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SDSC, SDSU Receive NSF Grant to Expand Computer Science Curriculum

Program to Offer "Computer Science Principles" Classes at High School, Undergraduate Levels

The San Diego Supercomputer Center (SDSC) at the University of California, San Diego (UCSD) and San Diego State University (SDSU), have received National Science Foundation (NSF) grants to jointly expand the computer sciences curriculum among San Diego's high schools, community colleges, and universities.

The three-year grants, worth a total of almost $1 million, are for a project called 'Computing Principles for All Students' Success' or *ComPASS*. The overall goal of *ComPASS* is to improve Southern California's educational capacity for preparing high school and college students of all backgrounds and disciplinary interests to contribute to and participate in what has become a computationally driven economic future.

ComPASS contributes to a nationwide goal of training approximately 10,000 high school teachers to teach advanced placement (AP) computer science (CS) principles courses by the year 2015. This larger national program, the CS10K, was launched in response to national studies and task force reports identifying a crisis in U.S. workforce preparedness. The reports specifically cite a serious shortage of workers to fill workplace demands for trained, innovative computing experts and computational problem-solvers in every field. A brief presentation on the *ComPASS* project is on the agenda of the Wednesday, September 14th meeting of the San Diego County Board of Education.

"UCSD and SDSU are committed to addressing national challenges in computing education," said Diane Baxter, director of education at SDSC and UCSD Principal Investigator for the *ComPASS* project. "This project strategically targets the critical elements necessary for offering stimulating and engaging college-preparatory computer science courses to all students in high school, when they are exploring directions and possibilities for their own futures."

"A solid conceptual understanding of the ideas, logic, and principles that underlie computing will benefit all of our students, not just the computer science majors," said Leland Beck, Chair of the Computer Science Department at SDSU and SDSU Principal Investigator for the *ComPASS* project. "It will also provide an excellent background for soon-to-be teachers in all fields."

The *ComPASS* initiative adopts and adapts one of five national pilot versions of the CS Principles course developed through the CS10K program, guided by the content and standards established by The College Board's CS Principles project (http://csprinciples.org/).

This version of the CS Principles course was developed by Beth Simon, a computer science and engineering faculty member at UC San Diego, Director of the UC San Diego Center for Teaching Development, and a recognized national leader in computer science education.

During the 2010-2011 academic year, Dr. Simon taught the course, Computer Science Engineering 3, to more than 1,000 students from all majors at UC San Diego. One of the main supporters of CSE 3 has been UC San Diego's Sixth College, which includes in its mission the promotion of digital literacy and interdisciplinary thinking among undergraduates, and which requires CSE 3 as part of its general education curriculum. The results of the pilot program last year provide strong support for its value as a vehicle for broadening computing interest and expertise among women and minorities, who made up more than half of the classes last year.

"CS principles give students the logical foundations for understanding how to use computers to solve the problems and questions that interest them," said Simon, one of the five national "CS Principles Pilot" principle investigators. Two students from her course expressed what they gained from the course this way: "[This class] has given me confidence that I'm able to figure things out on a computer that I never would have thought that I could do" and "Now, every time I find myself playing a video game, I actually understand what makes it work."
Under the new NSF grant, the *ComPASS* project will:

- Develop and evaluate pedagogical content knowledge curriculum to support faculty in adopting best methods and practices in teaching Computer Science Principles (CSP),

- Develop and evaluate tailored training and support programs to engage university faculty, in-service high school teachers with or without computing backgrounds, and pre-service high school teachers without computing backgrounds to teach CSP, and

- Continue development of the San Diego-area computing education community through the San Diego Computer Science Teachers Association (CSTA) chapter, specifically integrating support for new teachers.

Specifically, the *ComPASS* program calls for SDSU to offer pre-service teacher training through a senior-year extended course covering both content and methods of CSP, with an embedded practicum of teaching experience. This course will be specifically promoted to all single-subject credential majors, not just math and science.

UC San Diego will offer methods training for CalTeach pre-service math and science teachers through an existing specialized training program for teaching staff for CSP. UCSD and SDSC will offer training for current high school and community college teachers through summer workshops and year-round professional development.

At least six community colleges in the region will offer CS Principles courses equivalent to UC San Diego and SDSU's CSP courses, with the computer sciences departments at UCSD and SDSU committed to accept these classes for transfer credit, providing students pass the exams and complete the required project.

In addition, about 15 high schools will teach comparable CSP courses, with a similar agreement regarding transfer credit as that agreed upon for community colleges.

Transferable credit to the San Diego area's two largest state universities will attract high school students into the classes, giving them a strong foundation from which to integrate computing into any field they pursue.

The *ComPASS* project seeks to rigorously evaluate a broadly applicable and sustainable model for introducing computer science principles into general education at the high school level. The project will evaluate strategies and methods designed to prepare teachers to teach computer science while developing support for the value of this course among college-bound students, their parents, and their school administrators.

"To build sustainability, we need to create a new pipeline of instructors through offerings such as a novel bachelor's level program, to engage single-subject credential majors across all fields in training and gaining preliminary practice in teaching CS Principles," said Joe Pistone, president of the San Diego chapter of the Computer Science Teachers Association.

The *ComPASS* program was awarded under NSF grants 1138512 (UC San Diego) and 1138492 (SDSU).

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