

Service Learning in a Freshman Engineering Course

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Abstract

The session presented the first attempt to integrate a service learning project into a freshman-engineering course at San Antonio College. The students were organized in teams and worked together on several projects. The project selected as part of the service learning activity required teams of four students to participate in a construction project. Each team was assigned to a different part of the construction project. The project concluded with a report and a team presentation to the entire class that provided a forum to exchange ideas and lessons learned during the project. That way, the team presentations and reports covered a larger area of engineering applications and the entire class was exposed to a broader variety of subjects.

Project Description

This Service Learning project involved 2007 Spring Semester freshman-engineering students enrolled in ENGR 1201 – Intro to Engineering course. The course addresses five primary themes:

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

As part of the required coursework, the students were organized in teams to work together on several projects. The projects were mandatory and each one had a weight of up to 20% of the final grade, being designed to expose students to various activities of real life engineering and build teamwork skills that are necessary to succeed in an engineering career. One of these projects was designed to be part of a service learning activity that concluded with a report and a team presentation to the entire class providing a forum to exchange ideas and lessons learned during the project.

The students enrolled in this course earn two credit hours and conventional wisdom recommends that a student should reserve for learning about three to four hours outside the classroom for every hour spent in the class. This is particularly true for engineering courses. Based on this assumption and on the fact that this project had a weight of up to 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 about 20 students in this class, it was projected that about 400 hours of community service will be provided.

The community partner selected, U.U. Housing Assistance Corporation, was among the local housing authorities listed with our Service Learning office that declared to have a need for volunteer work. The initial scheduled time for completing this class project was between February and March, 2007, but was extended until the end of April due to unexpected delays. Initially each team was assigned to a different project. That way, the team presentations and reports were supposed to cover a larger area of engineering applications together with a multitude of operations and procedures that were characteristic to each site. This approach would enable the entire class to be exposed to a broader variety of subjects.

Goals

The primary goal of this project was to expose students who do not have advanced engineering knowledge to current problems encountered in everyday activities that are representative of engineering problems in general and can be solved with their level of expertise. The project has been planned to increase students' attention to details and enhance their problem solving abilities that are vitally important in an engineering career. At the same time, the project is meant to be part of a concerted effort to attract and retain students in the field of engineering.

Reflection Activities

As planned, during the entire course, the students maintained a journal to record their daily activities and serve as a base for their personal time management skills analysis. Particularly for this project, they presented weekly reports connecting their activities with the learning objectives. Their supervisors from the partnering construction companies signed and approved the reports.

The guidelines for the weekly reports were focused on recording:

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

Based on the weekly reports, the teams concluded the project with a team report and prepared a professional presentation of their projects to the entire class. This activity provided a forum to exchange ideas and lessons learned during the project. Each student presented a portion of the project and the presentations included their reflections together with lessons learned, details, procedures, significant pictures, and documents such as drawings, inspection certificates, building permits, and specifications. The entire class was exposed to a large variety of subjects that included field pictures, construction procedures, material specifications, typical documentation, floor plans, and analysis of the problems encountered at each site as well as students' position regarding the lessons learned in this project.

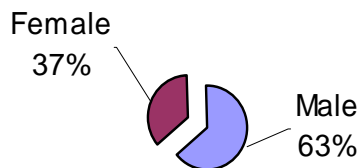
Evaluation

Students completed preliminary and post surveys of the value of the community service in their lives while analyzing their educational goals. The team reports were evaluated by the instructor and the score was shared by each individual team member. Each presentation was evaluated by the entire class as well as by the instructor from two points of view (content and clarity) and the individual scores were averaged and entered in the calculation of the final grade.

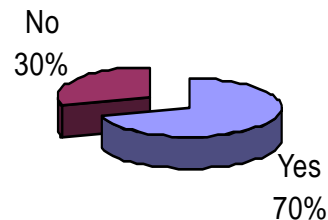
Project Execution

The entire class of 24 students was divided from the beginning of the course into six teams of four students each. The teams were consolidated by an introductory project that was finished before the service learning project was initiated. During the course of the project, four students withdrew from the course, five students abandoned the project but finished the class, and fifteen students completed the project. Group statistics are presented in Figures 1 and 2.

Gender Distribution



Previous Service Participation



In the beginning, six houses were selected—one for each team. Each house was in a different stage of restoration, so the teams could participate in various projects and be involved with different aspects of construction work. The six selected construction sites were all in the San Antonio area.

The first challenge encountered by the students was the liability problems. The paperwork had to be prepared to satisfy all legal requirements regarding liability issues for both the college and the contractors. Some details were outright scary and the wording made students feel quite uncomfortable. Statements such as “I, _____, 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 too strong and some students were reluctant to sign the documents.

Then, because of the liability concerns, neither the contractors nor the UU Housing construction manager would allow students to do any actual physical work at the construction sites. They were allowed to participate only in preconstruction meetings, damage evaluations, planning, permit application procedures, site inspections, work reviews, and specifications verification.

In the meantime, more problems appeared. Two construction sites were closed for lead and asbestos removal and one house repair start was postponed indefinitely because the house was on the flood plane and needed a certificate of elevation. The certificates issuance was delayed repeatedly for various reasons until the last projected date was beyond the project presentation date. After several unsuccessful attempts to start their projects at those addresses, the respective teams were reassigned to join the other teams at their construction sites. At this point, five students decided to abandon the project and accept a lower grade. The remaining students logged a total of 282 service hours.

The final presentations to the entire class provided a forum to exchange ideas and lessons learned during the project and covered a broad area of engineering applications. The entire class was exposed to a large variety of subjects that included field pictures, construction procedures, material specifications, floor plans, and analysis of the problems encountered at each site as well as students' position regarding the lessons learned in this project.

