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Science Education Alliance Builds Research Courses for the Next Generation

During the last three years, the Howard Hughes Medical Institute (HHMI) has recruited 44 colleges and universities across the country to join its Science Education Alliance (SEA), which is changing how freshmen learn about science by providing them with an authentic, classroom-based research experience. Now professors from three schools offering the SEA course will help create the next generation of research-based courses that will extend the program's reach to upperclassmen.

This summer, faculty from Cabrini College, the University of Louisiana, Monroe, and the University of Puerto Rico, Cayey, will spend several weeks at HHMI's Janelia Farm Research Campus in Ashburn, Virginia, designing lessons and testing experiments that will be used in the new courses.

"The very best people to extend the SEA to reach a broader group of students are the SEA faculty themselves," says Peter J. Bruns, HHMI's vice president for grants and special programs. "They are informed, experienced, enthusiastic, and committed educators. They know the strength of the SEA approach and are now ready to use it to enhance upper level courses."

These "SEA sabbaticals" are another step toward HHMI's long-term goal of making the SEA a resource for science educators nationwide. When HHMI unveiled the SEA program in 2007, it committed \$4 million over four years to the development and rollout of the Alliance's first course: the National Genomics Research Initiative. That year-long course has enabled freshmen to make real discoveries by doing research on phage, which are viruses that infect bacteria. The research-based laboratory course provides beginning college students with a true research experience that is teaching them how to approach scientific problems creatively and will hopefully solidify their interest in a career in science.

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- **Tuajuanda Jordan**

The freshmen students in the SEA course work closely with faculty to design experiments and make scientific discoveries. Many say the experience has changed their view of science. But it soon became apparent that one set of courses would not be enough to continue challenging students as they progressed through college. So HHMI decided to look for creative solutions to that problem.

"The question we were faced with was what to do with the students once they came out of that first class," says Tuajuanda Jordan, the SEA's director. "So we put that question out there to our faculty: How do we develop courses that will complement what is coming out of our freshman-level class?"

Jordan invited the 27 schools currently participating in the SEA to apply, and three were accepted. These new projects are focused on designing a curriculum that will pick up where the virus genomics class ends.

- Faculty from

Cabrini College

in Radnor, Pennsylvania, will develop a cellular and molecular biology course in which students will examine phage genes and determine which are essential for the virus's survival. In a biochemistry course, students will purify and characterize the proteins produced by the genes to determine their function.

- **University of Louisiana at Monroe**

's team will create three modules that could be used in several courses for juniors and seniors. In one, they will create lessons in which students develop methods to determine how their phages reproduce after they enter bacteria. Students would look at genetic markers to determine how phages should be classified into related "clusters" in a second module. Students taking the third course would explore the best way to determine whether genes are

essential to the survival of the virus.

- **University of Puerto Rico, Cayey**

faculty will create a course to help students examine and characterize various phage proteins. Proteins of interest include those that make up the virus's protective coating, and those that are activated once infection has begun.

During their sabbaticals, the three faculty teams will work at HHMI's Janelia Farm Research Campus, where the SEA is based. Janelia Farm is a world-class biomedical research center in which scientists from diverse disciplines use emerging and innovative technologies to pursue biology's most challenging problems.

The new courses will be evaluated during the next academic year. If promising, the courses will be refined for broad adaptation and disseminated by the SEA. Jordan said that some of the classes could be available to the larger science education community by the 2011-2012 school year.

Jordan hopes that summer sabbaticals will become a regular offering for faculty who participate in programs funded through the SEA. In the future, she envisions opportunities for faculty members to explore the development of new courses or modules based on their own research or collaborations with faculty in other disciplines. "Being part of the Alliance gives the faculty an opportunity to figure out how they can infuse their research interests into the curriculum. So it is a win-win situation for them and their students," she says.