Service-Learning as a Pedagogical Tool for Citizen Stewards

Service-Learning

Signon and Ramsey provided the first known definition of Service-Learning (S-L) as a value added component of student learning[1]. This definition continues to serve as the pivotal rationale for an increasing number of institutions encouraging S-L based curricula. For example, partnerships such as the Campus Compact, which comprises of over 1,100 colleges and universities, with over 6 million students across over 30 states, have brought the message of service as an integral component of learning to the mainstream of the education reform debate[2]. Many models abound on ways students can implement their classroom learning to meet the needs of a community, making S-L based curricula ideal for reinforcing educational concepts while promoting citizenship and stewardship. The Compact's resources abound with examples of faculty across the United States who have researched, and implemented service in various forms within their curricula, and students that have benefited in a variety of ways from such experiences. For example, the longitudinal study conducted by Astin et. al (2000), gathered data from over 20, 000 undergraduate students engaged in various service activities within the California colleges and universities[3]. All 11 outcomes measured qualitatively and quantitatively, and ranging from academic performance such as writing and critical thinking skills, to personal attributes such as self-efficacy, and leadership showed significant positive correlations.

Setting the Stage

I believe that engineering and especially environmental engineering is ideally placed to offer S-L based curricula, given the range of environmental concerns facing a community. This discipline directly involves solving the environmental problems in the community by efficient design and sustainable implementation, but also effective communication and collaboration. Therefore, from 2012, I have been offering S-L projects to my introductory environmental engineering students (senior year students) where they work with local community partners on a mutually agreed upon project. Students work on these four-six week projects in the laboratory portion of their course. A detailed narrative of my first year experience of setting up and successfully managing four S-L projects is described elsewhere[4]. The two projects described here are from the set of six projects that were carried out during the 2013-2014 school year. In each of these projects, the community partner was an elementary school.

Students at Norwich University are no strangers to the concepts of service. Engineering students in particular look forward to hands on learning and application of their knowledge through implementation. These two factors makes S-L a conducive pedagogical tool in the engineering classroom. It should be mentioned that S-L should be differentiated from volunteering, internships, community service, field trips and such as identified by Furco[5]. The emphasis is on student learning as well as community engagement, where each has an equivalent weighting, i.e. the community engagement is not at the expense of student learning. In fact, it may be stated that even if the student learns a great deal by working on a project, that learning needs to be tied back to the classroom education for the project to be a true S-L project.

Therefore, at the outset, even as we explored subject matter content on the air, water, and land pollution, contaminants, risk to human and ecological stakeholders, and ways to design solutions to prevent and control such pollution, students were also provided with a framework on the essence of S-L. Approximately mid way through the semester, teams were determined, and students were assigned a community partner. The six students who earned the highest grades at midterms served as the team leaders for the six project teams. These student leaders also served as the points of contact for their community partners.

Projects

For the first project, a four-member team was assigned to two community partners, who taught fourth and fifth grade students in an elementary school in Burlington, VT. The school had recently undergone a number of improvements to make the school more sustainable. However, they did not have a system to harvest rainwater, so my student team had the task of designing a rainwater harvesting system to collect water from the roof of the school and store it for potential use in watering the plants in a vegetable garden that was being planned for the school. My student group had the added responsibility of explaining the Engineering Design Process (EDP) to the fourth and fifth graders and involving them in some of the calculations and design work with an overall goal of getting them interested in STEM.

This project was set up over a five-week period. The team leader contacted both teachers and set up a meeting time (during their scheduled lab hours) to determine the scope of the project. The elementary school teachers and I predetermined this, but my students were still responsible for coming to their own agreement with the teachers and negotiating the overall amount of work. They then made

appointments for all future lab sessions within which the project was to be completed with a tentative task outline for each meeting.

Overall, the team met with their community partners a total of four times and used the four sessions to explain the EDP, demonstrate simple calculations, show the fourth and fifth graders some simple surveying techniques to determine the sizes and areas of the roof where the water would be harvested from. The student team also built Plexiglas models of the rainwater harvesting system to better demonstrate the concept. In addition to engaging the school children in these tasks, my student team came up with the final design with detailed engineering drawings and a cost estimate. The school has since used the student developed report (with drawings) to request funding for the system to be built and recently received word that they had been approved for a $5,000 grant from the Home Depot to construct the rainwater harvesting system. The construction is to begin in June.

In addition, one of the students from the team wrote about his experiences with this project and submitted his article to the National Council on Undergraduate Research (NCUR). His abstract was approved and he presented a poster at the NCUR 2014 event in Louisville, KY in April.

