

AC 2009-2138: RECRUITMENT, RETENTION, AND SERVICE LEARNING IN ENGINEERING

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Recruitment, Retention, and Service-Learning in Engineering

Abstract

In this study, an average of nearly 800 students per semester has participated in S-L projects integrated into courses throughout the four-year engineering curriculum at a public university. Over the academic years 2004-2008, an average of 30 core required engineering courses have had S-L projects each year. The hypothesis is that because the students would see with S-L more directly how engineering can improve the lives of those in the local and international community, they would be more motivated to enter and stay in engineering and try to learn the subject matter better. In terms of recruitment, S-L is advertised to prospective students as the number two reason to come to the college (number one is value). Twenty-two percent of first year students at the end of their first semester reported that S-L was one of the reasons for coming to the college, roughly the same as the 24% in December 2007 and 23% and 21% the previous years. In terms of retention, at the end of the spring 2008 semester, from a representative sample of students across 4 years and 5 departments ($n = 369$), 64% reported that S-L had a positive impact on the likelihood that they would continue in engineering (25% reported a very strong impact, i.e., chose 9 on a Likert scale of 1 – 9), while only 3.5% reported a negative impact, with the rest neutral. Females and underrepresented groups by race indicated a significantly (5%) more positive impact of S-L on retention on average. The retention responses also correlated positively with a number of responses indicative of factors known to affect retention (e.g., relationship with faculty, previous S-L experience). Enrollments have in fact increased, and overall retention has remained about the same over the last three years, but the effect of the S-L program will probably not be felt for some more years as it matures and improves. In conclusion, the effect of S-L on recruitment and retention of engineering students appears to be positive from the students themselves, and underrepresented groups in engineering appear more motivated to persist and be concerned about helping others in the profession.

Introduction

Recruitment and retention appear to be high on the list of concerns in higher education in general and engineering in particular, especially of underrepresented groups¹. The introduction of service-learning (S-L) into a number of required courses throughout the curriculum of a college of engineering was undertaken in part to increase such recruitment and retention. In what follows a brief literature review of the connection between S-L and retention. The treatment and survey measurement instruments are presented. Results follow, and then discussion and conclusions.

Background

The general positive cognitive and affective impacts of S-L on students, faculty, institution, and community are perhaps best discussed in Eyler and Giles² and Astin et al.³. The idea of implementing S-L on a broad scale in the college was motivated by the positive benefits shown in these studies on learning subject matter, tolerance for diversity, personal development, interpersonal development, and community-to-college connections, self-efficacy. In addition, recruitment and retention were motivating factors, and these are the focus of this particular study.

The hypothesis is that because the students would see with S-L more directly how engineering can improve the lives of those in the local and international community, they would be more motivated to enter and stay in engineering and try to learn the subject matter better. In terms of recruitment, S-L was advertised to prospective students as the number two reason to come to the college (number one is value).

In Tinto's classic work⁴, persistence was found to be affected by the integration of students into both the academic and social network of the college. Several studies have found that service-learning (S-L) affects the factors in Tinto's model. Mundy and Eyer⁵ document the consistency of S-L principles with models of persistence, including Tinto's. Campus Compact National Office provides a useful annotated bibliography of studies relating retention and service-learning⁶. Gallini and Moely⁷ found that S-L had a significant impact on plans to continue at a private university. Keup⁸ studied 20,000 first-year students and found an indirect positive relationship between S-L and intended persistence. Hatcher, Bringle, Muthiah⁹ also followed first to second year students and found a positive relationship between S-L and actual persistence at several universities in Indiana. Roose et al.¹⁰ found among 15 factors studied for 170 African American students of Oberlin that community service ranked the highest in positive impact on graduation rate.

For the effect of a single course with S-L, Lima¹¹ found higher rates of persistence for females and minorities in biological engineering. Similarly, Picket-May and Avery¹² found a positive correlation between retention of students in a first-year engineering design course with S-L over six years compared to students who did not take the S-L course.

In this study first-year students were asked if S-L had an influence on their choosing the university. Students from all four years were questioned at the end of the school year about a number of attitudes toward S-L and whether S-L projects had an impact on their staying in engineering. Comparisons of responses by underrepresented groups were made.

Methods

The students surveyed had from one to four years of engineering courses with a variety of S-L projects in them. We define service-learning as a hands-on learning approach in which students achieve academic objectives in a credit-bearing course by meeting real community needs. In engineering, the students become better professionals and better citizens while the community also benefits. Figure 1 summarizes the number and distribution of courses with S-L projects (some required of all students in the course and others elective) over the previous four academic years. Table 1 (at the end of the paper) summarizes the courses offered during the 2007-2008 academic year into which S-L had been incorporated. Illustrated there are the types of required courses and the variety of projects and community partners. Note that the credit given for the S-L project varied from course to course.

Since the S-L projects are designed to not add more class or homework time for students (by replacing existing "paper" projects), projects that meet real community needs and that help students achieve academic objectives in the courses are difficult to create. Faculty members were urged "to start small rather than not at all." The service-learning projects include direct and indirect involvement of the students with the community. Direct involvement is, of course, the

ideal for the students and the community to obtain maximum benefit of learning from each other. While the goal remains to maximize the direct projects, these projects are not always practical for all the students in all the courses. For example, not all the students can travel to meet with the client, who can sometimes live outside the U.S. Sharing of experiences with other students does maximize the benefit of those students who do work directly with the community (e.g., go to Peru). Therefore, opportunities were provided for students to share with each other results and experiences, thus creating a means of reflection and of extending the benefit of the S-L project.

