
AC 2011-1988: IS SERVICE AN EXPECTED PART OF THE ENGINEERING PROFESSION?

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Is Service an Expected Part of the Engineering Profession?

Abstract

Should community service be an expected part of the engineering profession? A certain amount of pro bono work is expected of professionals, in engineering as well as more prominently in law. And if service is part of the engineering profession, should it become part of the education of engineering students? How? Should it be integrated into technical courses, as in service-learning, or should it be left to extra curricular activities?

Student opinions were sampled recently. Courses with service-learning projects have been integrated into existing required courses in engineering over the past six years in five departments of University of Massachusetts Lowell. A recent sampling of entering engineering students at this university revealed that 75% agreed with the statement that public service should be considered as part of the engineering profession. A survey of all students in the same engineering school at all years in the curriculum resulted in an even higher percentage of agreement. Similar results were obtained in response to the statement that service and academic course work should be integrated.

The codes of conduct of several engineering professional societies as well as evidence from this case study supports the principle that service should be considered part of the engineering profession. Integrating service-learning within existing technical courses is a concrete way of training students in how and why engineers perform such professional community service.

Introduction

Is service considered part of the engineering profession? If service is part of the profession, should it not be considered integral to college programs leading to engineering degrees? Should ABET then require service as an accreditation criteria?

In this short paper, service in professional codes of conduct are explored, a case study is made of the opinions of beginning engineering students as well as students at all levels who have been involved with service-learning projects in several courses, and the implications are considered.

Service and professional societies

Engineering professional societies as well as the societies of other professions, such as the American Bar Association, expect community service in their codes of ethics and conduct, as for example, the following:

NSPE (National Society of Professional Engineers) code of ethics
III. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall: 1. Hold paramount the safety, health, and welfare of the public.

Professional obligations

2. Engineers shall at all times strive to serve the public interest.

a. Engineers are encouraged to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.(NSPE, 2011) .

IEEE (International Electrical and Electronic Engineers, the largest engineering professional society) code of ethics:

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree... (IEEE, 2011)

ASCE (American Society of Civil Engineers) Policy Statement 443:

ASCE encourages its members, as individuals, to provide pro bono expertise and professional services to charitable causes and those in emergency situations. (ASCE, 2011)

ABA (American Bar Association) Model Rule 6.1:

Every lawyer has a professional responsibility to provide legal services to those unable to pay. A lawyer should aspire to render at least (50) hours of pro bono publico legal services per year. In fulfilling this responsibility, the lawyer should:

(a) provide a substantial majority of the (50) hours of legal services without fee or expectation of fee to:

(1) persons of limited means or

(2) charitable, religious, civic, community, governmental and educational organizations in matters which are designed primarily to address the needs of persons of limited means; and

(b) provide any additional services through:

(1) delivery of legal services at no fee or substantially reduced fee to individuals, groups or organizations seeking to secure or protect civil rights, civil liberties or public rights, or charitable, religious, civic, community, governmental and educational organizations in matters in furtherance of their organizational purposes, where the payment of standard legal fees would significantly deplete the organization's economic resources or would be otherwise inappropriate;

(2) delivery of legal services at a substantially reduced fee to persons of limited means; or

(3) participation in activities for improving the law, the legal system or the legal profession.

In addition, a lawyer should voluntarily contribute financial support to organizations that provide legal services to persons of limited means.

Comment

[1] Every lawyer, regardless of professional prominence or professional workload, has a responsibility to provide legal services to those unable to pay, and personal involvement in the problems of the disadvantaged can be one of the most rewarding experiences in the life of a lawyer. The American Bar Association urges all lawyers to provide a minimum of 50 hours of pro bono services annually. States, however, may decide to choose a higher or lower number of

hours of annual service (which may be expressed as a percentage of a lawyer's professional time) depending upon local needs and local conditions. It is recognized that in some years a lawyer may render greater or fewer hours than the annual standard specified, but during the course of his or her legal career, each lawyer should render on average per year, the number of hours set forth in this Rule. Services can be performed in civil matters or in criminal or quasi-criminal matters for which there is no government obligation to provide funds for legal representation, such as post-conviction death penalty appeal cases.

