we had great relationships, and most of all, they always showed up for other class events. Why weren’t they interested enough to show up for something that will help their children in math? Didn’t they care? The worst part was that other teachers in the school seemed to know that this was going to happen. I am thankful that no one said, “I told you so.”

So, I went back to the drawing board. As I lamented over the low attendance with another teacher, he said, “When I was kid, I hated math. Most people do, you know. They are afraid of it.” Actually, I had some math anxiety of my own—but hate and fear? Those were pretty strong words. So, I began by addressing the matter in my classroom newsletter in the section titled “Did You Know?” It was short and simple. (See page 20)

That week, I called a friend of mine who taught in the local high school. I needed a
couple of her students to assist the families at the stations. Their job would be to clarify
directions and ask some extension questions for each station. She recruited four students
who were interested in community volunteering. They committed to attending each ses-
sion and to work in our classroom once a week to prepare for the sessions.

Next, I called the local businesses that I frequented; the pizza parlor, the phone com-
pany, and local stores of national chains of fast food and hardware. They provided me
with lots of goodies. I received boxes, pens, pencils, dominoes, rulers, and wooden paint
stirrers. I was also given dice and cards, from a friend who frequented a card room. I
made sure that I acknowledged all these folks in the next newsletter, which I sent to each
of them with a thank you note.

On Monday, I asked a high school intern to fill all the boxes with the donated sup-
plies, while the students listened to Claire de Lune and read their books. One by one they
started to notice the thirty-three boxes. A student asked, “Are those for us, Ms. Coates?”
I replied, “These are for each student that brings their parents to FAMILY MATH tomor-
row night.” I replied. They watched as the boxes filled with goodies. Actually, the boxes
contained the materials that we would need to complete the games or activities scheduled
for the evening.

As we prepared for the next evening’s event, I reduced the
quantity of food and drinks and optimistically set out enough
materials for fifteen families. As 6:00 p.m. neared, we had five
families waiting at the door, at 6:00 we had ten more and at
6:15 there were twenty-five families in the room. Now, I was
short of everything! As my partners introduced the first game,
I called the pizza place and ordered more pizzas and salad. I
made more lemonade.

We played Nim games to informally develop number sense
and sharpen our strategy skills; we created line art to examine
lines, line segments, and intersections; we talked about feelings
about math; and we shared ideas about creating the best home-
work environment and experiences for our children.

At the end of the evening, some parents stayed to help clean
up. They folded chairs, took away the garbage, wiped the tables,
and, more importantly, said it was great fun and that they would
return the following week. And, although we did not have
“prizes” every time we met, families continued to attend.

This was my first successful collaboration. I learned that even though I felt that I could
do this myself, things went better by including others. The high school students completed
their internships, and received credit for hours spent volunteering. Having the older kids
at FM seemed “really cool” to my students. I continued collaborating with the high school
for other events, and I reciprocated by being there for them when they held events.

Over the years, I have found that every community I work with has many wonderful
resources. The following are examples of successful collaborations in small and large
venues.

DID YOU KNOW?

Did you know that attending a FAMILY MATH Class series will:

• Increase our children’s confidence in mathematics
• Enhance our competence and confidence in assisting our children in mathematics
• Improve our children’s school attendance
• Increase our children’s achievement in school, and
• Increase the likelihood that our children will attend college?

Come to FAMILY MATH next Tuesday. Dinner will be provided.
Collaborations for High School Students

The Kids’ Breakfast Club is a nonprofit organization run completely by volunteers. They recruit community members with expertise in a variety of topics to work with families. Every third and fourth Saturday of the month, the club hosts a breakfast and education gathering at a local school. Often, the volunteers are high school students. After a healthy breakfast, programs such as Family Science, FAMILY MATH, or Family Engineering are presented.

Class leaders can be college or high school students, retired educators, or community members with special skills to share. Often they are working alongside classroom teachers. Classes often include visits by people with careers in math, engineering, or science.

