

AC 2008-255: INTRODUCTION OF SERVICE LEARNING IN A FRESHMAN ENGINEERING COURSE

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Service Learning in a Freshman Engineering Course

Abstract

This paper presents an account of the implementation of a new Service Learning Project as a component of a freshman engineering course. A significant part of the required work for this course is comprised of team projects. The service learning project required each team to work in a different area of urban housing renovation. One team would work on foundations, another team on plumbing, another team on electrical wiring, and so on. The team assignments were made by the Instructor in consultation with the contractor in order to assure equivalent workloads for each team.. The project concluded with a report and a presentation by each team to the class. The team presentations and reports covered a broad area of engineering applications related to residential construction that also provided a forum to exchange ideas and lessons learned during the project.. The planning, implementation, and results of this service learning project are examined and the project effectiveness is evaluated.

Project Goals

The primary goal of this project was to introduce freshman engineering students to authentic problems encountered in everyday activities that are representative of engineering problems in general, and that can be analyzed within their level of expertise. The project was also intended to increase students' attention to details and enhance their problem solving abilities. These goals support the larger effort to attract and retain students in the field of engineering. Specific learning objectives for the course in general and this project in particular are:

- Students will be able to work productively with fellow students.
- Students will be able to identify the distinctions between the various disciplines and functions within Engineering.
- Students will be able to use word-processing, spreadsheet, and presentation software to write and present reports on assignments and projects.

Project Description

This Service Learning project initially involved 24 students enrolled in one section of the Introduction to Engineering course during the 2007 Spring Semester at San Antonio College. This course addresses five primary themes:

- orientation to the engineering curriculum
- academic success strategies
- team building and community activities
- personal development
- professional development

As part of the normal required coursework, the students are organized in teams to work together on three projects. The projects are mandatory and each one contributes 20% of the final course grade. They are designed to expose students to various elements of real life

engineering and build teamwork skills that are necessary to succeed in an engineering career. The second of the three projects was selected to be a service learning activity. The first project was designed to emphasize the importance of teamwork skills.

The Introduction to Engineering course meets for two hours each week, and conventional wisdom recommends that a student should devote from two to four hours outside the classroom for every hour spent in the class. Engineering courses typically require a student commitment in the upper half of the range. Based on this principle, and a project weight of 20% of the final grade, it was expected that each student would perform about 20 hours of community service by the end of the project. With an enrollment of 24 students in this class it was projected that 400 to 500 hours of community service would be provided.

A local Housing Authority (U. U. Housing Assistance Corporation) was selected from a list of potential community partners provided by the Service Learning office at our college. This agency was chosen on the basis of their declared need for volunteer work and the learning objectives of the course project. Six houses in varying stages of restoration were selected to provide each team with a unique set of challenges. All of the construction sites were within the local San Antonio area.

Throughout the course students are required to maintain a journal to record their daily activities. This serves as a base for their personal time management skills analysis. For the service learning project they also presented weekly written reports on their activities in relation to the learning objectives of the project. Their supervisors from the Housing Authority approved and signed the reports. These reports were focused on:

- what students were seeing, hearing, observing while at their service site;
- experiences or incidents that reflected ideas discussed in class;
- thoughts, feelings, and values derived from their service activities;
- what was learned.

These weekly reports formed the basis for each team's final written project report and oral presentation to the entire class. Each student presented a portion of the final team report and included operations and procedures that were characteristic to their site, as well as their personal reflections on the activity. Finally, an open forum was provided for the entire class to discuss their ideas and exchange lessons learned during the project. Students completing the project were recognized in front of the entire class and were presented with certificates of appreciation.

Because of liability concerns, neither contractors nor the company construction manager would allow students to do any actual physical labor. They were only allowed to participate in preconstruction meetings, damage evaluations, planning, permit application procedures, site inspections, work reviews, and verification of site specifications. The liability issue also seemed to have an adverse impact on initial student engagement in the project. Participating students were required to sign a waiver form to satisfy institutional and agency legal requirements. Statements in the form with wording like "I, M. A. Student, understand that there are risks involved in my participation in this volunteer Service-Learning Program,

including the risk of PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.” were intimidating to several students, and they were reluctant to sign the documents.

Although the project was expected to be done in eight weeks, the time for completion was extended to ten weeks because of unexpected delays and reassignments related to several site specific issues. After the project started, two sites were closed for lead and asbestos removal and renovation at one site was postponed indefinitely because the location was determined to be in a flood plane. The students initially assigned to the problem sites were reassigned to other sites. Five students abandoned the project after the site closures, accepted a lower grade, and finished the rest of the class. Four students withdrew from the course during the semester for personal reasons. As a result of all these setbacks, only fifteen students ended up completing the Service Learning assignment and a total of 282 service hours were logged on the project.

Project Evaluation

The team reports were evaluated by both the instructor and the class, based on criteria of content and clarity. The members of each team received the same score for the project. The grades received for this project were based on the achievement of learning objectives and not the number of service hours they spent at the construction site. Students also completed both preliminary and post-project surveys of the value of the community service they provided in relation to their educational goals and their personal lives. Results from the final survey are presented in Figure 1 below.