Because of the long-term nature of the exposure to S-L over the curriculum, questionnaires were given to the students at the beginning of their first year in an introduction to engineering class. “Post” questionnaires were given to the first year students at the end of the introduction course in December and to all students at the end of the academic year in May. The actual survey forms are shown in the appendices. ID numbers were requested of the students so that the changes in responses could be tracked through the years of the program. In the past academic year, enough ID numbers were collected so that meaningful comparisons can be made over subsequent years of changes in opinions in a longitudinal study.

Some of the questions pertain to recruitment and retention, so these were analyzed with simple frequency counts, t tests between subgroups (by gender, for example), ANOVA for multiple factors (by department, for example), and paired t tests for comparisons between “pre” and “post” survey responses for individual students with ID number matching. Corrections were made for finite populations where the sample size was over 50% of the underlying population (the student body). Computations were made with SPSS software.

Actual enrollment data was obtained from the university institutional research office and the ASEE web site.

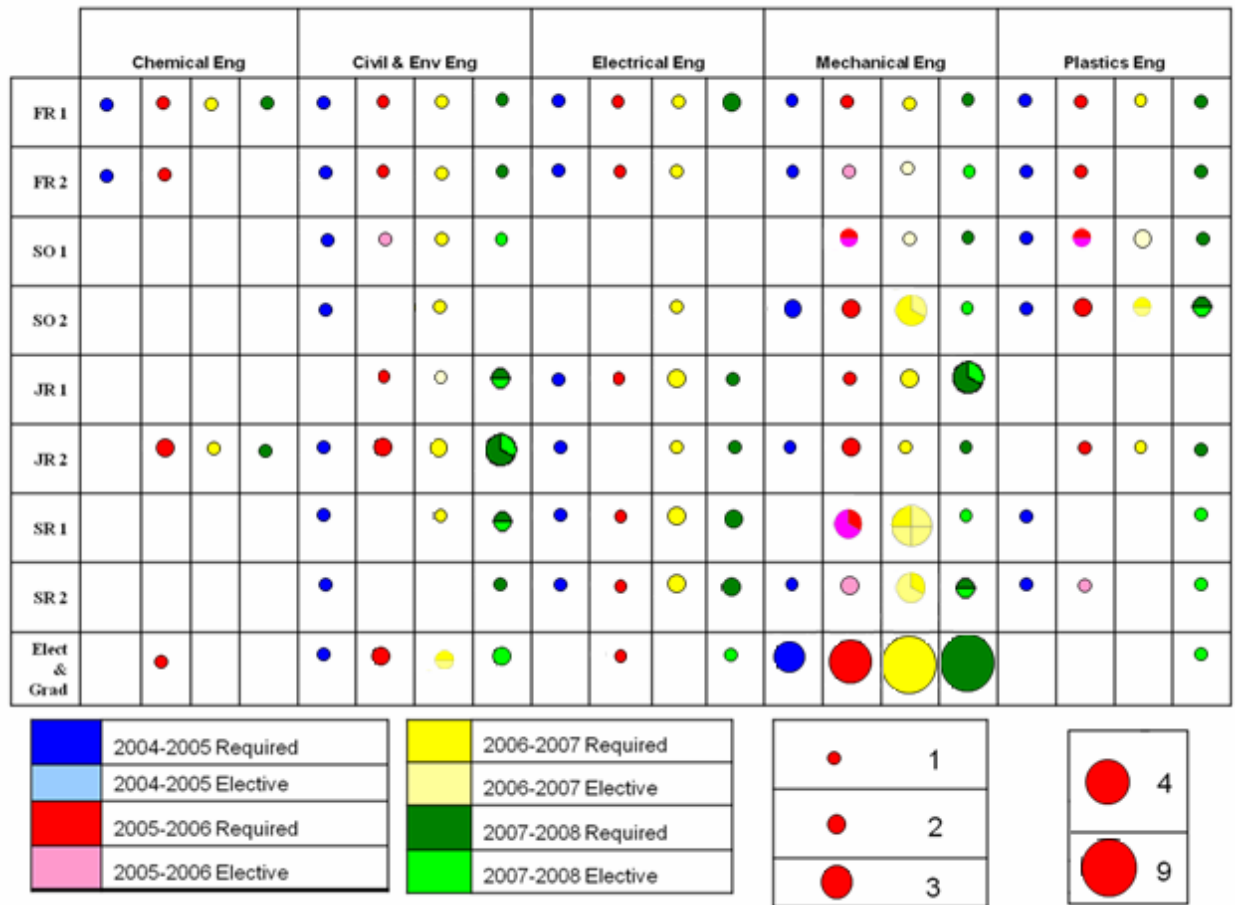


Figure 1. Distribution of courses with S-L across programs, academic years, and the four curriculum years for students.

Results

Twenty-two percent of the students at the end of their first semester in December 2008 reported that S-L was one of the reasons for coming to the university (n= 277), 24% in December 2007 (n=175), 23% in 2006 and 21% the previous year (Question 25). Roughly 70% of the students have had prior community service experience in high school or previous college. Thus, between one in four and one in five students reports being recruited at least in part by the S-L offered. In outreach to potential student recruits, S-L is listed as the number two reason to come to the university (value is the first).

By gender, in the first year sample, 10% were female for the “post” survey in 2008; 11% in 2007. In 2008 21.4% of females reported that S-L was one of the reasons for coming into the college (Question 25 again). The proportion from previous years was very roughly the same, particularly given the relatively small sample.

About 750 “pre” and almost 400 “post” S-L questionnaires in 2004-05 were obtained from the students. In the fall of 2004 students in all four academic years were surveyed to get “baseline” data. Some of the pre surveys are undoubtedly duplicates as some students were in more than

one S-L course. Some interesting results emerged: In the “pre” surveys, in a ranking of possible reasons for wanting to go into engineering, “helping others” ranked second to “challenge, self-development” among females and non-Caucasians, but did not rank in the top four for Caucasians, losing out to challenge, income, creativity, and security (Table 2).

