At Your Service

A Russ College Professor Brings Service Learning to Life

Engineering students come to college ready to solve problems. It's in their nature to think creatively and look a tall the angles for a viable solution. Professional engineers do it every day: Just look at NASA's victory this year repairing Space Shuttle Discovery's underbelly via a spacewalk during the ship's flight. NASA engineers had to make on-the-spot decisions that meant life or death for the astronauts aboard.

While the Russ College's students don't have quite that burden to bear, a new pedagogy—service learning—is teaching Russ College students not only how to apply their know-how to real-life problems, but also what it means to become an outstanding citizen.

Service Learning on the Rise

Service learning is fast becoming the nation's hottest teaching trend, a viable way of teaching from elementary school through the collegiate level.

"Service learning is a pedagogy that has students learning outside of the classroom to accomplish three goals," said Merle Graybill, associate dean of students and director of Ohio University's Center for Community Service. "The first is to give students the opportunity to apply what they've learned within their community by working with real problems. The second is to afford the community recipients the benefit of faculty and student expertise. The last is the opportunity to contribute to the education of young people."

The center connects professors with community partners, who then collaborate on a project that ultimately benefits both the community—the end-user of the product or service—and students, who gain a real-life experience in solving a problem and get a dose of positive citizenship.

Former software engineer Chang Liu, now assistant professor in the School of Electrical Engineering and Computer Science, brought the concept into his classroom. After two years of teaching a senior-level, project-based computer science class, Liu sensed that his students were detached from the project's outcome and that in general, the class seemed, well, boring.

"I was looking for a real project that a real engineer would have to solve. That's how students learn to distinguish what's really important from what's not so important," Liu said.

Once Liu heard about the pedagogy involved in service learning, he and other Russ College faculty participated in a few seminars both on and off-campus to find out more. For Liu, that's when it clicked.

Computer science Ph.D. student Reuben Dlamini presents to the software design and development class during spring quarter 2005.

Assistant Professor Chang Liu works with students in his class.

A patron uses the self-checkout system.

"This is what I was looking for. The students must now look for real solutions, because they will affect real people," he said.

The faculty worked with Graybill and Karen Sandell, the recently retired founding director of the Center for Teaching Excellence, who coached faculty to enhance the connection between teaching and learning. The center hosts special programs, workshops, brown bag discussions, and individual consultations. It shares the University's mission of constantly strengthening the teaching culture by highlighting and sharing best practices among University faculty and instructional staff.

Theory Meets Real-Time

Last spring, Liu put his software design and development students to work on a real project housed in a building that serves everyone from babies to boomers and beyond: the public library. And Steve Hedges, director of the Nelsonville Public Library System, couldn't have been more thrilled.

"We seldom have time to do all the software projects we'd like to pursue," Hedges said.

Liu tasked his students with creating a self-checkout system at the Athens City branch of the county library system. They designed a software program that enables library users to check out their own library books using their library card, a PC, a hand-held bar code scanner, and a printer. Readers simply scan their card, scan their items, click an icon to complete the transaction, and choose whether to print book titles and due dates on a paper receipt or hand-stamp due dates into the books.

The program is just one product the students created for the library system. Because the Nelsonville Public Library System (which runs six branches, including the Athens branch serving Athens County) uses open-source software exclusively, Liu's students were able to tackle several more projects.

In open-source software, the underlying programming code is available to the users so they can read it, make changes to it, and build new versions of the software incorporating their changes. "It's easy to modify and allows new systems to be integrated into the existing system," Lui says. The library system is one of the first in the nation to use the software.

Most recently, the library has employed an online organizational climate survey—also developed by Liu's students—so staff can evaluate the library system with complete anonymity, Hedges noted. And opportunities for future projects abound.

"We keep a list of projects in an online 'wiki' that the class can access any time," he explained. ("Wiki" is from the Hawaiian term "wiki wiki," meaning "quick" or "informal." A wiki is a Web application enabling users to add content, as on an Internet forum.) "The needs range from internal projects that would save staff time, to external projects that would serve the public," he said.

