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Science, it's elementary

In many local K-5 classrooms, science education is defying state trends

by David Boyce

Take two steel balls, one being about twice the size of the other, and two cups filled with the same amount of water. Put one ball in each cup and explain which cup will show the most change in the water level and why.

If you're a parent of primary-school kids and live in the Almanac's circulation area, it's likely that your children won't have trouble with this question. On annual standardized science tests, students from local elementary schools routinely turn in above-average scores.

The same cannot be said for much of the state.

- California ranked 43rd, just ahead of last-place Mississippi, in fourth-grade scores on standardized science tests administered in 44 states in 2005, according to data from the National Assessment of Educational Progress, a unit of the U.S. Department of Education.

- More recent results for the Bay Area in 2007 show about 46 percent of public school fifth-graders scoring above average on state science tests.

These statistics lead off a recent survey of 923 Bay Area teachers in grades K-5 that concludes that the teachers are not receiving enough training in science instruction. Of the respondents, 36 percent report receiving no science training at all in the last three years, and another 20 percent less than three hours.

The survey also concludes that teachers feel much more prepared to teach arithmetic, English and the humanities, and that 80 percent teach science less than 60 minutes per week.

The survey was done in October 2007 by the University of California at Berkeley's Lawrence Hall of Science and WestEd, a San Francisco-based nonprofit education research agency. The results may understate the problem in that "district personnel and teachers who took the time to respond ... were more likely to be more engaged in science education than those who did not."

This gloomy picture seems a world away from public schools in Atherton, Portola Valley, Woodside and Menlo Park, where officials report that primary grade teachers have been training in science instruction for years and that science topics are significant part of class work every week.

At Woodside Elementary School, for example, fourth- and fifth-graders receive three hours of science instruction per week, while third-graders get one and a half hours, says teacher and science specialist Kevin Kinsella.

Likewise in Menlo Park schools, third-graders study science for an hour and a half per week, and it's closer to four hours for fourth- and fifth-graders, says Jo Sauer Mitchell, assistant superintendent for curriculum and instruction.

An important local factor: engaged Silicon Valley parents who tend to be well educated, comfortable with science, actively supportive of science programs in school, and generous during fundraising campaigns. School foundation gifts of \$1 million a year are common locally.

"The community that we are in is kind of ready or poised to do better than average," Mr. Kinsella says of Woodside.

"Parents expect a strong academic program in all the areas," says Claire Abrams, the curriculum adviser for the Las Lomitas district. "We need to provide a full-service academic experience for kids."

"Not every school district has a foundation like we have and the (state) budget keeps going haywire," she adds. "One year, you have money and one year, you don't. How do you plan for that? It takes money to run a good school and meet everybody's needs."

Indeed, science test results published by the state tell the story. At La Entrada in the Las Lomitas School District, 68 percent of fifth-graders received above-average scores in 2007, while in the Woodside district, the number was 76 percent.

In Portola Valley, 91 percent of fifth-graders got above-average scores in 2007 at Corte Madera School. At Encinal and Laurel elementary schools in Menlo Park, the numbers were 82 percent, and 83 percent at Oak Knoll.

Preparing the ground

Science is a vast and complicated series of topics, but learning about it has to start somewhere. In the third grade at Oak Knoll School, students study concepts associated with matter and energy, plant and animal life, and some astronomy, says teacher Sue McCrary.

Right now, the students are growing bush beans hydroponically in the classroom over the next seven weeks. They embed bean sprouts in floating platforms in tubs of water, but only after reviewing what they've got in their hands: a dicotyledonous seedling with

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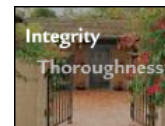
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leaves, roots and a stem.

Gone are the days when dicotyledon — a double-leaved seedling versus a single-leaved monocotyledon — first came up in a high school survey course. The finer points of recognizing mature monocots and dicots in the field will come, but the foundation has already been laid.