The trend of difference continued in the pre-survey in the fall of 2005, with over 500 responses: females and males showed significant differences in the “helping others” category ranking with a Chi-Square test at the 5% significance level. The trend continued in 2006, 2007, and 2008. In 2004-2005 the college had 12% females in its undergraduate engineering population of 914 full-time students. That fraction of female students was below the national average in the same year of 17.5%, so the above results of the differences by gender are encouraging in the sense that they support the notion that S-L will be a factor in attracting females into engineering in general

Table 2: Fall 2004 Student weighted averages of ranking of reasons for being in engineering (weighting: 5 for 1st, 4 for 2nd, 3 for 3rd, 2 for 4th, 1 for 5th)

Reason	Male Weighted Average	Male Rank	Female Weighted Average	Female Rank
Challenge	607	1	249	1
Income	401	2	145	4
Creativity	391	3	147	3
Security	366	4	123	5
Helping	198	5	173	2

- For retention, the responses to question 29E were particularly surprising. The data for May 2008 is relevant since many of the students would have had four years of S-L courses. That sample had the following breakdown:
 - n=458
 - 87.5 % male; 4% international students;
 - 81% white, 14% Asian; 5% black
 - 61% 18 to 21 years old; 60% work (20% >20 hrs)
 - 27% first year; 21% sophomore; 25% junior; 19% senior;

- 33% ME, 23% CE, 22% PLE, 11% ChE, 11% EE
- 74% previous service to this college

It should be noted that the fraction of students working per week appears to be considerably higher than other schools in general. A comparison of first year students in the fall of 2006 at this university (n=324) compared to other universities in general (n= 32,635) and to other public universities surveyed by the Higher Education Research Institute at UCLA revealed that twice the number of students at this university worked and three times the number worked more than 20 hours a week (20% vs 6%). This incidentally provides more motivation to have S-L embedded into required courses since the students here have less time to volunteer or to take elective classes.

Students indicated that S-L had a positive impact on the likelihood of their **continuing in engineering** (1-9 scale). In Spring 2008, 64% of 369 agreed (25% strongly); 3% disagreed; the rest neutral. In the Spring 2007 post survey, 67% of 188 students agreed. In the December 2008 survey with n=310 (some upper division students took the class also), 71% agreed (21% strongly); 8% disagreed. The results from this question were so positive, that the authors thought some artifact was at work, so the order of the questions was changed between Spring 2008 and December 2008. The positive result persisted and in fact increased.

Some other interesting results from the Spring 2008 survey:

- In response to Q 2 that service and academic course work should be integrated, 68% agreed, 9% disagreed, with the rest neutral (very consistent with previous years).
- 37% agreed S-L projects should be required, not optional in courses; 26% disagreed.
- On every single question the mean response on the Likert scale of 1-9 was significantly different (t-test at 5%) from the neutral value of 5, except for the above question about requiring S-L within courses and Q 18 (It is important to me personally to influence the political structure).

In terms of gender effect, females were significantly more likely (5% t test) to agree that S-L helped them stay in engineering (for the 2006, 2007, 2008 surveys). Also in 2008, the mean responses significantly different (5%, t-test) relating to:

- Career goal helping others
- Service and academic coursework should be integrated
- Solve social problems
- Essentially all questions relating to helping

Females appear to volunteer at a disproportionately higher rate than their male counterparts for S-L courses and projects. The EPICS program reports a two to one ratio for females participating in elective S-L courses¹³. Patterson and Fuchs¹⁴ also report a two to one ratio for enrollees in a graduate program linked to the Peace Corps and S-L courses with an international focus at Michigan Technological University. In this program there has been a three to one ratio

for females volunteering to participate in S-L courses related to the Village Empowerment international program at UML¹⁵.

Figures 2 and 3 illustrate two relationships between responses to the statement about S-L's effect on continuing in engineering and the responses to the statements that S-L should be required within a course and that the student has a close working relationship with a faculty member. The later has been shown to be an important factor in retention¹⁶. Both these regressions are significant, as well as Chi-Square tests, at the 5% level.

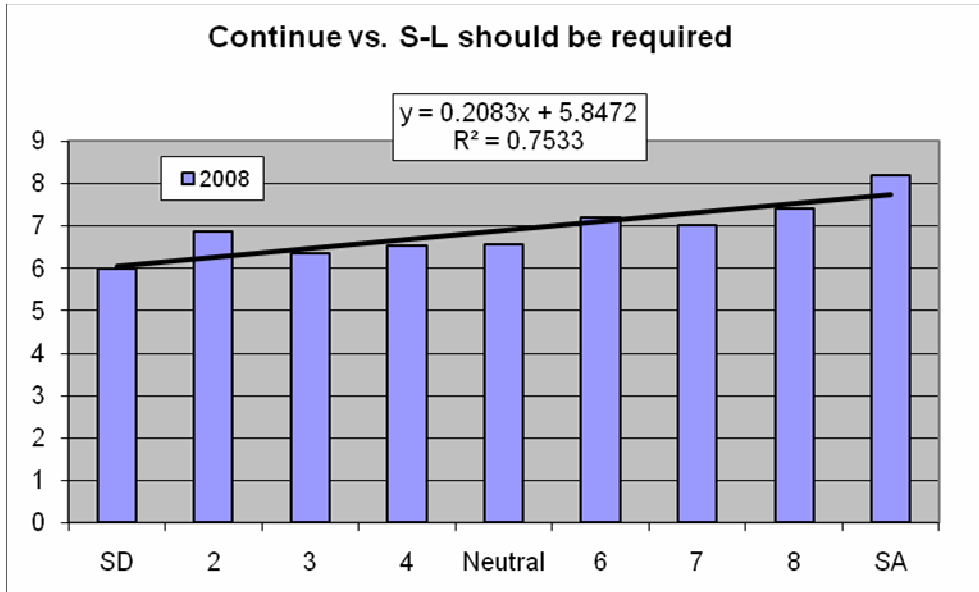


Figure 2. Regression of responses to statements of S-L effect on retention and that S-L should be required.