According to Hedges, the student projects have had many outcomes and benefits. "Sometimes their work helps us complete projects, sometimes they show us new approaches to solving problems, and sometimes they re-define projects for us," he said.

Liu says he would welcome working with other city departments, whether or not they use the software.

"My goal is that students learn while the community benefits. Team knowledge and civic responsibility—that's service learning," Liu said.

Success by Any Measure

In the world outside of academia, the successful outcome of a service learning marriage seems obvious: students gain real-world experience and feel good about helping their community; the "customer" gets a product everyone in the community can use. Sandell says that service learning's success on an academic level is determined by how well ideas move from one faculty member to the next.

"We measure success by the number of faculty who develop and continue teaching courses. Dr. Liu has very successfully incorporated service learning with both undergraduate and graduate students. He also has received National Science Foundation (NSF) funds to both enhance the teaching environment in his service learning classes and to assess his students' learning," she said.

In fact, Liu recently won a $74,999 NSF award to develop an educational software process that will facilitate cross-term, cross-team projects for service learning. This will help ensure organization in the classroom, because projects from community partners with different backgrounds and needs often don't have the structure of traditional academic projects.

Continuously Seeking Improvement

Even with Liu's success, he sees how his service learning pedagogy can become better. After teaching a few classes, Liu noticed that time constraints occasionally prevented the completion of projects.

"Each quarter is 10 weeks long, which leaves only two weeks for implementation—not enough time," he said. Sometimes, clients upgraded software before the students could finish the project using the original software.

To remedy this issue, Liu is also using his NSF grant to help him develop a service learning program better acclimated to the realities of the software engineering world.

"Software engineering is about large programming problems, not small, disciplined problems. As it is now, students can do the design for large projects, but the quarter ends before they can implement their work," he says.

Liu's educational software process integrates service learning for large projects to be completed over three or four quarters instead of one. The project lasts longer, and more students over time are invested in the outcome. The more students introduced to service learning, the better.

Sandell says Liu's dedication to service learning has made him a role model for other faculty members—inside and outside of engineering.

"Dr. Liu has done amazing things in his classes and with his students because he understands that students learn best when they can move beyond the practice atmosphere of the classroom to an actual setting where the work they are doing will be used," she said. "A practice project might result in an 'okay' solution. When the outcomes of their work will actually be used, students become inspired to find the best solution."

SERVICE THAT KNOWS NO BOUNDS

A new Russ College student organization is all about service. Engineers Without Borders helps developing communities worldwide with engineering needs while teaching engineering students about the problems and how to solve them.

Jeff Giesey, associate professor in the School of Electrical Engineering and Computer Science, established the Ohio University chapter in 2004.

"The idea is to create students who are more globally aware and get them involved outside the classroom," he explained.

Last year, the group designed and constructed a foot bridge for a park in nearby Chauncey, Ohio. Colleen Mitchell, B.S.C.E. '05, now a design engineer at an environmental engineering firm in Richmond, Virginia, said that as a student, working so close to home was eye-opening. "Meeting with the citizens and hearing what they needed, as opposed to what we thought they needed, was a great advantage," she said.

Engineers Without Borders students survey the Chauncey, Ohio, foot bridge site in March 2005.

This coming academic year, the chapter will design and develop sustainable teachers' accommodations for a village in Ghana. The village's chief, Nana K. Owuso-Kwarteng, recently finished his Ph.D. at Ohio University while working with the Institute of African Child.

Giesey scouted out the project in March. "Their goal is to get children educated. Currently, only a few of their students pass the high school entrance exam because of the lack of teachers," Giesey said.

Two faculty and two students will travel to Ghana in December for a preliminary assessment, then a full group will go in June to build a duplex the village can copy.

Mitchell said she is impressed that Engineers Without Borders isn't only interested in providing a solution, but in creating understanding within a community of how and why a solution was obtained. "The objective is to teach the community how to take care of things for themselves, and to pass on their knowledge," she noted.

As for herself? "Nothing can replace the experience of working hands-on to find a solution. Ohio University provided me with the foundation—now it's time to start building," she said.