The students that completed the project were recognized in front of the entire class and were presented with certificates of appreciation. The grades they received reflected their learning, not the number of service hours they spent at the construction site.

Benefits

The main beneficiaries of this project were the students, and with them, the faculty, the community in general, and the college itself drew many benefits as well. Among the most noticeable benefits were:

Benefits for students:

- Enhanced learning
- Connection between theory and practice
- Enhanced critical thinking
- Valuable work experience
- Possibility to explore majors & careers
- Enhanced civic responsibility
- Enhanced commitment to service
- Enhanced employability
- Break down barriers/promote understanding

Benefits for faculty:

- Enhanced student learning (more engaged students)
- Reinvigorated teaching
- Improved relationships with students
- Professional development
- Publishing opportunities
- Enhanced sense of making a difference

Benefits for the community:

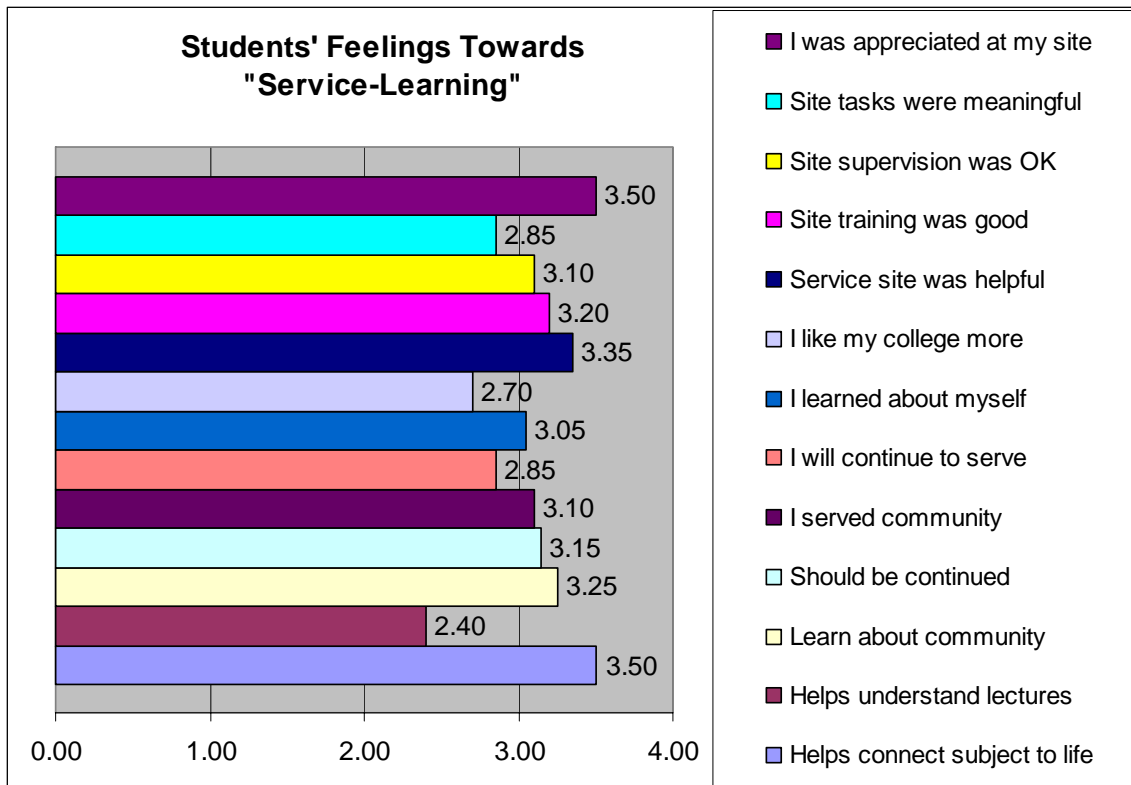
- Infusion of people power to help
- Partner needs met
- More informed and involved citizenry
- New ideas and energy
- Access to college resources

Benefits for the college:

- Fulfillment of Mission
- True partnership with tangible results
- Increased community support
- Public relations and free publicity
- Improved learning

Conclusions

Based on reports, presentations, and surveys, it can be concluded that the majority of students enjoyed the opportunity to provide help to the neediest group of our community. By participating in this service project, most of the students believed they enhanced their progress towards their educational and personal goals of working in the field of engineering. This project exposed them to a real life working environment where they were able to correlate the knowledge acquired in the classroom with physical realities around them, although some of them complained that the amount of time was excessive compared with the number of credit hours they received. Another point of discontent was the apparent lack of organization that exists in these kinds of activities, although most of them agreed that they learned a lot about the construction business in general and engineering in particular.



With this project, most of them realized the importance of service to their community and at the same time, they became aware of the importance of knowledge and learning in performing the duties required by the engineering profession. They also realized what important positions engineers have, and will continue to have, in our society and how vital their work is for all of us. Results from the survey are presented in Figure 3.

For the future, we plan to keep a service learning project as part of this course, although I will most likely ask for more planning before the start of the project, along with some revisions to the liability issues. This will give students more time and opportunity to experience the excitement of all hands-on activities while providing real help to the community.

Best Practices/Lessons Learned

Throughout the entire project, several extremely valuable lessons have been learned and several good practices were implemented successfully. These practices should be shared with other faculty that plan to implement service learning projects in freshman engineering courses. Some of the most valuable lessons learned are listed here:

- Expect the unexpected and be extremely flexible and adaptable;
- 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;
- Emphasize quality over quantity at every step;
- Gather and disseminate data about the project and its results;
- Recognize all participants;
- Market and publicize achievements to raise awareness within the community of efforts and your program.