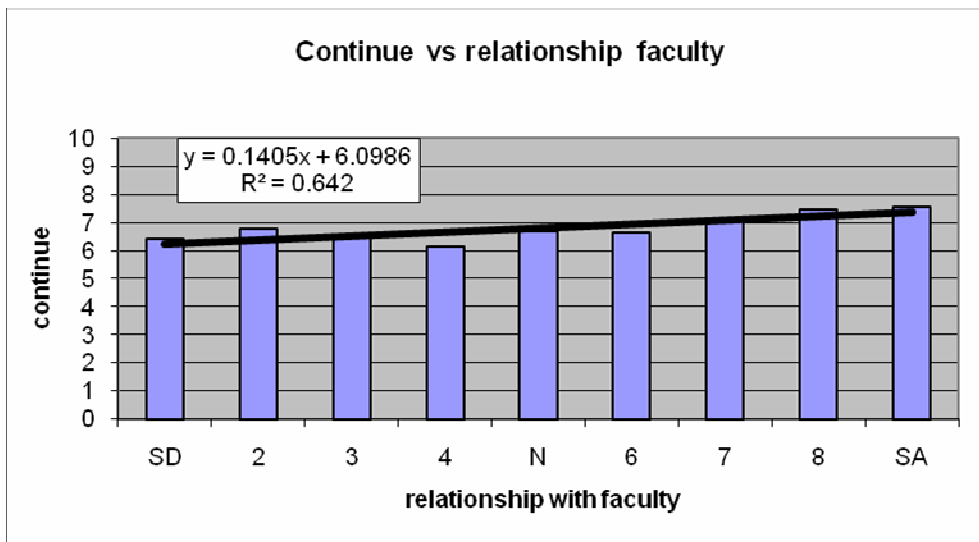


Figure 3. Regression of responses to statements about retention and relationship with faculty members.

Students were able to make open-ended comments at the end. About ten percent of students responded. At least one in the spring of 2008 was quite dramatic: “THANK YOU. S-L is what kept me in school at all.” (Female, Civil Eng.)

Actual enrollment figures for the college are given in Table 3. Actual enrollments have increased, but the proportion of underrepresented groups has remained about the same.

Table 3: Engineering College Undergraduate Enrollment by Gender and Race/Ethnicity

	Fall 2003	Fall 2004	Fall 2005	Fall 2006	Fall 2007
Men	894	887	906	1094	1042
Women	143	121	124	129	122
% women	13.8%	12.0%	12.0%	11.8%	10.5%
Am. Indian	3	1	1	1	0
Asian	114	110	100	117	138
Black	48	55	66	64	56
Cape Verdean	0	0	2	2	2
Hispanic	46	56	64	66	69
White	621	630	679	727	792
Non-resid alien	46	42	28	21	20
Unknown	159	114	90	96	87
Minority Total	211	222	233	250	265
% of resident students known	20.3%	22.0%	22.6%	20.4%	22.8%

Discussion and Conclusions

The positive responses of students of the effect of S-L on recruitment and retention are encouraging. The actual enrollment in engineering has increased over the duration of the S-L program; however, the proportion of underrepresented groups has not increased. Of course,

causes and effects are hard to establish with the actual enrollment figures. The effect of the S-L program will probably not be felt completely for some more years as it matures and improves.

In conclusion, the effect of S-L on recruitment and retention of engineering students appears to be positive from the students themselves, and underrepresented groups in engineering appear more motivated to persist and be concerned about helping others in the profession.

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

1. **Committee on Science, Engineering, and Public Policy.** *Rising above the gathering storm.* s.l. : National Academy of Sciences, 2008.
2. **Eyler, J. and Giles, D.** *Where's the learning in service-learning.* San Francisco : Jossey-Bass, 1999.
3. **Astin, Alexander, et al.** Understanding the effects of service-learning: A study of students and faculty. *Higher Education Research Institute, UCLA.* [Online] 2006. [Cited: February 5, 2009.] http://www.gseis.ucla.edu/heri/PDFs/pubs/reports/UnderstandingTheEffectsOfServiceLearning_FinalReport.pdf .
4. **Tinto, V.** *Leaving college: Rethinking the causes and cures of student attrition (2nd ed.)* . Chicago : U. of Chicago Press., 1993.
5. **Mundy, Meghan, & Eyler, Janet.** *Service-Learning and Retention: Promising Possibilities, Potential Partnerships.* s.l. : Vanderbilt University, 2002.
6. **Campus Compact.** *A Preliminary Overview of the Literature Linking Service-Learning and Retention.* Providence, RI : Campus Compact National Office, 2006.
7. *Service-learning and engagement, academic challenge, and retention.* **Gallini, S., & Moely, B.** 2003, Michigan Journal of Community Service Learning, pp. 10(1), 5-14.
8. *The Impact of Curricular Interventions on Intended Second-Year Enrollment.* **Keup, Jennifer R.** 2005, Journal of College Student Retention, pp. 61-89.
9. **Hatcher, J. A., Bringle, R. G. and Muthiah, R.** The role of service learning on retention of first-year students to second year. *Indiana Campus Compact.* [Online] 2005. [Cited: February 5, 2009.] <http://www.indianacampuscompact.org/Portals/0/Retention%20Article%209%2005.pdf>.

