

BioBridge Program Helps UCSD Bring the Excitement of Biological Discovery Into Area High School Classrooms

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All eyes on the glow: From left to right, San Ysidro High School students Karla Cervera, Carolina Avalos and Nicole Laforteza display the excitement of performing fluorescent protein purification with their science teacher Jenine Winslow during a recent BioBridge session

On a recent Saturday morning in Chula Vista, 25 science students from four San Diego County high schools were in a classroom learning about the wonders of DNA research, specifically how to isolate and purify protein samples derived from jellyfish and corals. Observing the isolated genetic specimens through laboratory vials and petri dishes, they become particularly enthused by the impressive array of fluorescent colors the specimens emit during the science exercise. "Wow, I really like the colors," cooed Mayra Gracia, a freshman at Chula Vista High School. "I never knew science could be like this." San Ysidro High senior Karen Flores was equally impressed. "It's neat learning with students from different schools and seeing how the genetic process really works." The source of all the excitement is a program called BioBridge, a new "hands-on" science education initiative conducted by the University of California, San Diego in partnership with the Sweetwater Union High School District, San Diego Unified School District, and Grossmont Union High School District.

"Through BioBridge, we are now seeing 21st Century discoveries in biology - such as in genetic research-- entering high school classrooms for student learning. There is not the usual 10 to 15-year lag time between laboratory discovery and students seeing these advances in textbooks." -- Steve Rodecker, Science Coordinator, Sweetwater Union High School District, and BioBridge Co-Coordinator

The mission of BioBridge is to link the educational and scientific communities in creating hands-on laboratory experiences that help enhance bioscience achievement at schools in underserved areas. BioBridge began in November 2005 in the laboratory of UCSD researcher Roger Tsien, a Howard Hughes Medical Institute investigator in Pharmacology. The program is flourishing in its current state as a science education outreach program through support from UCSD Student Educational Advancement (Student Affairs) and funding from the Fund for the Improvement of Postsecondary Education (FIPSE), and the Howard Hughes Medical Institute. (HHMI).

"BioBridge is a perfect example of what can happen in a strong relationship between a major university and major school districts such as Sweetwater, San Diego Unified and Grossmont Unified," says Loren Thompson, Assistant Vice Chancellor, UCSD Student Educational Advancement, the administrator of the HHMI and FIPSE grants supporting the BioBridge Program. "BioBridge helps bridge the gaps in science education faced by many secondary schools...It brings district teachers into UCSD laboratories to learn directly from university bioscientists about recent discoveries and lab techniques - knowledge which teachers use to train a cadre of their own students before training is fully integrated into the classroom."

BioBridge to date has trained more than 75 district science teachers in cutting-edge genetic research techniques. And currently, approximately 16 teachers at 10 district schools have implemented BioBridge training

into their everyday science curriculum, with additional schools and teachers being added each month, program officials report.

Taking Teachers Back to School: After receiving instruction in BioBridge techniques during morning lab sessions at UCSD, high school science learn about DNA molecular structure at the San Diego Supercomputer on campus. Later, they implement BioBridge knowledge and skills in their own classroom

Teachers learn through active hands-on laboratory experiences under UCSD geneticists and research specialists. Later at their own schools (about a week following training), teachers instruct a small group of their high school students in the new techniques during a four-hour Saturday workshop with university laboratory professionals. The trained high school students then assist their teacher in acclimating other students at their respective schools to the learned material once BioBridge techniques are fully implemented in classroom science curriculum.

Through its partnership with district schools, BioBridge has identified other opportunities to enhance student achievement in the program. For instance, as an added component during classroom implementation, trained bioscience undergraduates from UCSD's Hughes Scholars Program assist in BioBridge instruction and later serve as role models in science and college preparation to students. In addition, BioBridge is working with William Howe, director, Center for Student Leadership Services in UCSD Student Life, to train a core group of BioBridge high school students in leadership skills to help fellow classmates succeed in science and BioBridge techniques.

In its current phase with teachers and their students, BioBridge is instructing participants in the process of DNA transformation and protein purification, using fluorescent proteins --a cutting-edge research advance developed at UCSD in Dr. Tsien's laboratory and which is being used in research facilities worldwide to visualize cellular signaling processes.

During their day-long training session at UCSD, teachers also attend sessions at virtual- reality facilities in the California Institute for Telecommunications & Information Technology (Calit2) to study the 3-D molecular biology of important proteins.

"Our visualization facilities allow teachers to look at three-dimensional images of proteins that can be ten feet tall," says Jürgen Schulze, a Calit2 research scientist. "Soon they will also be able to immerse themselves in a complete 3-D environment projected all around them --making the learning experience that much more powerful and memorable."

The protein visualizations come from the Protein Data Bank, based in the San Diego Supercomputer on the UCSD campus. And at San Diego Supercomputer's Teacher Tech facility, teachers receive further training in protein visualization.

District teachers and students will later be exposed to additional cutting-edge science techniques and discovery at UCSD through BioBridge as the program progresses.

Says Jeremy Babendure, Ph.D., BioBridge director: "BioBridge not only boosts kids' excitement and interest in science, it also has the potential of boosting the declining number of U.S. high school students pursuing undergraduate science degrees." What's more, he says, the program engages science teachers in a stimulating way, helping them to integrate new scientific learning more quickly into the classroom setting than traditional ways. These advantages enthuse both students and teachers, feedback from both groups shows.

After leading his cadre of students through a recent BioBridge training session, Greg Steinbach, a science teacher at San Diego's Mira Mesa High School, says, "The program's hands-on learning is what was great for my kids. It brought science to life for them in a meaningful way -teaching them how cool science can be, especially when they can actually see the colors of the proteins. These are things many students don't ordinarily get a chance to experience because of lack of school resources."

And there are direct advantages for teachers as well, explains Robert Manroe, Castle Park High science teacher and co-coordinator of BioBridge: "Through BioBridge we are getting teachers back into the laboratory, re-exciting them about scientific content, showing them what's new and cutting-edge in biotechnology and how to implement this in the classroom. If the content is exciting to the teacher, the chances are high that this will rub off on students as well."

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