[2] Paragraphs (a)(1) and (2) recognize the critical need for legal services that exists among persons of limited means by providing that a substantial majority of the legal services rendered annually to the disadvantaged be furnished without fee or expectation of fee. Legal services under these paragraphs consist of a full range of activities, including individual and class representation, the provision of legal advice, legislative lobbying, administrative rule making and the provision of free training or mentoring to those who represent persons of limited means. The variety of these activities should facilitate participation by government lawyers, even when restrictions exist on their engaging in the outside practice of law.

[3] Persons eligible for legal services under paragraphs (a)(1) and (2) are those who qualify for participation in programs funded by the Legal Services Corporation and those whose incomes and financial resources are slightly above the guidelines utilized by such programs but nevertheless, cannot afford counsel. Legal services can be rendered to individuals or to organizations such as homeless shelters, battered women's centers and food pantries that serve those of limited means. The term "governmental organizations" includes, but is not limited to, public protection programs and sections of governmental or public sector agencies.

(ABA, 2011)

Case Study Student Survey Response

There are, of course, philosophical arguments for including service as part of a profession, such as social justice and humanitarianism. Public relations and a positive public image for the profession could also be considered as motivation.

The question of whether service is, or should be, considered part of the engineering profession was put to engineering students, both beginning an engineering program and those who have taken courses with service-learning projects embedded.

Service-learning is "a course based, credit-bearing, educational experience in which students (a) participate in an organized service activity that meets identified community needs and (b) reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility." (Bringle & Hatcher, 1995).

The service-learning program in question involves the integration of service-learning (S-L) projects into existing core required courses in five departments over the last six years. Last academic year (2009-2010) S-L projects in courses (ranging from 7% to 100% of the grade) were completed by 1150 students. Figure 1 indicates the spread of S-L courses over the last six years.