10. **Roose, D, et al.** *Black Student Retention Study: Oberlin College* . s.l. : Oberlin College, 1997.
11. **Lima, M.** Service-Learning: A Unique Perspective on Engineering Education. [book auth.] E. Tsang. *Projects That Matter: Concepts and Models for Service Learning in Engineering*. Washington D.C. : American Association for Higher Education, 2000, pp. 109-117.
12. *Service Learning First Year Design Retention Results.* **Piket-May, Linda and Avery, James.** Reno, NV : ASEE, 2001. ASEE/IEEE Frontiers in Education Conference. pp. F3C-19-22 vol. 2.
13. *EPICS: A model for integrating Service Learning into the Engineering Curriculum.* **Coyle, E. J., Jamieson, L. and Sommers, L.** 1997, Michigan Journal of Community Service Learning, Vol. 4, pp. 81-89.
14. *Development for the Other 80%: Engineering Hope.* **Paterson, K. and Fuchs, V.** 1, 2008, Journal of the Australasian Association for Engineering Education, Vol. 14, pp. 1-12.
15. *Village Empowerment: Service-Learning with Continuity.* **Duffy, J.** 2008, International Journal of Service-Learning in Engineering, Vols. web-based.
16. **Pascarella, E. T., & Terenzini, P. T.** *How college affects students, Vol 2.* . San Francisco : Jossey-Bass, 2005.
17. —. *How college affects students.* San Francisco : Jossey-Bass., 1991.
18. *Service-Learning Integrated into Existing Core Courses throughout a College of Engineering.* **Duffy, J.J., et al.** Washington, DC : American Society of Engineering Education, 2007. Proceedings American Society of Engineering Education Annual Conference. p. CD.
19. *Service-learning projects in core undergraduate engineering courses .* **Duffy, J., et al.** 2008, International Journal of Service-Learning in Engineering,, pp. Vol. 3, No. 2, pp. 18-41.
20. *Development for the Other 80%: Assessing Program Outcomes.* **Paterson, K.G.** s.l. : ASEE, 2008. Proceedings of the 2007 ASEE Annual Conference and Exposition.

Table 1. Courses with Service-Learning, 2007-2008

Service-Learning in Courses 2007-2008								
Y	Course #	F, S	C	Course Title	Professor	Activities	S-L stu	# stu
Common First Year Course								
F	25.107	F 07	2	Intro. to Engineering I	Dave Kazmer	Design and building zoo toys to reduce boredom in lion and tigers at the Franklin Park Zoo for Zoo	380	380

						New England. (20% of grade)		
CORE REQUIRED COURSES								
CHEMICAL ENGINEERING								
Jr	10.304	S 07	3	Heat Transfer	Al Donatelli	Heat loss study for United TeenEquality Center (UTEC) (20% course grade)	20	20
CIVIL ENGINEERING								
F r	25.108	S 08	2	Intro. To Eng. II - CEE	Jackie Zhang	Pinanski Parking Lot re-design: - UML Facilities Dept. (30% of course grade)	36	36
S o	14.286	F 07	3	Probability & Statistics for Engineers	Oz Gunes	Statistical Analysis of Chloride Levels in Wells in Dunstable (in lieu of worst exam)	15	39
Jr	14.332	S 08	3	Environmental Eng. Lab	Cliff Bruell	Salt analysis for the Town of Dunstable Board of Health (12.5% of course grade)	37	37
Jr	14.350	F 07	3	Structural Analysis I	Susan Faraji	footbridge analysis for AHF (5% extra credit)	33	36
Jr	14.352	S 08	3	Concrete Design	Susan Faraji	Pedestrian bridge column and footing design for UML/City of Lowell (10% of course grade)	33	33
S r	14.431	F 07	3	Foundation and Soil Engineering	Sam Paikowsky	Analysis of alternative methods for bridge in Yanacaca, Peru (20% of grade)	30	30
S r	14.452	F 07	3	Steel Design	Susan Faraji	footbridge design for AHF based on analyses from 14.350 class (5% extra credit)	17	34
S r	14.460	F 07	3	Water Resources Engineering	Jackie Zhang	Using Hydrology to Gain Insight on Chloride Levels in Wells In Dunstable (one homework assignment)	27	27

S r	14.485	S 08	3	Capstone Design	Oguz Gunes	Trolley system design for UML, NPS, City of Lowell (100% of course grade)	28	28
ELECTRICAL ENGINEERING								
F r	25.108	S 08	2	Intro. To Eng. II - EE	Jay Weitzen	Modified a basic PS-2 mouse and to have large buttons (about 3 inches in diameter) to allow severely handicapped students to left and right mouse click. (20% of course grade)	130	130
F r	16.100	F 07	1	Intro to Electrical Engineering	Xingwei Wang	Manufacturing button switch testers for Assistive Tech agencies (35% of grade)	127	127
Jr	16.365	F 07	3	Electronics I	Joel Therrien	Design remote control for the canal lock gate for the NPS (15% of grade)	41	41
Jr	16.365	S 08	3	Electronics I	Joel Therrien	Canal gate clicker design for the NPS (carry over from 16.365 F'07) (15% of course grade)	26	26
S r	16.399	F 07	3	Capstone I (Proposal)	Alan Rux, Donn Clark, Senait Haileselasie	Develop a business plan to fund the design and development of a product which would be considered an "Assistive Technology" device. Students work with a specific client and identify Capstone Assistive Technology project to be accomplished in 16.499.	35	35
S r	16.399	S 08	3	Capstone Proposal	Donn Clark	Business plan to fund the design & development of Assistive Technology device; incl. client (100% of course grade)	17	17
S r	16.499	F 07	3	Capstone II (Project)	Alan Rux	Students are required to design, test and deliver a device that would enhance the quality of life for a disadvantaged person. Students are required to have direct contact with their client	26	26