Grandparents and Parents As Leaders

In Berkeley, California, Lynne Alper volunteers at Rosa Parks School, where her granddaughter attends. Last spring, she brought together a group of parents and grandparents to lead a FAMILY MATH evening. A group of about twenty parents and caregivers met for an afternoon and evening to become familiar with the FM goals, activities, and games. After a quick break to eat a supper provided for them, they resumed with the training. Before the evening was over they had created stations, assigned themselves tasks and roles, and chose which station they would staff on the evening of the class. On the evening of their FAMILY MATH Night, over a hundred parents and children attended an evening of mathematics, pizza, and fun.

Unexpected Outcomes

Program evaluators report some unexpected benefits for families who participate in ongoing learning experiences together. For example: in FAMILY MATH, parents report more open communication with their children about school and other areas of their social lives. Families who have not previously participated in school events become more involved after attending FM classes (Ramage, Shields, 1999). In Family Literacy classes, parents and children agree that they listen more closely to one another’s ideas, and connect stories to their own lives or experiences. FM program evaluators also found that some FM parents also return to school to complete their degrees, GEDs, take ESL classes, or enroll in other learning programs.

Working Together

As classroom teachers and education leaders, we often have our days and evenings filled with activity. Collaborating with organizations, universities, museums, community-based groups, and like-minded others makes the work less daunting and more rewarding. Including family voices makes the work more culturally relevant and meaningful. Sharing the vision of a more creative, more informed, and more connected community can only lead to interesting and committed collaborative partners.

RESOURCES


Parents play important roles in their children’s scholastic success. Decades of research indicate that regardless of race, socioeconomic status, and other background factors, students achieve greater academic and behavioral success in school when educators, families, and the community work together. Many schools are finding innovative ways to involve parents and the community in all subjects. This article focuses on how schools at all grade levels are involving parents and the community with students in math and science.

A Comprehensive Framework

One framework that hundreds of schools across the country are using to organize their programs of family and community involvement is that of the National Network of Partnership Schools (NNPS) at Johns Hopkins University (see sidebar on page 25). NNPS guides schools to organize and implement four components of partnership program development:

1. Form an Action Team for Partnerships (ATP) with teachers, parents, an administrator, and others to work together as a committee of the School Council (in high schools, students also are on the ATP)
2. Write a One-Year Action Plan for Partnerships
3. Include in the Action Plan activities from the Six Types of Involvement to engage parents in different ways (see back cover)
4. Evaluate the quality and progress of the program and activities each year.

Schools that are guided by a district leader to implement these structures and processes generally involve more families, work to meet challenges to engage families who were previously uninvolved, and reach results for student success.

Research on Family Involvement in Math and Science

Parental Involvement in Math. Many studies indicate that positive parental involvement increases students’ math achievement. Studies show, for example, that parents’ involvement in math-related activities and discussions about math encouraged children to take more advanced math courses and increased students’ math achievement. Also, parents’ educational expectations and positive connections between home and school predicted high school students’ math achievement.

School-based math interventions may engage more parents with their children on math activities and math homework—including those who do not become involved on their own. Several studies investigated connections of parent involvement, homework, and
students’ math achievement. Parents’ educational attainment and confidence in their own math skills affected the extent to which they assisted their children with math homework.\(^5\) However, workshops for parents and guidelines to use math kits at home helped more parents gain confidence about helping their children and increased the percentage of students attaining math “proficiency” from one year to the next.\(^6\), \(^7\)

A longitudinal study of elementary school classrooms that used Teachers Involve Parents in Schoolwork (TIPS-Math) activities found that more parents were involved in positive interactions with their students in math compared to those in matched control classrooms. With students’ prior achievement and other background variables statistically controlled, TIPS-Math students had higher standardized test scores and more students and parents reported being happier doing math homework than did the control group.\(^8\), \(^9\)

**Parental Involvement in Science.** There are fewer studies of parental involvement in science than in math, but the existing studies suggest that when parents are involved students’ improve their attitudes about science, complete more science homework, and have higher science report card grades and test scores.