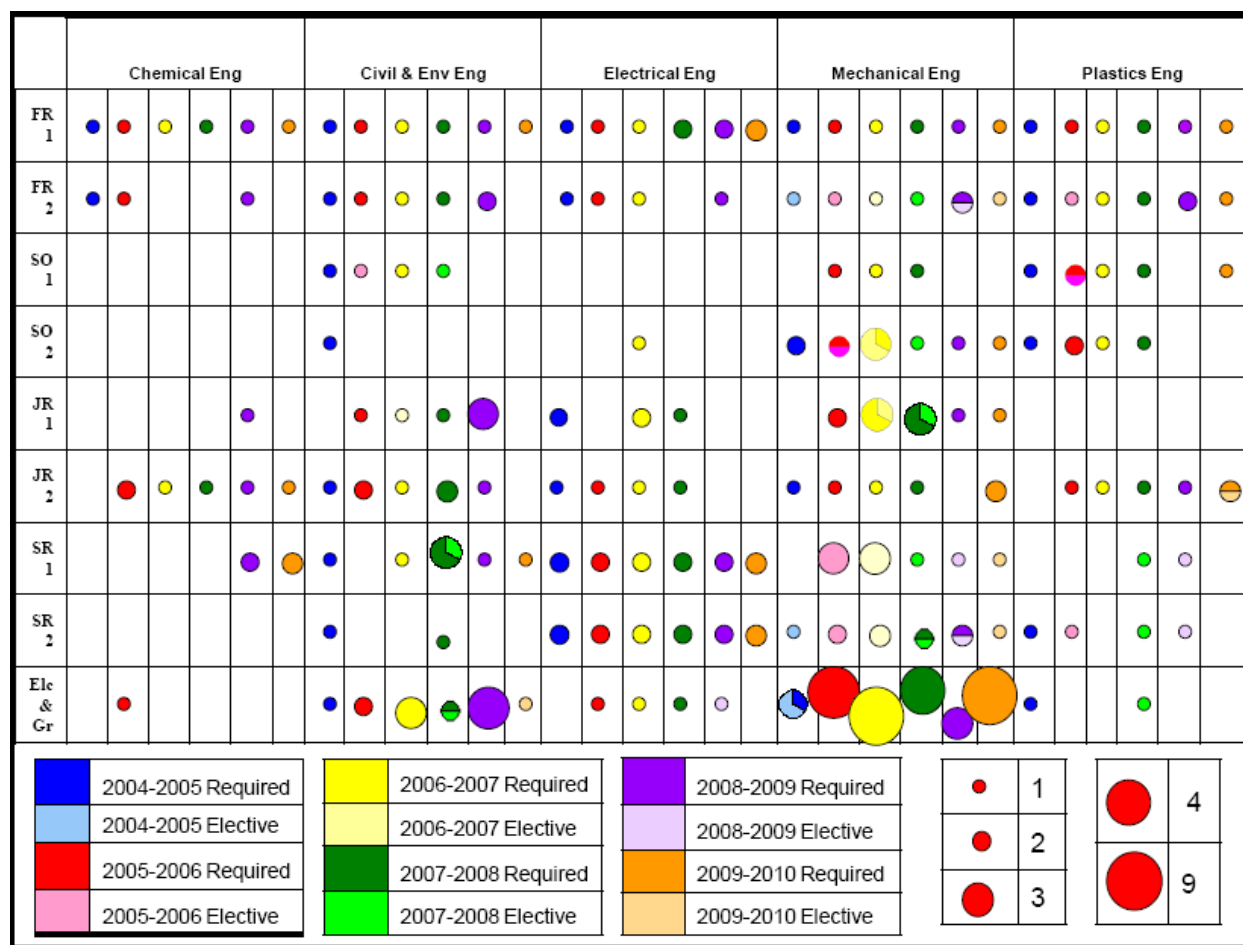


Figure 1. Distribution of Courses with Service-Learning by Semester and Dept. 2004-2010

Entering students have been sampled every fall with a pre survey, and then all students are surveyed post at the end of the spring semester. The surveys themselves are included in Appendix A. In September 2010, in the pre survey with 469 responses (out of approximately 530 students in the introduction to engineering class), the response to the statement, “Service in general should be an expected part of the engineering profession” was that 75% agreed, 8% disagreed, and the rest were neutral. The mean was 6.57 on a Likert scale of 1 to 9 (strongly disagree to strongly agree with 5 neutral). In post surveys last spring in response to the statement on the same Likert scale of 1 to 9 with 471 responses from students across all years, the mean response was 6.72. Interestingly, the mean response of females (n=64) was 7.69 (significantly different from males of 6.57, at 5%, t-test). Also, a consistent trend in more positive responses was noted from first year to senior year students. Interviews with students yielded similar results (West, Duffy, Barrington, & Heredia, 2010).

The pre surveys of beginning engineering students in the fall of 2010 were compared with the post surveys of the same students at the end of the semester after they had completed a modest service-learning project (7% of the grade) of developing shoebox experiments for K-8 students. Surveys were matched by the ID number of the students (n=292), and then a paired t-test was performed with a significance level of 5%. The level of agreement to the statement that service

should be an expected part of the profession increased significantly from 6.61 to 6.89 on the Likert scale.

In other studies of faculty, Astin's group at UCLA reported that its 2007-2008 survey of over 12,000 full time faculty members at 379 institutions that the percentage of faculty who found it "very important" or "essential" to encourage commitment to community service rose 19 percentage points compared to 2004-05 (55.5 % from 36.4 %), the largest increase in any of the survey items (DeAngelo, Hurtado, Pryor, Kelly, & Santos, 2009).

Implications

Since acceptance of community service as an expected part of the engineering profession appears to be growing, the question arises as to whether community service should be a expected part of engineering education. Service-learning is an obvious way of integrating service into the curriculum. From the student's point of view, a key objective of service-learning is enhanced comprehension of subject matter in courses (Bringle & Hatcher, 1995) (Eyler & Giles, 1999). Another objective is the development of professional skills in students (such as communication and teamwork, which are typically involved in service-learning projects in courses) (Lima & Oakes, 2006). Embedding service-learning into required core courses would clearly make service an expected part of the profession, that is, service is a "given." Thus, service-learning would fulfill yet another engineering education objective. In the experience of the program in the case study, no additional courses have been added to the curriculum to integrate service-learning.

From a broader perspective again, schools of other professions require service. For example, the recent hearings on the appointment of Elena Kagan to the Supreme Court brought to light her approval of requiring service of all the students in the Harvard Law School while she was dean (Harvard Law Bulletin, 2009). Some accrediting agencies, in the midwest and the west, have included service in academic programs as an accreditation requirement for colleges and universities, not just professional schools. For example, the North Central Association has Criterion Five, Engagement and Service: "As called for by its mission, the organization identifies its constituencies and serves them in ways both value." In the discussion section of the accreditation handbook on core criteria and examples of evidence (North Central Association Higher Learning Commission, 2011), the following appears: "Service learning programs, for example, now appear on many campuses. Faculty, students, and external constituencies of the college collaborate in creating activities directly connecting student learning with serving community needs." (p. 3.2-17)

Apart from the means of integrating service into engineering education, if service is considered part of the engineering profession, another question arises as to whether community service should be a part of engineering education and whether ABET should include service.