						throughout the project.		
S r	16.499	S 08	3	Capstone Project	Alan Rux	Design, test and deliver a device that would enhance the quality of life for a disadvantaged person; including direct contact with client (100% of course grade)	24	24
MECHANICAL ENGINEERING								
F r	25.108	S 08	2	Intro. To Eng. II - ME	John McKelliget	Renewable energy application for Grtr Lowell Tech HS (GLTHS) and Lowell High School (LHS) (30% of course grade)	22	94
S o	22.202	S 08	2	Design Lab II	Byungki Kim	Arm rehab device - student's father(4), cribbage board for visually impaired - student's aunt (2); dosimetry rack for UML radiation lab (4) (25% of course grade)	10	63
S o	22.296	F 07	3	Mechanical Behavior of Materials	Emmanuelle Reynaud	5 emerging materials topics for the ATHM (groups of 3, 4 groups per topic)	60	60
Jr	22.341	S 08	3	Conduct'n & Radiation	Hongwei Sun	Heat Loss windows analysis for UML Facilities	50	50
S r	22.342	F 07	3	Convective Processes	Gene Niemi	Design of Small Hydropower System for Village of Paty, Peru (20% of grade)	45	45
Jr	22.361	F 07	3	Mathematical Methods for Mechanical Engineers	John McKelliget	Impact analysis of Village Empowerment Peru project installations on Casma and Huarney (5% of grade)	65	65
Jr	22.381	F 07	3	Fluids	Majid Charmchi	Design irrigation system to supply water to 100 avocado trees in the rural community of Laguna, Huarney, Peru.	12	50

S r	22.423	S 08	3	Capstone Design	John Duffy	modular BR unit for Arizona Indian Res. (100% of course grade)	4	40
S r	22.425	F 07	3	Design of Machine Elements	Chris Niezrecki	World's Largest Book Page Turner for GDRMS;	4	44
S r	22.441	S 08	3	Thermo Applications	Hongwei Sun	Air-to-air heat exchanger design for the Pollard Library, City of Lowell (10% of course grade)	42	42
PLASTICS ENGINEERING								
F r	25.108	S 08	2	Intro. To Eng. II - PE	Carol Barry	Nano outreach project for schools (14.3 % of course grade)	34	34
S o	26.215	F 07	1	Plastics Process Lab I	Carol Barry	education modules on polymer materials for the ATHM (20% of course grade)	24	24
S o	26.218	S 08	2	Intro. to Design	Steve Orroth, Nick Schott	Water filter designs for PET bottles for VE Peru Project	26	26
J r	26.373	S 08	3	Plastics Mold Engineering I	Dave Kazmer, Steve Johnston	Googleplex connectors mold for the Tsongas Industrial History Center	21	21
S r	26.415	F 07	3	Capstone Design	Nick Schott	New manufacturing line of hard plastic ice packs for Employ+Ability	3	20
S r	26.416	S 08	3	Capstone II	Nick Schott	Manufacturing line coldpack design for Employ+Ability (100% of course grade)	2	19
ELECTIVE/GRADUATE COURSES								
CIVIL ENGINEERING								
S r, G r	14.555	S 08	3	Advanced Structural Design	Susan Faraji	Advanced design and analysis of two-way slab building construction including columns and beams for proposed North Campus student union/ trolley terminal for UML	18	18

						Administration (20% of course grade)		
G r	14.733	F 07	3	Directed Study graduate Structures project	Susan Faraji	Analysis of building supports for fitness equipment area for UTEC (100% of course grade)	1	2
ELECTRICAL ENGINEERING								
S r	16.409	F 07	3	Directed Study	Yan Luo	Design of a Control System for the World's Largest Book Page Turner for Groton Dunstable Regional Middle School (GDRMS) 100% of grade	2	2
MECHANICAL ENGINEERING								
G r	22.504	F 07	3	Energy Engineering Workshop	John Duffy	Habitat for Humanity Green Building analysis (100% of course grade)	2	2
G r S r	22.521	F 07	3	Solar Fundamentals	John Duffy	Solar hot water system design and solar hot water collector design for Tohono O'odham;(20% of course grade)	11	11
G r	22.527	S 08	3	Solar Systems Eng	John Duffy	PV battery charging station for Paty, Peru; PV water pumping system for the Tohono O'odham reservation; PV lighting system for UML; PV lighting system for Lowell National Historical Park; Teaching modules schools in Peru; PV design for large composter at UML. (20% of course grade)	15	15
PLASTICS ENGINEERING								
G r S	26.518	S 08	3	Plastics Product Design	Nick Schott	Solar panel shipping corners for VE Peru Project (20% of course grade)	28	36

r								
INTERDISCIPLINARY ENGINEERING								
S	25.200	F	1	Community-based Engineering Project I	Byungki Kim	Improving a special chair for a disabled child for the Hogan Regional Center	2	2
S	25.401	F	3	Capstone Community-based Engineering Design Project	John Duffy	Biodigester as Civil & Env. engineering project for Peru	2	2
						Total 2007-08 Total S-L Student- Courses	1587	1913

Appendix A “Pre” student survey form

Survey on Service-Learning, New students,
UML College of Engineering

Instructions:
For each question, make a solid mark
that fills the oval completely.

