



A museum–school partnership program, Communities Alive in Nature, turned an underperforming science program into a distinguished one.

A Transforming Partnership

By Susan Black

At Carlsbad, California’s, Jefferson Elementary School in San Diego County, you’re likely to find kids peering at insects through microscopes and spooning mud samples into vials to check for microorganisms. And you might see children comparing water levels on computer spreadsheets. Some lessons spill over into the school’s adopted site, a watershed in nearby Calavera Hills Canyon. At Jefferson, science is everywhere—in classrooms and in the community.

But, it wasn’t always this way. Just a few years ago this school suffered from low test scores and a lackluster “science from workbooks approach” that wasn’t motivating many in the 75% Hispanic and 50% learning-to-speak-English student body.

A partnership program with the San Diego Natural History Museum called Communities Alive in Nature (CAN) changed all that. The program centered on using the watershed, where water drains from mountains to the Pacific Ocean, as a broad canvas where teachers and students could investigate local environmental concerns such as water quality, water conservation, native habitats, and erosion. In addition, the partnership offered other attractive incentives—a multiyear commitment to the school from the museum and lots of opportunities for teacher training.

The principal was convinced that the program’s true-to-life investigations would help her students learn

more and better science, inspire them to think about careers in science, and help improve the whole school culture. She was right.

A Spiral Curriculum

Jefferson’s transformation began with help from the Natural History Museum’s liaison who worked with the school’s teachers and principal to figure out how to best revamp their program.

The group decided to weave two major concerns affecting the community—quality-of-life issues such as clean water and flood control and environmental preservation such as erosion control and habitat protection in the San Diego and Baja areas—into a new, inquiry-based curriculum that incorporated resources from the museum as well as municipal and natural resource agencies.

The heart of the program is Adopt a Watershed, a spiral curriculum that builds on students’ learning in each successive grade and includes topics such as water quality, soils, plants, animals, and habitats. (Museum educators adapted the curriculum to fit Jefferson Elementary School and the City of Carlsbad.) In primary grades, students study concepts such as life cycles, erosion, seasons, natural habitats, and botany. In the upper grades, students build on this knowledge foundation as they study the local watershed.

For example, fourth graders study soil erosion and its effect on the canyon's drainage areas. Fifth graders concentrate on native and invasive plants and how they fit into the canyon's overall ecology, while sixth graders research and report on water quality.

But these grade-level topics aren't isolated chunks of learning. Fifth graders don't just "do" plants; the students rely on plant studies in the earlier grades to build their inquiries into the watershed's flora.

At the end of each school year, fourth-, fifth-, and sixth-grade students show what they know through presentations at the school's theater. Some kids narrate their own PowerPoint shows; others present computerized photo albums that correspond to the scientific principles they studied in the watershed.

Teacher Training

To feel comfortable working with the new curriculum, Jefferson teachers needed training in two areas—technology and scientific content. To address teachers' technology needs, the program liaison arranged for all teachers to learn a number of computer programs, including Excel and PowerPoint, so they could build their own science websites. In two weeks time, teachers became adept at integrating digital photographs and importing graphics into website portals, and they mastered creating charts and tables to display scientific data they'd collected.

To address the need for more science content learning, the teachers took field trips to observe and study local habitats and to learn about ecosystems and about native and nonnative plants, animal communities, and nonliving components of the watershed. Working side by side with science specialists, teachers waded through rivers and estuaries, recording vegetation springing from rock ledges and taking close-up photographs of insects and animal habitat. They returned from the watershed carrying sacks laden with samples of native and nonnative plants and vials of water obtained from dripping ledges, cascades, and pools. And they returned with eagerness to share their collections with their students, and, more importantly, a wellspring of contagious excitement over their adventure.

But before the teachers could present what they learned to their students, they had to complete a final assignment—a technology-supported presentation in which they demonstrated the scientific principles they'd learned in the canyon through narratives and accompanying photographs, illustrations, and charts. In essence, teachers would be creating the same type of performance assessment they would use with their students.

In addition to these training opportunities, the partnership continuously supported teachers in numerous ways (see "More Training" sidebar).

Field Learning

Of course, outdoor learning wasn't reserved for teachers only—the partnership afforded all the students opportunities to conduct classroom studies in the field and participate in science-related community service projects.

