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HOWARD HUGHES MEDICAL INSTITUTE

RESEARCH NEWS

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HHMI Chooses Twelve Schools To Join National Science Education Experiment

Hundreds of students at 24 large universities and small colleges currently participate in a national experiment that aims to change the future of undergraduate science education. Now the Howard Hughes Medical Institute has invited 12 more schools to join the Science Education Alliance to engage their students in scientific discovery on a national scale.

HHMI created the Science Education Alliance (SEA) in 2007 in the hope that it would become a resource for science educators. Faculty participating in the SEA work together to deliver innovative science education programs and bring the excitement of doing science directly to students in a novel, collaborative way. HHMI has committed $4 million over four years to the first Alliance program – the National Genomics Research Initiative. It is a two-part, year-long course that enables students to make real discoveries by doing research on bacterial viruses, called phage. “Students across the country are really talking about science and thinking about the research they are doing,” says Tuajuanda Jordan, SEA’s director. “We are helping to bring up a new generation of students who love research and want to become scientists.”

“Beyond the opportunities for beginning students to be involved in authentic discovery, a real strength of the SEA is the partnership of the member schools,” says Peter J. Bruns, HHMI’s vice president for grants and special programs. “The faculty members are helping each other and the communication among them is really important. That sharing of resources and ideas is a novel and exciting development.”

Participating schools, which are selected through national competitions, generally offer the course as a substitute for their introductory biology laboratory class. In the first term, the beginning college students isolate phage from locally collected environmental samples. Given the diversity of these viruses, each one is almost certain to be unique, so the students get to name their newly identified life form. They then spend the rest of the term purifying and characterizing their phage and extracting its DNA. Between terms, the purified DNA is sent to the Joint Genome Institute-Los Alamos National Laboratory in New Mexico, where it is sequenced. In the second

term, the students receive files containing their isolated phage's DNA sequence. The students then use bioinformatics tools to analyze and annotate the genomes from their phage.

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Students in the SEA course say they have been inspired by the chance to do hands-on science. And faculty who teach the classes say helping students embrace the creativity of real research has changed the way they look at teaching.

"It wasn't even the end of the semester and the students were working independently, doing things on their own. I don't normally see that in my freshman chemistry labs," said Melinda Harrison, a chemistry professor at Cabrini College, a small Catholic liberal arts college in Radnor, PA, which first offered the course in Fall 2009. "What's really cool about it is there are endless possibilities. There is not one outcome that everyone has to get."

The faculty members' excitement is borne out by data collected by the first 12 schools that joined the SEA. In 2008-2009—the program's first full year—participants in the SEA course were more likely to complete the class than students in other labs for introductory biology students. Only 2-5 percent of students dropped out compared to school-wide averages of 14 percent. And the SEA students did better in the introductory biology classes by an average of six out of 100 possible points when compared to other students not taking the SEA course. Those gains held up across the board, no matter whether the students were honors or at-risk students, biology majors or those who had not yet declared a major.

The 12 new SEA colleges and universities were chosen through a competitive application process. They will start offering the course in Fall 2010. HHMI provides research and laboratory materials and support from Jordan and a dedicated HHMI staff.

Four other colleges will join the SEA as associate members. They will attend training sessions that will allow them to implement this research experience in laboratory classes on their campuses. Queensborough Community College of the City College of New York system will be the first community college

in the country to become an associate member of the Alliance. Queensborough biology professor Patricia Schneider was initially attracted to the SEA project because it is so different from traditional lab courses. “The thing that was most appealing to me was that our students will participate in a nationwide authentic research project.” Schneider says. “Working with faculty from campuses all over the country will be a real source of support and inspiration.”

That support network is an important part of the Alliance, Bruns says. He notes that during the 2009-2010 school year, the SEA set up a buddy system to match new schools with those that had already been through the program. The new faculty members say it is valuable to be able to turn to professors who have already taught the class with questions about everything from troubleshooting a problem with their phage preparations to using bioinformatics tools. There is also an active web site that allows faculty members and students to share questions and ideas, successes and setbacks.

“The faculty are modifying the program as they go to make the lab instructions better and lower the materials costs– some of the protocols are different now, not because we changed them but because the participants did,” Bruns says.

Biology professor Vassie Ware at Lehigh University tries to foster a similar supportive atmosphere among students in her SEA class and inside the biology department, which offered the SEA course for the first time in the Fall 2009. For example, the students were able get help from graduate students and faculty members in the department to take a picture of their phage using an electron microscope. “That may have been the most exciting thing for the students, to see the phage that they had been working on for months,” Ware says. “Their excitement has permeated the entire department.”

The newly-selected participants in the SEA’s National Genomics Research Initiative are

Baylor University Waco, TX

Bucknell University Lewisburg, PA

Culver-Stockton College Canton, MO

Gonzaga University Spokane, WA

Jacksonville State University Jacksonville, AL

Loyola-Marymount University Los Angeles, CA

North Carolina Central University Durham, NC

Purdue University West Lafayette, IN

University of Alabama-Birmingham Birmingham, AL

University of Texas-El Paso El Paso, TX

University of Wisconsin-River Falls River Falls, WI

Virginia Commonwealth University Richmond, VA

The associate members are

Brooklyn College New York, NY

College of Charleston Charleston, SC

Queensborough Community College New York, NY

University of California-Davis Davis, CA