Michael Buckley, State University of New York at Buffalo

Socially Relevant Computing:
Computer Science Solves Real-World Problems

Unfairly or not, computer science has gained a reputation among some college students as being a dull and abstract subject. Researchers at the Center for Socially Relevant Computing in New York are working to reverse this perception by promoting computer courses and software design projects that give students the opportunity to make a profound impact on people's lives.

While some first-year computer science courses teach software programming by having students write applications that count ducks or play chess, researcher Michael Buckley's students are creating software that enables speech-impaired adults to communicate and allows firefighters to work more safely in dangerous situations.

Teaching students the basics of computer science and engineering through projects that have the potential to dramatically improve people's lives is a driving force behind the Center for Socially Relevant Computing. Buckley co-founded the center at the State University of New York at Buffalo (UB) in 2008 with financial and software support from Microsoft External Research. Its programs seek to attract more students—particularly women and minorities—to technology by changing the common perception of computer science as an abstract, isolated field and showing that the profession plays an important role in solving significant, real-world problems.

This objective reflects a broader concern among educators and business leaders that U.S. student enrollment in science, technology, engineering and math (STEM) courses is lagging behind the rapidly growing demand for qualified professionals in STEM fields.

"A lot of people assume computer science has limited reach, that it's all huge amounts of data and theorems and coding," says Buckley, who is the director of the center and a UB associate faculty member. "We want to show that this is a helping profession, and that making a profound social impact through computer science is within the reach of any undergraduate student."

The center's initiatives include offering introductory computer programming course materials that weave social relevance and community outreach activities into students' daily work, such as learning to construct data arrays by studying the movement of water pollution through the Great Lakes. Buckley and Kris Schindler, a teaching assistant professor in the UB computer science and engineering department, have also developed a pair of senior-level software engineering courses in which students work in teams to design and build technologies that solve real-world challenges faced by individuals and community nonprofit organizations.

Recent projects include the DISCO system, a programmable hardware and software system that employs lights, sounds and other sensory input to teach choice-making and other skills to physically and developmentally disabled children at a care facility near the university. In another project, students designed a wireless

Computer science students at the Center for Socially Relevant Computing work on a remote-controlled wheelchair that will be used to teach mobility to physically disabled children.

networking device for emergency response personnel, such as firefighters, that continuously monitors the wearer's position and vital signs and provides two-way communications.

"These projects have showed us that when students are passionate about the work they're doing, they will excel," says Schindler. "The students recognize that long after they finish a project, real people are continuing to benefit from the technology."

The vision for the center originated several years ago, when Buckley was looking for ways to get undergraduates more excited about introductory computing courses. "I found that a lot of the textbooks and sample programs used abstract lessons about separating cows from horses, or they mainly talked about how to design computer games," he says.

Around that time, Schindler asked if Buckley and his students might like to help design a software application that could be used for communication by a stroke patient named David, who was unable to speak. "When we started rounding up students to work on the project, I was amazed at how charged up they got," says Buckley.

Students met with David several times to learn more about his requirements and continued the project well after the end of their semester in Buckley's class. They succeeded in building a communication device called the UB Talker that allows David to select preprogrammed phrases as well as type new words by touching the screen on a tablet PC, which then translates his selections into speech. The night that he received his UB Talker from the students, David used the device to make his first phone call in 20 years. Subsequent groups of students have continued refining the UB Talker software as a tool to help speech-impaired individuals communicate in school, at work and in social environments.

These days, Buckley and Schindler typically have more than a dozen socially relevant technology projects lined up each semester for students to pursue. Teams can also identify a need in the community and develop their own project. Nonprofits, government

organizations and individuals can submit requests for technology assistance to the Center for Socially Relevant Computing on its Web site. The site also provides sample curricula and other resources for university faculty members interested in launching their own socially relevant computing courses, as well as an invitation for companies to sponsor technology projects.

"In Mike and Kris's classes, it's a lot more interesting because we get to create real software that can make someone's life dramatically better," says Eric Nagler, a junior in computer engineering at UB who has worked on both the UB Talker and firefighter communication software projects. "I like the challenge of being given these development tools and having to figure out on my own how to design an application that works. That experience will make me a better computer engineer in the end."

Support from Microsoft External Research is helping the center add new software and computers to its project design labs. Students do most of their development work using the Microsoft .NET Framework and the Microsoft Office Access® database application. "We like .NET because it's powerful but also very stable, and students can get up to speed on it quickly," says Schindler.

Other universities are joining the movement to make their computer science courses more relevant, both in terms of appealing to students' personal interests and addressing important problems in society. At Rice University in Houston, Texas, three professors with ties to the Center for Socially Relevant Computing have launched a course that involves developing computational tools to assess hurricane risk and design evacuation policies. Teams of students in computer science, political science and civil engineering have shared their results with the City of Houston's Office of Emergency Management to help plan for future disasters.

Jane Margolis, a senior researcher in the Institute for Democracy, Education and Access at the University of California, Los Angeles, who is also working to make computer science education more relevant for students, says the UB center provides an important resource for educators concerned with broadening participation in computing. "Finally, there is a center that centralizes, examines, designs and further explores socially relevant computing and makes it available to the larger community," says Margolis, who adds that she plans to adapt some of the online resources for her organization's work with Los Angeles high school students.

Buckley hopes this groundswell of interest in socially relevant computing education will enable the center at UB to connect more students and faculty members with community organizations that have problems to solve through technology.

"Students can make the world a better place, become experts in the latest software and hardware, and have fun doing it," says Buckley. "With all of that, why wouldn't computer science be the best major on campus?"

At a Glance

Project: Center for Socially Relevant Computing

Location: State University of New York at Buffalo (UB)

Project Principals:

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Web Site:

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Microsoft Technologies:

.NET Framework, Office Access, Tablet SDK, .NET Compact Framework, Speech API