

Solving the *Science* CHALLENGE

By MELISSA W. KAYE

Penn State faculty aim to interest the next generation in technical careers



Fred Weber—Campus Photography

Dr. Jacqueline Bortiatynski (right), a faculty member in the Chemistry Department, and Dr. Joanna Skluzacek, Penn State Center for Nanoscale Science outreach coordinator, created a summer camp in which children learn about the chemistry of their favorite foods.

In the recent report “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,” the National Academies suggested that children did so poorly in math and science that in the future there would be a lack of workers to handle the huge range of jobs that require such skills.

The panel said that America

needed to vastly improve K–12 education in order to increase the country’s pool of talent and compete successfully in a global economy.

Are we, as the National Academies suggest, in the midst of a science crisis? There is definitely work to be done. In the recent National Assessment of Educational Progress—a test administered every five years to track American

students’ knowledge of science at different levels—elementary school children improved in science; however, middle school students’ scores remained the same, while high schoolers’ scores dropped. The test also seemed to perpetuate the feeling among some young people that science is only for men, with boys outperforming girls in every grade tested. And while minority students made gains in the fourth grade, significant gaps continue in high school.

The results were enough to make the National Assessment Governing Board, which administers the test, concerned. “In a world made infinitely smaller and more competitive by the technological advances of the last half-century, these results ... should redirect attention to the major challenge of preparing students for technical careers in today’s economy,” said Board Chair Darwin Winick.

Importance of Early Intervention

The good news is that Penn State needed neither the National Academies nor the results from a national test to inspire it to take action. The University has increasingly provided outreach activities that aim to not only



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Scientists agree that if they fail to reach out to young people, there will be a shortage of scientists in the future.

The Scores

Here's how kids are measuring up:

- In 2005, 54 percent of high school seniors performed at above or basic level, compared with 57 percent in 1996.
- The number of fourth-graders who performed at or above the basic level increased by 5 percent since 1996.
- In 2005, about 59 percent of eighth-graders received basic level scores or higher. There was no overall improvement since 1996.

Source: National Assessment of Educational Progress

instill a love of science in young children but also to attract women and minorities to the field. And while much of the action takes place in the spring and summertime—from Space Day to camps to Arts Fest—the fall is a time for Penn State scientists to brainstorm about what to offer the next year, as well as an opportunity to maintain connections with the K–12 community through visits and brief day programs.

“There is an overall belief that you have to engage the public and provide venues for children, teachers and parents to see science in action and recognize the importance of science,” said Dr. Rebecca Peterson, director of outreach in the Eberly College of Science. “Most scientists recognize if we aren’t reaching out to young people, we are not going to have scientists in the future.”

Women in the Sciences

Many scientists agree that a lot of work needs to be done to encourage women, in particular, to consider science as a career choice.

This received media attention recently when former Harvard President Lawrence Summers made his infamous comment about whether women had the innate ability for science. “He made a lot of people furious,” said Dr. Nüket Acar, a former director of Penn State’s Women in the Sciences and Engineering Institute (WISE) and now a faculty member in veterinary and biomedical sciences. “But the issue resurfaced, which is a good thing.”

While the number of women in the sciences has increased over the last 30 years—particularly in the life sciences—the numbers are still low when it comes to the

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Chemistry Faculty Member
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math, physics, chemistry and engineering fields.

The key, scientists agree, is early intervention, and providing fun, hands-on experiences.

Undergraduates as Mentors

This past summer Penn State chemistry faculty member Dr. Jacqueline Bortiatynski —along with Dr. Joanna Skluzacek, outreach coordinator for Penn State’s Center for Nanoscale Science—offered for the first time the “Burger ‘n’ Fry Chemistry” camp, in which children learned about the chemistry of their favorite foods in a laboratory. The camp is just one offering of the Action Potential Science Experience program, which Bortiatynski co-directs along with Peterson.

Other Action Potential camps created by Bortiatynski, “Potions” and “The Adventures of the Apprentice’s Stone,” were so well received that they have been licensed by Infotonics Technology Center—a Center of Excellence in upstate New York—and are now used at summer programs in New York’s Finger Lakes region.

Important to such programs are Penn State students who act as mentors; in the camps, undergraduates typically work one-on-one with the young students. “The kids become attached to these role models,” says Bortiatynski. “They see that there are women in science, people of other ethnic backgrounds in science, and think that they might want to do that, too.”

Dr. Marguerite Ciolkosz, a retired chemistry teacher in State College who has worked as a volunteer at camp, added: “These mentors and volunteers were so excited about the fun for both teacher and student that the word will be spread to friends and colleagues. The impact will be felt in the quality of science teaching far and wide.”

Undergraduate mentors are also key for other, similar

programs offered at the University, including those from the College of Engineering.

Assistant Professor of Chemistry Dr. Mary Beth Williams focuses on encouraging undergraduate women to help out at science camps or at events such as Arts Fest.

“My goal would be to see a gender-neutral field,” said Williams. “I would like to see both young girls and boys look at careers in science as something they could do.”

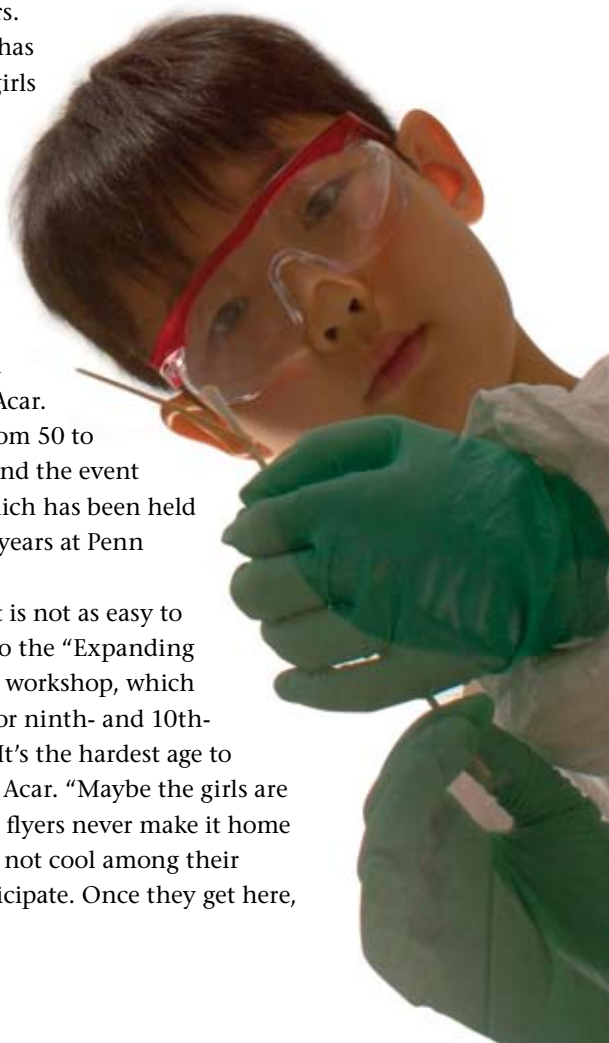
Ninth-Grade Girls Hard to Attract

WISE aims to provide for girls role models with its annual fall activities “Expanding Your Future in Science and Technology” and “Expanding Your Horizons in Science, Mathematics and Engineering.” This year Dr. Kathryn Sullivan, the first U.S. woman to walk in space, will join both events, which will take place on Nov. 4.

“Expanding Your Horizons” is a career exploration day for sixth-, seventh- and eighth-grade girls. WISE provides hands-on activities and brings in women role models from not only academia but also local industry, including veterinarians, physicists and engineers.

“Research has shown that girls can make up their minds about what they want to be when they grow up as early as sixth grade,” said Acar. Anywhere from 50 to 100 girls attend the event annually, which has been held for about 15 years at Penn State.

Acar said it is not as easy to attract girls to the “Expanding Your Future” workshop, which is intended for ninth- and 10th-grade girls. “It’s the hardest age to attract,” said Acar. “Maybe the girls are too busy, the flyers never make it home or maybe it’s not cool among their peers to participate. Once they get here,





Penn State's Women in the Sciences and Engineering Institute offers hands-on activities for young women. At left is a demonstration of chemical reactions; on the right, girls participate in a fiber optics workshop.

they have a good time and learn a lot. In addition to being introduced to fields that have been traditionally dominated by men, such as nuclear, civil, mechanical or aerospace engineering, girls are also introduced to newly emerging fields, such as nanotechnology."

Part of the challenge, added Acar, is that such careers are not typically tied in with their regular course work. "There's a gap. There should be an avenue where students are made more aware of these career choices. That void needs to be filled."

Penn State is helping K-12 teachers move in that direction. Assistant Professor of Materials Science and Engineering (College of Earth and Mineral Sciences) Dr. Chris Muhlstein has created with Penn State Public Broadcasting a new, multimedia 7-12 grade nanomaterials curriculum available on a new education portal (see page 25 for more information).

Diversity in Science

Promoting diversity in science is another ongoing goal. "One reason we don't have more minorities in particular is that they're not exposed to it," said Dr. Craig Cameron, Paul Berg Professor of Biochemistry and Molecular Biology. Cameron says that as an African American he has seen the challenges that minorities have faced and would like to see more interaction opportunities for at-risk youth "as early as possible, as long as possible and in as many facets as possible."

Cameron regularly invites undergraduate minority students (through WISE and Penn State's Minority Undergraduate Research Experience) to do research in his lab in the hope of keeping these students interested in science; he is currently seeking funding to expand the effort, for a program called InSure Success.

Class Visits

During the school year, Penn State faculty members often make their materials and curricula available for both visiting local classes and trips to teachers' classrooms in order to support K-12 science teaching.

For example, middle schoolers visited the lab of Penn State chemistry faculty member Dr. Jacqueline Bortiatynski for a rotation called "Chemistry Designed Specifically for You," developed in conjunction with the Center for Nanoscale Science. "The kids get to see how scientists can be creative in the way that they design things," with substances such as polymers, explained Bortiatynski.

"These sessions brought science to life for my students," said Steven McAninch, a science teacher in the State College Area School District. "Many students identified these lessons as some of their most memorable of the entire year."

In the meantime, the myth that science is inaccessible still needs debunking. On Williams' Web site is a quote that takes aim at such thinking: "We Make Chemistry Look Good." Williams explained, "It's tongue-in-cheek, but at the heart of it is the fact that we'd like to get around the stereotype that science is for only dorks, men and old people. We're saying that [our students] are so cool that even chemistry looks good."

And Bortiatynski points out that while it would be great if the Action Potential camps encouraged kids to look at science as a career choice, the main goal is to promote science literacy. "We'd like kids to see how science impacts what they do," she said. ▀