In Teachers Involve Parents in Schoolwork (TIPS-Science) students “take the lead” in discussing science or conducting science experiments with a family partner.\(^10\) Two longitudinal studies of TIPS-Science in the middle grades reported that more parents were involved in discussing science with their children at home. After controlling for background variables and past performance, TIPS students completed more science homework and had significantly higher report card grades than non-TIPS students.\(^11\), \(^12\)

It seems clear that more parents become involved with students in science and students increase science learning when teachers design homework that enables students to lead experiments and discussions. Students’ knowledge and test scores benefit most from high-quality science teaching, but parents’ beliefs, attitudes, and interactions with their children about science also influences students’ science attitudes and achievements.

**Promising Practices that Involve Parents with Students on Math and Science**

What should teachers do with the results of research on family involvement in math and science? NNPS Schools are demonstrating innovative ways to engage parents in math and science activities and to increase students’ success in these subjects. In addition to TIPS interactive homework, NNPS has collected in annual books of Promising Partnership Practices many examples that help teachers to connect families with students in math and science.\(^13\), \(^14\)

**SAMPLE MATH INVOLVEMENT ACTIVITIES**

**Involve Families Unable to Attend Family Math Night.** Very few school-based activities involve all families, even when that is the goal. Good partnership programs try to get important information to parents who could not attend meetings and events. Edison Elementary School in Kennewick, Washington, took this challenge seriously in developing Math Games at Home. Families played math games and received a bag to take home with the pieces and directions for all of the games they played. Then, the ATP distributed the
same game bags to all students whose families could not attend the event so that they and their parents had the same opportunities to play the math games at home.

**Connect Families and Students with Math in the Community.** Busy work schedules and concerns that they will not be welcome keep some parents from attending activities held in the school building. Some schools conduct various activities in the community to reach more and diverse groups of parents. Lee Hall Elementary School in Newport News, Virginia, held its annual math night at Family Night at Bottom Dollar Food Store. Families received grade-specific math activities to complete by checking items throughout the store. For example, fifth-graders had to find items from specific food groups, such as fruits, meat, or dairy, to create a healthy menu for less than $20.

Children also received a book to take home and adults received coupons and other prizes. Additional community support came from a local credit union, which set up a booth with information for families about budgeting and savings plans.

**Conduct Involvement Activities Regularly.** Although most parent involvement activities occur once, some schools implement ongoing initiatives. When volunteers are involved, it helps to have a regular schedule for them to follow. Fairmount Elementary School in St. Peters, Missouri, worked to boost students’ math success by training volunteers to practice math with students on Flashcard Friday. Every Thursday, teachers received a list of the volunteers for their classrooms. On Friday, the volunteers received a Flashcard Friday nametag, a set of flashcards for their assigned grade level, and a thank you note for volunteering their time. They checked in with their assigned teachers and worked with pre-selected students. The clear organization of this activity and students’ responses and increased skills made this an attractive initiative for many volunteers.

**SAMPLE SCIENCE INVOLVEMENT ACTIVITIES**

**Conduct Hands-On Activities.** Students are more likely to complete activities that are hands-on and fun. Alexander Mitchell Integrated Arts School in Milwaukee, Wisconsin, held Silly Putty Family Night to teach students and families about polymers and how to conduct science experiments with these materials. Children made silly putty with their parents and participated in hands-on experiments with their freshly made product. They left with their own silly putty and instructions to make it at home. Because the only two ingredients are starch and glue, families can make more silly putty at home and conduct other experiments with the goo. Not only did students and families learn more about science, but they also found that learning can be fun!

