

Building Diversity through Science and Science through Diversity

by Barbara Sprung and Merle Froschl

Education that legitimizes the cultural norms of only one culture within a pluralistic society robs students from other cultural backgrounds of self-esteem and contributes to discrimination.¹

In 1982, when we founded Educational Equity Concepts (EEC) to address discrimination in education based on gender, race/ethnicity, disability, and level of family income, we identified science as one area in which all of these biases converged to limit children's potential. Research told us that students from underrepresented groups have traditionally been excluded from the science pipeline to higher education and the science/math related jobs of the future. Too often, school systems have not viewed these students as "scientist material," and have conveyed the message to students that "science is not for me."

To counter this attitude, we have developed programs to help teachers, after-school group leaders, and parents learn about equity issues in science and math, and we have provided practical tools to deliver inquiry-based science to all students in grades K–8. In 2005, EEC merged with the Academy for Educational Development (AED), and we are now known as the Educational Equity Center at AED (EEC/AED). Our goal remains the same: to impart the skills and a "can do" attitude so every child—girls, children of color, children with disabilities, and children who are poor—will say, "I can do this. Science is for me."

The good news is that in the past twenty-four years the field of science has become more diverse through the efforts of the National Science Foundation, the American Association for the Advance-



ment of Science, the National Science Teachers Association, the Eisenhower Clearinghouse and many small organizations and individuals who have worked tirelessly to open that pipeline. For example, the EntryPoint program from the AAAS has a core of young scientists with disabilities available as role models; EEC/AED has developed an on-line community of practice around issues of science, gender, and after-school programs; and many science and technology corporations have posters available that illustrate the diversity of their workforce.

Despite the gains, however, old attitudes die hard. Every time we ask teachers, group leaders or parents to "imagine a scientist," the same picture still emerges: an older white male with wild hair (think Albert Einstein) wearing glasses and a white coat with a pocket protector full of pens. Statistics tell us that much more

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work needs to be done. In 2002, only 12% of science, math, and engineering degrees were awarded to African-Americans, Latinos, and American Indians. Women, who are 51% of the population, are only 8.3% of full professors in mathematics at the top 50 universities, and only 15% of the entire United States science and engineering workforce. Students with disabilities represented 4.8% of the 2003 college graduates but of those, a minute fraction (.0001) graduate with a degree in math or science. Clearly, these students have gotten a message that math and science are not for them.

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Benefits for society

Today's children—those who choose science careers and those who don't—will be making decisions about crucial matters concerning the environmental, health, and energy future of the country and the world. It is critical that they be scientifically literate. It is disturbing to know that in 2000 American students placed nineteenth, half-way down the list of 38 countries, in the Third International Mathematics and Science Study (TIMSS), well behind Singapore, Latvia, the Netherlands, and Malaysia. To compete successfully in the rapidly growing global economy, diversity in science has become more essential than ever. To succeed at any level, the United States must value, educate, and engage all children as future scientists and/or as scientifically literate citizens.

Benefits for students

Inquiry-based science is a wonderful way to level the playing field for all students. Students who are less verbal or English Language Learners can shine in a hands-on environment; students with disabilities can utilize the problem-solving skills they hone through everyday living; and girls can engage in cooperative learning, a style that research has shown works well for them. Conducting science explorations

with culturally familiar, found or inexpensive materials means that science is accessible to everyone, not just a privileged few. As students are learning science, they are improving their literacy skills, connecting to social studies and various cultures, learning math, and expressing themselves creatively.

Benefits for families

Research has shown that parent and family involvement is key to children's success, and feeling empowered is key to family involvement. It is empowering for parents to know that they can provide science experiences to their children every day. When they walk to the store and notice different shapes, when they bake a cake or mix ingredients for soup, when they sort and put away the groceries, when they give their child a bath—they are doing science. You don't have to be a scientist to teach your child how to explore, solve problems, and discover. For this reason, each of our science and math programs has a family involvement component that keeps parents "in the loop," enables them to take an active role in their children's science learning, and provides ideas for doing science at home.

Curricular approaches

If you want to build diversity in science, you need to start early. *Playtime is Science* is an early childhood physical science program that develops higher order thinking skills—decision-making, problem solving, and creative thinking. Using inexpensive and commonly found materials, the activities engage all children in inquiry-based science learning. The activities include modifications for students with a variety of disabilities. Parent involvement is integral to the program.

Providing inquiry based science after-school is another way to reach large numbers of diverse students. After-school, with its informal structure, provides opportunities for exploration not available