With this botany lesson, third-graders can explore other disciplines. How many seeds does a single sprout produce? How many seeds from 10 plants? How many in three years? Can it be shown in a graph? Is the bean plant's life cycle worthy of a letter describing it to a friend?

Such connections are suggested as exercises in the workbook that comes with the boxed science kits for the teachers.

A systematic approach

The teaching of K-5 science used to be a "helter-skelter" kind of thing, says Oak Knoll third-grade teacher Sue McCrary. Last year, Menlo Park schools district-wide adopted the Full Option Science System across the district, a package developed by U.C. Berkeley's Lawrence Hall of Science. FOSS is used in the Menlo Park, Las Lomas, Portola Valley and Woodside school districts.

The kits, which contain everything a teacher needs, reflect the state's content standards for science and make life much easier for teachers, many of whom tend to be uncomfortable teaching science, says Ms. Abrams of the Las Lomas district.

"Science is difficult," she says in an interview with an Almanac reporter. "I think it's the fact that people like you and me never had to study it much."

By training most K-5 teachers in the same program, it "levels the playing field so that all kids are getting an equally rich science experience," she says.

The Menlo Park district has one person spending eight to 10 hours a week replenishing the kit boxes, Ms. Mitchell says.

In Portola Valley, teachers add their own materials, literature and favorite experiments, Ormondale School Principal Jennifer Warren says. "Ormondale has always had a love of science, so weaving in the traditional favorites that are linked to the grade level content-standards has been a key part of this new (kit) adoption process."

At Woodside Elementary, students in grades 3 through 5 study science in a dedicated classroom, a rarity in elementary schools and a boon to a science teacher, Mr. Kinsella says.

School districts with the wherewithal to afford science specialists tend to have them travel from classroom to classroom with their equipment on a cart, and they tend to be shared among schools, he says.

Having a science background is another rarity, he says. Mr. Kinsella has a bachelor's degree in biological sciences and a teaching credential in life science. Oak Knoll's Ms. McCrary was a pre-med student in college.

An offer they can't refuse

What if a kid doesn't like science? "You can't say, 'I don't feel like taking science,'" Ms. Abrams says, adding: "I've never seen a kid, when they're doing a lab, who isn't somehow excited or engaged in what they're doing."

"I would be very surprised to find a kid who says, 'I don't like my science class,'" Ms. Mitchell says.

"I think it makes a difference when they've seen it, talked about it, and actually touched it," Ms. McCrary says.

Science literacy is increasingly important and a science-lite path is not really an option anymore, Mr. Kinsella says.

Toward that end, the science programs in the Woodside, Menlo Park and Las Lomas districts regularly benefit from the districts' annual "fund-a-need" fundraising efforts.

The science program at Woodside has produced many participants in state science fairs, as have the programs in the Las Lomas, Menlo Park and Portola Valley districts.

Science instruction can produce interesting dilemmas. On the wall in Mr. Kinsella's classroom is a collection of unanswered student questions: Where do comets get their water? What makes a planet start moving? Are meteors on fire in the atmosphere or are they vaporizing?

Occasionally, he says, a student will resolve such puzzles with: "It's that way because God made it that way."

"There are many different ways to find answers to things," he says. "Eventually, you have to choose what works for you."

For Woodside seventh-grader Cammie Merten, concerns about global warming grew out of a class taught by Mr. Kinsella on naturalist John Muir and the valley that was lost to sight after the damming of the Tuolumne River to create the Hetch-Hetchy reservoir.

"I think that had something to do with my science project this year," she says.

Cammie built two solar water heaters — one with unpainted copper pipe and the other with black plastic tubing — to determine which material was better at retaining heat. Her conclusion: plastic tubing loses heat more slowly than copper and reaches operating temperature faster after overnight darkness.

"I don't want our planet to become all polluted," she says. "I want our planet to stay healthy and I know that solar products are one way to cut down (on) fossil fuel use."

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