In conclusion, there appears to be a growing acceptance of service as a part of the engineering profession, and service-learning within existing technical courses is a concrete way of training students in how and why engineers perform such professional community service.

Acknowledgement

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Appendix A: Pre and post surveys

**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="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

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="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

6. What is your age?

<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>

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

<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>
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**Survey on Service-Learning, New students,
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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"/> 0	<input type="radio"/> 0
<input type="radio"/> 1	<input type="radio"/> 1
<input type="radio"/> 2	<input type="radio"/> 2
<input type="radio"/> 3	<input type="radio"/> 3
<input type="radio"/> 4	<input type="radio"/> 4
<input type="radio"/> 5	<input type="radio"/> 5
<input type="radio"/> 6	<input type="radio"/> 6
<input type="radio"/> 7	<input type="radio"/> 7
<input type="radio"/> 8	<input type="radio"/> 8
<input type="radio"/> 9	<input type="radio"/> 9

10. What is your current academic status?

- ☐ Freshman
☐ Sophomore
☐ Junior
☐ Senior
☐ Graduate

11. I am a transfer student.

☐ Yes
☐ No

12. What is your major?

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

13 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

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

Helping: Doing things for others, building a better world

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

Income: Making a high salary

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

Security: Having stable employment and income, not worrying about lay-offs

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

Variety: Doing many different activities, not doing the same things all the time

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

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]

14. Service and academic coursework should be integrated.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

15. Engineers should use their skills to solve social problems.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

16. I enjoy learning when course materials pertain to real life

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

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

17. I learn more when courses contain hands-on activities	1	2	3	4	5	6	7	8	9
18. The things I learn in school or college are useful in my life	1	2	3	4	5	6	7	8	9
19. Social problems are not my concern.	1	2	3	4	5	6	7	8	9
20. People who receive social services largely have only themselves to blame for needing services.	1	2	3	4	5	6	7	8	9
21. Most social problems are easy to solve.	1	2	3	4	5	6	7	8	9
22. I plan to do something to improve my community in the near future.	1	2	3	4	5	6	7	8	9
23. I should give some of my time to help those in need.	1	2	3	4	5	6	7	8	9
24. I can have an impact on solving problems that face my local community.	1	2	3	4	5	6	7	8	9
25. I can have an impact on solving problems that face under-served communities internationally.	1	2	3	4	5	6	7	8	9
26. It is important to be involved in a program to improve my community.	1	2	3	4	5	6	7	8	9
27. It is not necessary to volunteer my time to help people in need.	1	2	3	4	5	6	7	8	9
28. I am not sure what skills are necessary for my career.	1	2	3	4	5	6	7	8	9
29. I am concerned about community issues.	1	2	3	4	5	6	7	8	9
30. Working in teams is a waste of time.	1	2	3	4	5	6	7	8	9
31. It is important to me personally to influence the political structure.	1	2	3	4	5	6	7	8	9
32. It is important to me personally to have a career that involves helping people.	1	2	3	4	5	6	7	8	9
33. I can learn more from working on group projects than from working alone.	1	2	3	4	5	6	7	8	9
34. 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
35. 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
36. I feel well-prepared for my future career.	1	2	3	4	5	6	7	8	9
37. I have a close working relationship with at least one faculty member at this institution.	1	2	3	4	5	6	7	8	9

The following questions are about “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.

38. 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 38A)

38A. 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"/> 0 | <input type="radio"/> 0 |
| <input type="radio"/> 1 | <input type="radio"/> 1 |
| <input type="radio"/> 2 | <input type="radio"/> 2 |
| <input type="radio"/> 3 | <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 |

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

39. Being able to take classes with service-learning was one of the reasons for my coming to UMass Lowell.

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

40. Within service-learning courses, the service-learning projects should be required and not optional (with a choice of both service and non-service projects).

☐ Yes

☐ No

Thank you for completing this survey!

Student Post Survey about Service-Learning

Spring 2010

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. Your responses will form an important part of a research project on service-learning. Responses are kept confidential.