Like this: Not like this:

Student ID (ISIS No.):

Course #

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Your responses to this survey will form an important part of a research project on service-learning. You may elect not to answer any question you choose. All responses will remain confidential and anonymity in any reported results is assured. The instructor of this course will not view the individual questionnaire responses. Filling out this questionnaire is completely voluntary, and you will not be penalized in any manner if you decide not to participate. The ISIS ID number is very important for research purposes. Thanks from the SLICE project, UML College of Engineering.

1. What is your gender?

- Male
 Female

2. Are you an international student?

- Yes
 No

3. What is your race?
(check all that apply)

- American Indian or Alaska Native
 Asian
 Black or African American
 Native Hawaiian or Other Pacific Islander
 White

4. What is your ethnicity?

- Hispanic/Latino Non-Hispanic/Non-Latino

For the following questions, please write your answer in the space () then fill in the bubbles.

5. How many miles do you live from campus? (if you live on campus, put zero -00).

<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>

6. What is your age?

<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>

7. How many hours per week do you work at a paid job?

<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>

8. If eligible, have you voted in a public election?

- Yes No Not eligible

9. How many credit hours of courses are you taking this semester?

- | | |
|-----------------------|-----------------------|
| _____ | _____ |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |

10. What is your current academic status?

- Freshman
 Sophomore
 Junior
 Senior
 Graduate

11. I am a transfer student.

- Yes
 No

12. Have you ever been involved in community service/service-learning activities?
Check all that apply

- No
 Yes, during high school
 Yes, during college (go to 12A)

12A. If you answered "Yes, during college," estimate the total number of college courses you have taken prior to this academic year which included service-learning in which you participated (count courses at all 2 or 4-year institutions you have attended)

- | | |
|-----------------------|-----------------------|
| _____ | _____ |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
| | <input type="radio"/> |
| | <input type="radio"/> |
| | <input type="radio"/> |
| | <input type="radio"/> |
| | <input type="radio"/> |
| | <input type="radio"/> |

13. What is your major?

- Biomedical
 Chemical
 Civil
 Computer
 Electrical
 Energy
 Engineering Tech.
 Mechanical
 Plastics
 Undeclared
 Other

14. Please rate the Importance of each of these career values

[1 = Not Important, 5 = Neutral, 9 = Very Important]:

Challenge: Learning new skills or information, doing things in a new way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Helping: Doing things for others, building a better world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Income: Making a high salary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Security: Having stable employment and income, not worrying about lay-offs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Variety: Doing many different activities, not doing the same things all the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please respond based on your honest reaction to each item. Please choose the answer that makes sense to YOU; not what you think others would say.

[1= Strongly Disagree, 5=Neutral, 9=Strongly Agree]

15. Service and academic coursework should be integrated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Engineers should use their skills to solve social problems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I enjoy learning when course materials pertain to real life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I learn more when courses contain hands-on activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. The things I learn in school or college are useful in my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Social problems are not my concern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. People who receive social services largely have only themselves to blame for needing services.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. Most social problems are easy to solve.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I plan to do something to improve my community in the near future.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I should give some of my time to help those in need.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I can have an impact on solving problems that face my local community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26. I can have an impact on solving problems that face under-served communities internationally.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27. It is important to be involved in a program to improve my community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[1= Strongly Disagree, 5=Neutral, 9=Strongly Agree]

28. It is not necessary to volunteer my time to help people in need.	1	2	3	4	5	6	7	8	9
29. I am not sure what skills are necessary for my career.	1	2	3	4	5	6	7	8	9
30. I am concerned about community issues.	1	2	3	4	5	6	7	8	9
31. Working in teams is a waste of time.	1	2	3	4	5	6	7	8	9
32. It is important to me personally to influence the political structure.	1	2	3	4	5	6	7	8	9
33. It is important to me personally to have a career that involves helping people.	1	2	3	4	5	6	7	8	9
34. I can learn more from working on group projects than from working alone.	1	2	3	4	5	6	7	8	9
35. I am uncomfortable working with people who are different from me in such things as race, wealth, and life experiences.	1	2	3	4	5	6	7	8	9
36. I have a realistic understanding of the daily responsibilities involved in the career in which I am interested.	1	2	3	4	5	6	7	8	9
37. I feel well-prepared for my future career.	1	2	3	4	5	6	7	8	9
38. I have a close working relationship with at least one faculty member at this institution.	1	2	3	4	5	6	7	8	9
39. Within service-learning courses, the service-learning projects should be required and not optional (with a choice of both service and non-service projects).	1	2	3	4	5	6	7	8	9

Thank you for completing this survey!

Appendix B "Post" student survey form

Service-Learning Integrated throughout the College of Engineering (SLICE)
supported through a grant from the



National Science Foundation
WHERE DISCOVERIES BEGIN

SURVEY REGISTRATION AREA

Instructions:
For each question, make a solid mark that fills the oval completely.
Like this: ● Not like this: ◐ ◑ ◒

Student ID (ISIS No.):

○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○

Please fill in this survey registration area. This information is used for research purposes only, and has no bearing on your academic or program status.

1. What is your gender?

- Male
- Female

2. Are you an international student?

- Yes
- No

3. What is your race?
(check all that apply)

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White

4. What is your ethnicity?

- Hispanic/Latino
- Non-Hispanic/Non-Latino

For the following questions, please write your answer in the space () then fill in the bubbles.

