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Science-outreach office showed students, teachers 'cool' research this summer

BY JESSE BOYETT ANDERSON



Jesse Boyett Anderson

Terra Linda High School teacher Saum Zargar studied how to more efficiently cool off an overheated person in the lab of biological sciences Professor H. Craig Heller, through a summer program of the Office of Science Outreach.

Donald Kennedy, president emeritus and editor-in-chief of *Science*, kicked off The Stanford Challenge's initiative on K-12 education last April with an academic call to arms. Bemoaning the lack of scientific preparation of incoming college freshmen, Kennedy urged more rigorous science instruction in secondary schools.

The Office of Science Outreach (OSO) is helping heed this call to arms by enabling Stanford faculty to share the wonders of math, science and engineering with the general public, as well as excite K-12 students and teachers through two summer programs: One targets promising first-generation college students. The other is designed for middle and high school science teachers.

"If these programs help to inspire more Bay Area students to pursue science or engineering, we feel they are successful," said OSO Director Patricia Devaney. Originally opened in 2005, the office just wrapped up its first summer research internship program. The summer programs ran from June 18 to Aug. 10.

High school students

The office worked directly with local schools to identify high-achieving students who would be the first in their families to attend college. Each student spent eight weeks working in the

laboratory of a faculty mentor, and their projects ranged from conducting research on the behavior of silk proteins at air-fluid boundaries to monitoring the population of large- and medium-sized mammals at Jasper Ridge Biological Preserve to building a circuit to test the durability of an ultraviolet-light-emitting diode.

On Fridays, all 12 participants gathered to tour various research facilities, including the Stanford Linear Accelerator Center and the Stanford University Medical Media and Information Technologies center, where they tried their hands at virtual surgery. The program grew out of a conversation between Devaney and Stanford alumnus Chris Bischof, founder and principal of Eastside College Preparatory School, a private high school in East Palo Alto with ties to the Stanford School of Education.

Although every student to pass through Eastside Prep had gone on to college, Bischof told Devaney, they were not going into science and engineering.

"What can you do to help us?" Bischof asked.

The summer research internship program is Devaney's response. In its inaugural year, the program accommodated students who were either from Eastside Prep or High Tech High School in Redwood City. Most will be the first person in their family to attend college. Whether or not they ultimately pursue science or engineering remains to be seen.

One student's words, however, may offer a glimpse into her future. During the Aug. 9 poster session that capped her eight-week research internship, she commented on the likelihood that she would study science in college: "It will be a really big possibility now that I've done this," she said. "I really liked it. I liked going into the field, and I liked the biology."

Teacher program

On Aug. 10, 18 middle and high school teachers gathered in the atrium of the Packard Electrical Engineering Building to share what they had learned during a parallel program for secondary school educators. The Summer Research Program for Teachers is sponsored by the Office of Science Outreach in partnership with Industry Initiatives for Science and Math Education (IISME), a local nonprofit that matches Bay Area teachers with appropriate summer research internships.

"There's a lot of evidence that science research fellowships are one of the best professional development activities for science teachers," said Kaye Storm, who has directed IISME for the past 23 years. "They get to actually do science. They get to practice what they preach."

IISME has placed teachers in Stanford research labs each of the past three summers. When Storm first approached Devaney in 2005, she hoped to find positions for two or three teachers the following summer. Devaney proposed something on a larger scale: She adapted the IISME plan to capitalize on Stanford's resources.

This summer, teachers spent eight weeks in the lab of a faculty member researching everything from carbon nanostructures to the molecular markers of aging. On Mondays, they met with their fellow interns to discuss issues in teaching, tour research facilities and learn about innovative science research from some of Stanford's top faculty members.

At the conclusion of their fellowship, the teachers presented their research at a poster session and submitted an educational transfer plan—a blueprint for taking what they learned at Stanford into the classroom—to IISME. Each teacher also received a \$7,400 stipend—funded by Stanford, the San Mateo County Board of Supervisors, the Howard Hughes Medical Institute, the Camille and Henry Dreyfus Foundation and the National Science Foundation.

"It is hard to bring university-level research and make it palatable for a high school classroom," said IISME peer coach Tom Grace, who helped the teachers develop their educational transfer plans.

The program, although difficult, was worth it in the end, according to Saum Zargar, a biology teacher at Terra Linda High School in San Rafael. This was Zargar's third summer as an IISME fellow and his second at Stanford.

Last summer he worked with Jennifer Cochran, assistant professor of bioengineering, and Gene Connection, a local nonprofit that brings biotechnology into high school classrooms, to develop a series of laboratory exercises incorporating digital probes. This summer, he used his knowledge of digital instrumentation in the laboratory of Craig Heller, professor of biological sciences, to study how to more efficiently cool off a person who has overheated.

Zargar used his experience this summer to develop a student-directed lab activity incorporating digital instrumentation. This activity will accompany the first topic he teaches to his freshman biology students: the scientific method. Students will be asked to formulate their own hypotheses, devise experimental protocols, collect data with the digital probes and determine if the data support or refute their hypotheses.

In her closing remarks on Aug. 10, Devaney thanked faculty and graduate student researchers gathered in the Packard Building for making the program possible by welcoming teachers into their labs this summer. In all, more than 50 Stanford faculty members and students hosted, mentored or lectured in the teacher program, and more than 30 volunteered for the high school student program.

"You did it with no expectation of getting anything back except a new generation of better science teachers," said Devaney, noting that the 18 educators who took part in the summer program will go on to teach 3,000 students this year alone. "The potential leveraging impact of this program is really significant."

Middle and high school teachers interested in participating in an IISME fellowship at Stanford may contact Kaye Storm at (650) 326-4880 or kstorm@iisme.org.

Jesse Boyett Anderson is a freelance science writer.



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