**Connect with Experts in the Community.** All communities have hidden experts who are waiting to be asked to share their knowledge and skills. William Hubbard Middle School in Forsyth, Georgia, discovered that one student’s grandfather was an avid astronomer. The ATP planned Dessert Under the Stars to draw upon this volunteer’s knowledge. Parents, students, and others rotated through experiment stations focused on Astronomy, Life Science, and Earth Science. Several parents provided homemade desserts for refreshments. By planning and sharing leadership for a science event with parents and community members, the school relieved science teachers of some of the stresses of planning an event. More importantly, students benefited from several community members’ expertise.
**Target Specific Populations.** Not all parent involvement activities have to be school-wide. Some successful partnership activities target specific populations. Cooper Magnet Elementary School for Technology in Hampton, Virginia held a Father/Daughter Princess Ball that attracted more than 175 participants. Then, mothers at the school suggested having an activity involving their sons. In response, the ATP and teachers organized a Mom & Son Mad Scientist Lab Extravaganza. First, a local community member made a dynamic presentation. Then, mothers and sons worked in small groups conducting science experiments with household items. For example, in the activity “Ice Cream, You Scream,” boys and moms combined ingredients (e.g., vanilla, milk, sugar,) and used rock salt and ice to make a simple and delicious treat that demonstrated how liquids become solids. The families also received instructions to replicate the experiments at home.

Dedicated educators, parents, and community partners are working together to design and implement activities that engage all families, improve students’ attitudes and achievements in math and science, and enable parents and students to enjoy these subjects together.

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**NOTES**

Six Types of Involvement

This issue focuses on collaborations among schools and communities to do the very best job possible in supporting our students in their learning. There is much research that validates specific actions that can make big improvements in student achievement.

—Editor

All schools can use this research-generated framework to develop a comprehensive program of school, family, and community partnerships. For more about community partnerships, see Darcy Hutchins article beginning on page 22. From Joyce Epstein, et al., these recommendations are published in School, Family, and Community Partnerships: Your Handbook for Action, third edition (Corwin Press, 2009).

A RESEARCH-BASED FRAMEWORK OF SIX TYPES OF INVOLVEMENT

All schools can use the research-generated framework of six types of involvement to develop a comprehensive program of school, family, and community partnerships (Epstein et al., 2009).

Type 1—PARENTING: Assist families with parenting skills, family support, understanding child and adolescent development, and setting home conditions to support learning at each age and grade level. Assist schools in understanding families’ backgrounds, cultures, and goals for children.

Type 2—COMMUNICATING: Communicate with families about school programs and student progress in varied, clear, and productive ways. Create two-way communication channels from school-to-home and from home-to-schools so that families can easily communicate with teachers, administrators, counselors, and other families.

Type 3—VOLUNTEERING: Improve recruitment, training, activities, and schedules to involve families as volunteers and as audiences at the school or in other locations. Enable educators to work with regular and occasional volunteers who assist and support students and the school.

Type 4—LEARNING AT HOME: Involve families with their children in academic learning activities at home, including homework, goal setting, and other curriculum-related activities and decisions. Encourage teachers to design homework that enables students to share and discuss interesting work and ideas with family members. (Note: The TIPS Interactive Homework process supports and strengthens Type 4.)

Type 5—DECISION MAKING: Include families as participants in school decisions, governance, and advocacy activities through school councils or improvement teams, committees, PTA/PTO, and other parent organizations. Assist family and teacher representatives to obtain information from and give information to those they represent.

Type 6—COLLABORATING WITH COMMUNITY: Coordinate resources and services for families, students, and the school with community businesses, agencies, cultural and civic organizations, colleges or universities, and other community groups. Enable students, staff, and families to contribute their service to the community.

Schools may choose from hundreds of practices to represent the six types of involvement. Each type of involvement has explicit challenges that must be met to turn an ordinary program into an excellent one. Family and community activities can be designed and implemented for each type of involvement to help students reach specific school goals. Visit the National Network of Partnership Schools at partnership.schools.org for more information.