5. How many miles do you live from campus? (if you live on campus, put zero -00).

○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

6. What is your age?

○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

7. How many hours per week do you work at a paid job?

○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○
○	○

8. If eligible, did you vote in the November 2008 public election?

- Yes No Not eligible

9. Prior to UML have you ever been involved in community service activities? Check all that apply

- No
 Yes, during high school
 Yes, during college

10. How many credit hours of courses are you taking this semester?

- | | | |
|-------|-----------------------|-----------------------|
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |
| _____ | <input type="radio"/> | <input type="radio"/> |

11. What is your current academic status?

- Freshman
 Sophomore
 Junior
 Senior
 Graduate

12. I am a transfer student.

- Yes
 No

12. What is your major? (check all that apply)

- Biomedical Eng.
 Chemical Eng.
 Civil Eng.
 Computer Eng.
 Electrical Eng.
 Energy Eng.
 Engineering Technology
 Mechanical Eng.
 Plastics Eng.
 Undeclared Eng.
 Other

-END OF SURVEY REGISTRATION AREA-

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

supported through a grant from the



National Science Foundation
WHERE DISCOVERIES BEGIN

Your responses to this survey will form an important part of a research project on service-learning. You may elect not to answer any question you choose. All responses will remain confidential and anonymity in any reported results is assured. Filling out this survey is voluntary, and you will not be penalized in any manner if you decide not to participate. Thanks from the SLICE project, UML College of Engineering.

1. Please rate the importance of each of these career values

[1 = Not Important, 5 = Neutral, 9 = Very Important]:

- | | | | | | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Challenge: Learning new skills or information, doing things in a new way | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Helping: Doing things for others, building a better world | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Income: Making a high salary | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Security: Having stable employment and income, not worrying about lay-offs | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Variety: Doing many different activities, not doing the same things all the time | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Please respond based on your honest reaction to each item. Please choose the answer that makes sense to YOU; not what you think others would say.

[1= Strongly Disagree, 5=Neutral, 9=Strongly Agree]

- | | | | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 2. Service and academic coursework should be integrated. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Engineers should use their skills to solve social problems. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 4. I enjoy learning when course materials pertain to real life | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 5. I learn more when courses contain hands-on activities | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 6. The things I learn in school or college are useful in my life | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7. Social problems are not my concern. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 8. People who receive social services largely have only themselves to blame for needing services. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 9. Most social problems are easy to solve. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 10. I plan to do something to improve my community in the near future. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 11. I should give some of my time to help those in need. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 12. I can have an impact on solving problems that face my local community. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 13. I can have an impact on solving problems that face under-served communities internationally. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

SURVEY (POST) CONTINUED

[1= Strongly Disagree, 5=Neutral, 9=Strongly Agree]

14. It is important to be involved in a program to improve my community.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
15. It is not necessary to volunteer my time to help people in need.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
16. I am concerned about community issues.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
17. Working in teams is a waste of time.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
18. It is important to me personally to influence the political structure.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
19. It is important to me personally to have a career that involves helping people.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
20. I can learn more from working on group projects than from working alone.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
21. I am uncomfortable working with people who are different from me in such things as race, wealth, and life experiences.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
22. I have a realistic understanding of the daily responsibilities involved in the career in which I am interested.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
23. I feel well-prepared for my future career.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9
24. I have a close working relationship with at least one faculty member at this institution.	<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5	<input type="radio"/> 6	<input type="radio"/> 7	<input type="radio"/> 8	<input type="radio"/> 9

The next section is about your experience with service-learning. "Service-learning" is a hands-on learning approach in which students achieve academic objectives in a credit-bearing course by meeting real community needs.

25. Was being able to take classes with service-learning one of the reasons you chose UMass Lowell?

- Yes No

26. On average, approximately how many hours did you spend working on the service-learning project this semester?
[Please indicate the total number of hours]

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- | | |
|-----------------------|-----------------------|
| <input type="radio"/> | <input type="radio"/> |
| <input type="radio"/> | <input type="radio"/> |
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| <input type="radio"/> | <input type="radio"/> |

SURVEY (POST) CONTINUED

27. What role did you assume while working on the service-learning project? (choose one)

- I was in a leadership role
- I was very involved as a team member
- I was moderately involved as a team member
- I was minimally involved as a team member
- I carried out the project on my own
- I did not do a service-learning project

28. Based on your experience with service-learning, to what extent do you agree with the following?
[1= Strongly Disagree, 5 = Neutral, 9= Strongly Agree]

a. The amount of effort I put into the service-learning project was greater than what I would have had to put in for an equivalent class project not involving service. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

b. In the service project I learned how engineers apply the concepts I learned in class to real-life problems. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

c. In the service project I learned how to work with others effectively. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

29. To what extent have your service-learning project(s) this year had an impact on the following:
[1= Strong Negative Impact, 5=Neutral, 9=Strong Positive Impact]

a. My belief that I can make a difference in the community ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

b. My interest in learning ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

c. My commitment to being involved in community issues as an engineer ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

d. My ability to write and speak credibly about community issues as an engineer ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

e. The likelihood that I would continue in engineering. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

f. My ability to find information about an issue or a problem in the community ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

g. My ability to evaluate many different types of information for usefulness and accuracy ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

h. My decision-making skills ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

i. My leadership skills ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

SURVEY (POST) CONTINUED

J. My understanding of the value of teamwork in addressing community issues 1 2 3 4 5 6 7 8 9

k. My ability to plan and carry out a project for the community 1 2 3 4 5 6 7 8 9

l. My interest in volunteering. 1 2 3 4 5 6 7 8 9

m. My school pride. 1 2 3 4 5 6 7 8 9

30. What formal mechanisms did you use in your service-learning class to assess what you learned through your service-learning project? (Check all that apply)

- Discussion
- Making a presentation
- Keeping a journal/log
- Written reports
- Written assignments other than a report
- None
- Other

31. Did your service-learning project(s) lead you to further action (for example, volunteering) with the community agency or organization you worked with, or the topic/issue you worked on?

- Yes No

Comments and suggestions: