UCSD Launches Education Initiative to Keep Middle School Girls Interested in Engineering and Technology Careers

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UCSD engineering faculty and students, together with San Diego Supercomputer staff, are launching an environmental education initiative they hope will keep middle school girls excited about science, and eventually, careers in engineering. The UCSD team will help San Diego county students monitor the air quality, solar radiation, and other environmental factors surrounding their own schools, and will use the environmental research concepts and techniques to create a multi-player online science challenge game designed specifically for 12-15 year-old girls.

The UCSD Information Technology - Engineering and Environmental Education Tools project, dubbed IT-E3 Tools, is funded through a new three-year, $1.2 million National Science Foundation grant as part of the Information Technology Experiences for Students and Teachers (ITEST) award program. ITEST was created in response to the shortage of information technology workers in the U.S. and is supported with income from H-1B visas (awarded to professionals from other countries recruited to fill specialized jobs in the U.S.).

"Despite the fact that information technology touches every aspect of our lives, women remain a minority in engineering enrollment at U.S. universities and in technology careers," says Jeanne Ferrante, associate dean of the UCSD Jacobs School of Engineering and principal investigator of the project. "There is a critical leak in the talent pipeline, when girls lose their enthusiasm for math and science in the vulnerable years between 6 th and 9 th grade. We know that one of the best ways to keep girls engaged is to show them how engineering and computing connects with issues in their own lives."

Ferrante says the principles behind the IT-E3 initiative stem from the Jacobs School of Engineering's successful Teams in Engineering Service (TIES) program. This service learning program recruits teams of UCSD undergraduates to solve real-world technology problems for San Diego non-profit organizations.

"TIES attracts a high percentage of female participants who want to apply their engineering skills towards a worthy cause," says TIES program director and IT-E3 co-principal investigator Silvia Mah. TIES teams are already implementing an environmental education module at the Preuss School, and UCSD students participating in TIES will work with faculty and staff of the Jacobs School of Engineering and San Diego Supercomputer Center on the IT-E3 initiative, and will serve as role models and peer mentors to the middle school students.

The first component of the new program brings science to life by giving students the tools to measure air quality and other environmental indicators around their own schools. UCSD undergraduates will design low-cost environmental sensors, which teachers and their classes can build and deploy at their school sites. Students will be able to visualize and share data they collect with other students and discover the value of data in understanding environmental issues. Airborne particulate concentration and wind speed information, for example, can help students understand their school's health risks during fire season.

"Students remember the catastrophic fires of 2003 that drove many people from their homes and caused several local school districts to close schools," says Steven Buckley, a UCSD mechanical and aerospace

engineering professor who teaches in TIES and a co-principal investigator in the new project. "At that time, there were only three stations around the county able to provide crucial information about concentrations of airborne particulates, and limited resources for interpretation of concentrations to guide decisions about health and safety. We hope that the measurements that we make will be useful and capture the students' interests."

The San Diego Supercomputer Center will host a website where data can be collected from classes across the county. Web-based user interfaces will allow students and teachers to interact with and analyze the scientific data.

In addition to airborne particulates, sensors will measure local solar radiation, which will help students understand why they need to be careful about sun exposure while at the same time analyze the potential benefit of solar power for their school site.

In order to help teachers integrate this hands-on learning experience with their science curricula, UCSD will host summer workshops and monthly professional development meetings, and UCSD student interns will provide in-class support. Interested teachers from schools throughout San Diego County can apply for the training which will begin in summer 2007 for classroom implementation in fall 2007.

Environmental investigation techniques, tools, and data will all become elements of a new multi-player online science challenge game designed specifically for middle school girls.

"We know girls like games that involve adventure and mystery and where they can take on the persona of the lead character. Girls are also more likely to play games in a community, rather than on their own," says Diane Baxter, education director with the San Diego Supercomputer Center, who will oversee development of the game.

Game topics will support California 's earth science curriculum standards for middle school. The new game will build on an early prototype of a virtual science center, with many galleries to explore. Players create for themselves an avatar, or character, and set out to solve challenges. Many solutions will require the players to work together. Incentives at each level completion include "Talk to a Scientist" to enrich the mentoring aspect of the game. As girls gain proficiency levels, they will become mentors for new visitors to the space.

"We hope that this online game will provide peer and mentor support and form a virtual community that will help sustain girls' interest in science and technology," says Baxter.

Researchers expect a first prototype of the new game to be available by spring 2008.

The science challenge video game will be introduced to students in participating middle school classes, including Preuss and Gompers Middle Schools. In addition, UCSD will collaborate with informal science education programs including Sally Ride Science, TechTrek, and Expanding Your Horizons to provide training workshops for girls during summer science camps and one-day enrichment programs.

Working through the university's Center for Research on Educational Equity, Assessment and Teaching Excellence (CREATE), UCSD plans to conduct extensive research to understand the outcomes of the program and provide insights for future initiatives focused on encouraging girls to pursue careers in science.

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