K–3 students stay close to school for their outdoor science lessons, which include planting seeds, tending plants, and sketching stages of growth in gardens just outside the school's door. The youngsters also take field trips to a nearby beach and other sites where they observe insects, worms, and millipedes; test soil samples for filtration capacity; measure stream banks for erosion; and look for tracks and other signs of animal habitation.

Students in grades 4–6 venture farther into the field, often working in teams alongside biologists and other scientists in the canyon's watershed. For example, at a lagoon in the watershed and along a nearby creek a toxicologist demonstrated fieldwork techniques for studying insects and plants and collecting water samples to Jefferson's sixth graders. He showed the kids how to use the data they'd collected on biological, chemical, and physical features of the watershed. Like true scientists, the kids compared their assessments with standard

More Training

The training provided by scientists and others affiliated with the San Diego Museum of Natural History was intense, amounting to 32 hours in the first year:

- Applied field biology and ecology—12 hours. Teachers learned to identify ecosystems, interactions, interrelationships, and adaptations. Teachers also learned to make observations and collect data used by field biologists.
- Curriculum unit training—8 hours. Teachers learned to use a scope and sequence Adopt-a-Watershed curriculum developed by the museum. Teachers learned to incorporate grade-level standards in all academic areas.
- Technology training—8 hours. Teachers learned specific skills, such as creating PowerPoint presentations, data graphics, digital photography, and video and sound accompaniments.
- Field assessment training—4 hours. Teachers learned to identify ideal sites for grade-level field studies.

Teachers received support beyond their first 32 hours of training as well. Some teachers chose to shadow scientists to learn more about concepts in their science curriculum, and others requested help in designing and teaching daily lessons from the museum partnership liaison.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Program Standards

Standard A:

All elements of the K–12 science program must be consistent with the other National Science Education Standards and with one another and developed within and across grade levels to meet a clearly stated set of goals.

Standard B:

The program of study in science for all students should be developmentally appropriate, interesting, and relevant to students' lives; emphasize student understanding through inquiry; and be connected with other school subjects.

Standard C:

The science program should be coordinated with the mathematics program to enhance student use and understanding of mathematics in the study of science and to improve student understanding of mathematics.

Standard D:

The K–12 science program must give students access to appropriate and sufficient resources, including quality teachers, time, materials and equipment, adequate and safe space, and the community.

rubrics used in professional laboratories to determine the status of the watershed.

In addition, all students are invited to complete science-related community service projects to maintain and restore the watershed, such as sandbagging flood-ravaged sections of the canyon to prevent future damage; clearing acres of invasive species and reseeded areas to their once-natural habitat; and replacing vegetation to stabilize eroding riverbanks.

Science Is Here to Stay

Today science is vibrant at Jefferson. Some of the school's success is due to the continuing support from CAN affiliates. Also, the new emphasis on science and teacher training has created a cadre of elementary teachers who serve as in-house science specialists at every grade level. The specialists still teach their own classes, but they're available to teach model lessons and help new teachers plan lessons based on national and state science standards.

Positive results are reflected in students' achievement-test scores in science and other subjects. Scores are up in all areas of California's state achievement tests. Since the partnership began in 2001, Jefferson's composite scores have risen steadily from 574 to 750. For Hispanic students, the fastest growing segment of the school population, achievement has increased from 492 to 689.



And, there's no sign of stopping.

Today the science program has obtained more funding from the San Diego Foundation to expand into a multischool collaborative that includes Jefferson Elementary, Calavera Hills Elementary, and Calavera Hills Middle School. Middle school students can sign up for an elective course to continue their scientific studies of the watershed, and they are eligible to serve as mentors to the fourth- through sixth-grade students.

At Jefferson, students and teachers have ignited a passion for science, and they are intent on keeping the flame of learning lit. Now, there's a new sign outside the school honoring Jefferson as a "California Distinguished School." It's a well-deserved award, representing the fact that Jefferson, once labeled an "underperforming school" not long ago, now ranks 10 out of 10 compared with similar schools.

Their inspiring story reminds us that school/community partnerships involving organizations such as universities, museums, cities, and natural resource agencies can be a catalyst to take a program from dull to dynamic. Why not consider a similar school/community partnership where you live? ■

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Resources

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academy Press.