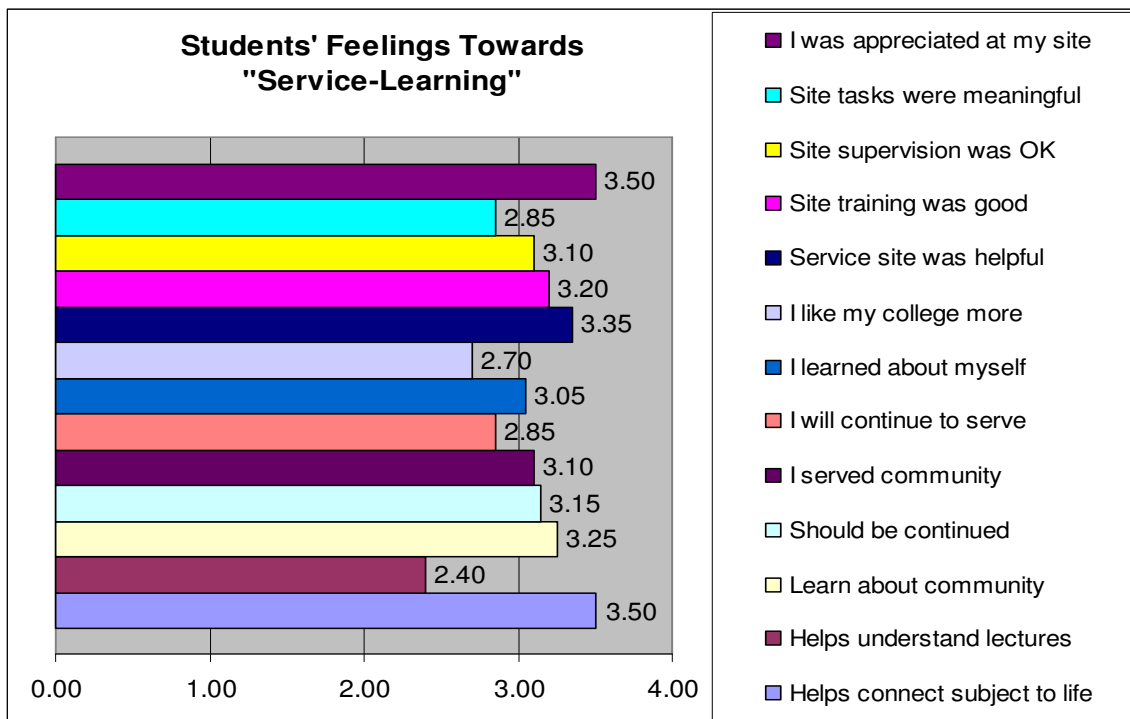


Figure 1. Student Survey Results

Conclusions

This project introduced students to a real life working environment where they were able to correlate information acquired in the classroom with the physical realities around them. Based on the students' reports, team presentations, and surveys it appears that most of the participating students enjoyed the opportunity to provide assistance to the community, and most of them agreed that they learned a lot about the construction business in general and engineering in particular. Most of the students also indicated that the experience reinforced their educational and personal goals of working in the field of engineering. Significant points of discontent were the apparent lack of organization that was displayed in regard to the site closures, and the strong language of the waiver form. A few students complained that the amount of time required was excessive in regard to the number of course credit hours received.

The primary beneficiaries of this project were the students, who were able to gain valuable work experience and make connections between theory and practice by participating in real world engineering work. The entire class was able to learn about a broad range of engineering practices and real-life problems related to residential construction and public safety. Each student's personal experience at a particular site provided an enhanced receptivity for understanding and integrating the information from the other team reports. Through this project, most of the students realized the importance of service to their community and at the same time they became aware of the importance of content knowledge and life-long learning in a professional engineering career. They also were able to see the importance of the role engineers have, and will continue to have, in our society, and how vital their work is for all of us.

The most noticeable benefits for the instructor were the satisfaction of helping students learn while also making a contribution to community improvement, and improved relationships with students. As a result of conducting this pilot project some valuable lessons were learned and some new practices were successfully adopted. For faculty that may be considering the implementation of Service Learning projects in their freshman engineering courses, the following points need to be addressed:

- Administrative support is crucial for the success of the project;
- Emphasis should be placed on academic rigor;
- Participation in faculty training offers a lot of help and numerous chances to network with other like-minded faculty;
- Emphasis should be placed on quality over quantity at every step;
- All participants should be prominently recognized;
- Market and publicize achievements to raise awareness within the community of efforts and your program.
- Expect the unexpected; be flexible and adaptable.

It appears likely that a service-learning project will be retained in the Introduction to Engineering course as long as more thorough planning can be undertaken before the start of the project, and the liability issues can be addressed in a more student-friendly manner. These efforts are needed to provide students with less frustration and a more productive cycle of experiential learning.