SURVEY REGISTRATION AREA

Student ID (ISIS No.): _____

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

☐ Other: _____

4. What is your ethnicity?

☐ Hispanic/Latino

☐ Non Hispanic/Non-Latino

5. How many miles do you live from campus? (if you live on campus, put zero: 0)
_____.

6. What is your age? _____

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

8. How many credit hours are you taking this semester? _____

9. What is your current academic status?

☐ Freshmen

☐ Sophomore

☐ Junior

10. I am a transfer student.

☐ Yes

☐ No

☐Senior

☐Graduate

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

☐Biomedical Engineering

☐Engineering Technology

☐Chemical Engineering

☐Mechanical Engineering

☐Civil Engineering

☐Plastics Engineering

☐Computer Engineering

☐Undeclared Engineering

☐Electrical Engineering

☐Other

☐Energy Engineering

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

☐No ☐Yes, during high school ☐Yes, during college ☐Yes, outside of school

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

☐Yes ☐No ☐Not eligible then

We define “**service-learning**” as a learning approach in which students achieve academic objectives in a credit-bearing course by meeting real community needs.

14. Estimate the total number of service-learning projects you have participated in your entire academic career. _____

SURVEY RESPONSE AREA:

INSTRUCTIONS: Your responses 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. Thanks from the SLICE project, UML College of Engineering.

1. Please rate the importance of each of these career values. Please choose the answer that makes sense to YOU; not what you think others would say.

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

Challenge: Learning new skills or information, doing things in a new way

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Helping: Doing things for others, building a better world

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Income: Making a high salary.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Security: Having stable employment and income not worrying about lay-offs.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Variety: Doing many different activities, not doing the same things all the time.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

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.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

3. Engineers should use their skills to solve social problems.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

4. I learn more when courses contain hands-on activities.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

5. Service in general should be an expected part of the engineering profession

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

6. People who receive social services largely have only themselves to

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

blame for needing services.

7. Most social problems are easy to solve.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

8. I can have an impact on solving problems that face my local community.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

9. I can have an impact on solving problems that face under-served

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

communities internationally.

10. Working in teams is a waste of time.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

11. It is important to me personally to influence the political structure.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

12. It is important to me personally to have career that involves helping people.

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

13. I am uncomfortable working with people who are different from me in

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

such things as race, wealth, and life experiences.

14. I have a close working relationship with at least one faculty member

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

at this institution

15. Within service-learning courses, the service-learning projects should

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9

be required and not optional (with a choice of both service and non-service projects).

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

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

☐ Yes

☐ No

17. Please indicate the number of classes in **each semester** in which you participated in a class project that addressed a real community issue or problem through service-learning.

FALL 2009

a. Total number of service-learning classes taken

☐ 0 ☐ 1 ☐ 2 ☐ 3

- b. Number of the classes in which service-learning was required.

0 1 2 3

- c. Number of the classes in which service-learning was optional.

0 1 2 3

SPRING 2010

- a. Total number of service-learning classes taken

0 1 2 3

- b. Number of the classes in which service-learning was required.

0 1 2 3

- c. Number of the classes in which service-learning was optional.

0 1 2 3

18. Approximately how many hours total did you spend working on all your S-L projects in each semester? [Please indicate the number of hours].

Fall 2009:_____ Spring 2010:_____

19. On average, across service-learning projects,

[1=Much less; 5=Same; 9= Much more]

- a. The amount of effort I put into the service-learning

1 2 3 4 5 6 7 8 9

project(s) relative to an equivalent class project without service was:

[1=Strongly disagree; 5=Neutral; 9= Strongly agree]

- b. In the service project(s) 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(s) I learned how to work with others
effectively.

1 2 3 4 5 6 7 8 9

20. To what extent have your service-learning project(s) this year had impact on the following:

[1=Strongly disagree; 5=Neutral; 9= Strongly agree]

- a. The likelihood that I would continue in engineering.

1 2 3 4 5 6 7 8 9

b. My belief that I can make a difference in the community using

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

engineering skills

c. My interest in learning the subject matter of the courses.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

d. My commitment to being involved in community issues as an engineer.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

e. My ability to address complex, open-ended problems (typical of community

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

projects)

f. My ability to write and speak credibly as an engineer.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

g. My understanding of the value of teamwork in addressing community issues.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

h. My ability to plan and carry out a project for the community.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

i. My school pride.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

j. The likelihood that I would drop out of engineering.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

k. My view of the engineering profession in a positive way.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

21. 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

22. 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

__ Written assignments other than a report

☐ Making a presentation

☐ None

☐ Keeping a journal/log

☐ Other

☐ Written reports

23. Comments and suggestions: