University of Massachusetts Lowell

CICEP | INNOVATION AND ECONOMIC PROSPERITY UNIVERSITIES AWARDS PROGRAM

CASE STUDY 2014

Service-Learning Integrated throughout the College of Engineering (SLICE)

UMass Lowell's Service-Learning Integrated throughout the College of Engineering (SLICE)[1] program integrates service-learning into the engineering curriculum so that every student is exposed to service-learning in every semester. Since 2004, SLICE has established sustainable partnerships with regional community organizations.

The SLICE program connects faculty, students and external community partners to collaborate on engineering projects. Local organizations present an identified need to the SLICE Coordinator, who engages with faculty to incorporate the project into an engineering course. The students use subject knowledge learned in the classroom and apply it to the project which is a real world problem (*an identified need by an external partner*). By challenging students to come up with solutions, it leads to a better understanding of the course material. Actual and potential outcomes of incorporating service-learning throughout the college benefits students, faculty, the community, and the institution.

SLICE Outcomes

For Students	For Faculty	For Community	For Institution
Attraction of underrepresented groups into engineering Knowledge to solve "real world" problems Enhanced motivation, active learning, experience with serving others, while covering the same course material More practical applications in the courses Treatment of the sociological and environmental consequences of engineering decisions Application of "good engineering practice" for community "customers" for quality improvement	Revitalization in teaching and service Coincidental generation of ideas for research and service through course projects Enhanced cooperation and unity among departments Engaged students, departments, and college Promotion and tenure	Technical design and testing services available that otherwise would not be Infusion of new ideas Exposure to innovative, efficient, environmentally appropriate engineering systems Assistance in attaining the goals of the particular community group Transfer of knowledge and skills to community groups and vice-versa Transfer of donated equipment to those in need	Reform of many courses Increased economic and social benefit to the region (project community) Improved community relations and support Increased recruitment and retention of students Graduates with more civic responsibility

1. For more information http://www.uml.edu/Engineering/SLICE/.

SLICE projects benefit and impact local, regional, and international communities. External partners for SLICE projects from the most recent academic year include three middle schools (Lowell, MA and Lawrence, MA) and one high school (Tyngsboro, MA); four non-profit organizations in developing nations (Tohone O'odham Indian Nation, Haiti, India, and Peru); twelve local non-profit organizations (Lynn, MA, Lowell, MA, Methuen, MA, and Nashua, NH); 60-100 individuals with disabilities (per year); two projects with a local municipality (city of Lowell, MA); and UMass Lowell's Building & Grounds department. In addition to these formal relationships, students often seek out additional external partners on their own to identify projects.

The SLICE Coordinator distributes pre- and post- surveys to students to learn how their service-learning experience impacts them as aspiring engineering majors. Survey results have shown positive results and appear to have an impact. Some students choose to continue collaborating with community partners as they complete their undergraduate degrees and as alumni. This expands the student's network as well as the university's influence.

SLICE students participating in the Assistive Technology initiative conduct project-based research and development designed to provide support to physically challenged persons. Scores of electronic and microprocessor-based systems have been delivered that have made a major impact on the freedom and quality of life for the disabled.

SLICE Students present Assistive Technology Device to a Community Member

In the academic year 2012–2013, 122 Electrical & Computer Engineering seniors designed, built, tested, redesigned and delivered one-of-a-kind products for individuals with disabilities, involving the clients and caregivers as part of their Capstone course. Four Mechanical Engineering senior Capstone students remade an adaptive tricycle for a young man whose parents had to help transport him. Mechanical Engineering sophomore students also took part in a program in which 160 students created devices to help a relative or friend with a disability with everyday activities. 180 first-year students even learned soldering skills, by manufacturing switch testers to be used to check functionality of Big Button Switches in community partner sites. In 2012–2013, the Plastics Engineering students got involved, with 29 sophomores designing and rapid prototyping actual Big Button Switches of unique designs not available in catalogues.

Assistive Technology project partners have included the Franciscan Children's Hospital, Lowell Public Schools, Stavros Center for Independent Living, regional Veterans Administration Hospital, and persons served through the Village Empowerment Project in Peru. Some 50 percent

of those served are under 18 years old. Deliverables include communication devices, wheelchair assistors, cause-and-effect stimulators, and special home lighting designs. This project has won the Massachusetts Governor's Award for Public Service, Daily Points of Light Award, and UMass President's Award for Public Service. A summary of SLICE metrics is included in the table below.

SLICE Metrics

Number of Students who engaged in Academic Service-Learning	1,235
Number of Students who engaged in forms of community service (not including the students counted in academic service learning count above)	32
Number of Students engaged in at least 20 hours of any kind of community service per academic term	284
Total number of community service (including academic service-learning) hours engaged by SLICE students	50,699

A second project SLICE students have recently taken on is a mechanical engineering project to assist Groton Dunstable Regional Middle school with their Pages for Peace Book. The book is 10 feet by 12 feet and is to be assembled in Museums across the country, a few of which include the JFK Library and at the United Nations convention. The book is complete but in need of a large scale page turner that will operate 8 hours a day and be able to turn the large pages one-by-one for audiences to view. UMass Lowell mechanical and electrical engineering students will be taking this project on and plan to build a live page turner. The page turner will travel all around the world accompanying the book and promoting peace, UML, and our collaborative partnership with the middle school.

Another project SLICE students are undertaking is the design and implementation of a waste water treatment system in Haiti. A group of civil engineering students are working closely with professional engineer Craig Miller to help Fond du Blancs, a remote area of Haiti, to have proper sanitation for its hospital. One class of students is exploring the possible economic benefit that waste treatment would provide Haiti and its citizens. The potential is endless from restoring Haiti's sugar cane trade, to providing new fuel for fire other than trees to help save the deforestation of Haiti.

This project is complex and has many components. Because of this many engineering courses can take on a project to cover one aspect of the problem. For example, the Engineering Economics course can take on a project to research the economic and social benefits of implementing a waste water treatment system at the St. Boniface's hospital in Haiti. A second chemical engineering course can take on a project to discover cheap and easily accessible water cleaning chemicals and methods for an area like Haiti. In fact, an entire technical elective was created just for this complex Haiti project.

UMass Lowell's SLICE program is unique in the country as no engineering college to the university's knowledge has similarly integrated service-learning into its core required courses.

The advantages of including service-learning in the class room allow students to improve their critical thinking skills as well as encourage a tolerance for diversity. As a result, service-learning not only leads to cooperative learning but to recruitment of underrepresented groups in engineering such as females, African Americans, Hispanics, and other minorities.