In the second project, my student team of four seniors worked with fourth graders at an elementary school in Montpelier, VT, helping them learn about landfill design in a fun way. After using some sketches on the whiteboard to explain what the various layers in a landfill are and the function they serve, the fourth graders got to build ice-cream sundaes as a way to demonstrate their understanding. They had to come up to the board and identify the various layers and explain their role back to my students in order to earn the supplies to build their "landfill sundaes". The project reinforced my students' technical understanding of landfill design, but also tested their ability to explain complicated technical terms and concepts to a lay audience.

Reflections: An Integral Aspect of Service-Learning

In addition to applying the lessons learned in the classroom to help community partners in need, students had to reflect on various aspects of their projects as an integral aspect of S-L. Specifically, for this course, I used reflection as defined by Eyler (2001)[6], as a process that helps students connect the dots between their classroom lessons and their observations and experiences in the community. As researchers in this field have noted that continuous reflections (over a course of time) are the most meaningful, three reflection pieces were expected from each

student. Over a three-week period as students worked on their S-L projects, they reflected on their community partners, their personal growth and experience in the projects, as well as the relation between the projects and their course.

For example, in a reflection on the personal qualities developed by working on the rainwater harvesting project, one of students commented ***"…Having patience with others and taking the time to make sure they understand why decisions are made will help me outside of this project. People will be much more willing to work with me if I take the time to interact with them, whether it is a client or other engineers. If I can help them understand the reasoning behind a decision they will be able to make more informed future design decisions. Ironically patience was also one of the major difficulties I faced with the service learning project. The students were split; about a third of the students seemed very interested in the project while others did not really care. …."***

In the context of how the project activities related to the classroom learning, a student in the landfill project reflected, ***"This service-experience reinforced the course material and helped the group understand the landfill and recycling process even better. Often times, the act of teaching material helps solidify the original information that was learned in the beginning. This was the case in this project because in order to teach others, one has to perform more research and become more familiar with the topic as a whole. Even though the students were only in fourth grade, the task forced the group to really do their homework and be well informed about the topic before addressing the students."***

Conclusion

An informal survey taken by the elementary school children seemed to indicate that a number of students agreed that it was fun to work on these projects with college students. My students indicated that they got a taste of what their future may hold when it comes to working with disorganized clients, or ones that were unaware of their own needs at times, and where they may have to negotiate project scope based on time and resources as they did with some of the projects.

From an instructor's standpoint, an S-L based curriculum is a lot of hard work. Managing multiple projects and community partners with their diverse needs can be an organization nightmare, unless one is on top of partner needs, students needs and deadlines. Logistical issues included scheduling meetings with community partners, arranging student transportation, making students accountable to provide community partners with their reports, to name a few.

Overall, it should be noted that the projects were successful in engaging senior year college students in a course content effectively, and providing them a taste of a post graduation life working with clients. The community partners were provided with services that met their needs. All community partners expressed willingness to continue collaborating on future S-L projects with next year's student groups. From an instructor perspective, student interest in the course content, along with meeting some community needs made the amount of time and effort spent in developing, and implementing the S-L component of the course worth it.

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[1] Sally Berman, *Service Learning: A Guide to Planning, Implementation, and Assessing Student Projects* (Thousand Oaks, CA: Corwin Press, 2006), 232.

[2] Campus Compact, "Who We Are," http://www.compact.org/about/history-mission-vision/ (accessed March 23, 2014).

[3] Alexander Astin, Lori Vogelgesang, Elaine Ikeda, Jennifer Yee, "How Service Learning Affects Students," 2000, *Higher Education Research Institute, California, LA,* http://heri.ucla.edu/pdfs/rhowas.pdf, (accessed March 22, 2014).

[4] Tara Kulkarni, "Service-Learning Projects in Environmental Engineering Courses: Models of Community Engagement Activities, 2014," Proceedings of 2014 Zone 1 Conference of the American Society of Engineering Education (ASEE Zone 1), http://asee-ne.org/proceedings/2014/Professional%20Papers/105.pdf (accessed June 1, 2014).

[5] Andrew Furco, "Service Learning: A Balanced Approach to Experiential Education," *Expanding Boundaries: Serving and Learning* (Washington D.C.: Corporation for National Service, 1996), 2-6.

[6] Janet Eyler, "Creating Your Reflection Map," *New Directions for Higher Education* 114 (2001): 35-43.

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