

SERVICE LEARNING: ENGINEERING, CONSTRUCTION SCIENCE, AND THE EXPERIENTIAL CURRICULUM

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Abstract — *Service Learning is a form of experiential learning that utilizes the context of a community service project to practice academic skills. In recent years Service learning has been included in many academic disciplines throughout the United States. Incorporating a hands-on component into the curriculums of construction science is challenging for the instructor. Most often these service-learning activities are accompanied by lessons in the classroom creating a pedagogical synergy not found in singular teaching/learning activities in the traditional classroom setting. A difficulty arises when professors want to develop service-learning projects for courses in Structures. This paper examines the current status of service learning in the Construction Science curriculum and proposes a service-learning project for Construction Science students at Texas A&M University. Recent interest in Service Learning has occurred at the university.*

Index Terms — *Experiential Learning, Service Learning, Structures Classes, Hands-on Component*

INTRODUCTION

Service learning is a form of experiential education that uses community service experiences to enrich and expand academic scholarship. When community service projects are combined with skills students learn in a classroom the service learning activity allows the learner to test and practice academic prowess in a risk free hands-on environment. Service learning is mutually beneficial for the participating students, the facilitating faculty member, and the community. University students not only gain opportunities to practice skills, but also to test, refine, and generate theory through systematic reflection. The faculty facilitator gains by integrating teaching, research, and service into the curriculum. Construction science and engineering curriculums can be enhanced by utilizing hands-on activities such as Service Learning.

Experiential learning is not a new concept in this country. In fact, it was the way people learned in our early history. For hundreds of years, professional education in the construction fields was comprised of a lengthy apprenticeship that had relatively few if any collegiate requirements. During the last couple of centuries classroom education has gained the favor it now enjoys [1]. “The effect of an experience is not borne on its face. It sets a problem to the educator. It is his business to arrange for the

kind of experiences which, while they do not repel the student, but rather engage his activities are, nevertheless, more than immediately enjoyable since they promote having desirable future experiences” [2]. This is the challenge for engineering and construction educators.

To achieve an effective mix of learning modes, the construction educator might combine laboratory experiences, audiovisual components, and group exercises with lectures. Approaches such as these are critical for more effective construction education. Practical activities can be as important as the theoretical underpinnings of the construction management field. One of the best laboratories for construction management is the construction project itself. There is no substitute for knowledge derived from guided experience in the field [1]. Structures courses in engineering and construction management are a very important component in the curriculum, therefore devising a hands-on experiential component for these courses could enhance learning for students.

“America’s best-known educational philosopher, John Dewey, proposed that we evaluate schooling by its success in creating in the student the desire for ‘continual growth’ and in supplying the student with the means for making that desire effective in fact” [3]. The engineering and construction science curriculums often lack the means for creating ‘continual growth’ because these disciplines are dependent upon traditional classroom instruction, lab experiences, and artificial competition projects. Continual growth requires application what is learned, therefore experiential activities should be devised for engineering and construction science students.

Service learning incorporates additional learning outcomes that provide all student participants with lessons in community service, philanthropy, teamwork, and leadership. There has not been a definitive formula for integrating actual practice into construction education. There are multiple variables in any given construction project, and these variables can be interrelated in several different ways. Many situations in construction management are commonly uncertain and ambiguous. Most decisions in construction are made with the benefit of experience with previously encountered cases or situations [1]. This creates one of the major challenges for Construction Management educators. Perhaps the greatest challenge is designing curriculum that allows students to learn how to facilitate the resources necessary to manage and complete an actual construction

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project. Service learning projects can offer professors teaching in construction management programs an avenue for teaching these multiple concepts.

SERVICE LEARNING

Service learning [4]-[6] is being adapted into multiple college curriculums in the United States. Universities such as Clemson in South Carolina and Colorado State University at Fort Collins, Colorado have offices devoted to service learning and community service. The University of Louisiana at Lafayette has a Dean of Community Service. These universities are examples a growing trend in this country. "In recent years, a number of colleges and universities have made some form of community service a part of the graduation requirements. Even where community service projects are not required, administrators and community members may collaborate to encourage students to practice it. Many professors incorporate service learning into their curricula which is an integration of community service with subject matter learning by informed application of classroom principles within organizations that serve their communities" [7].

Service learning may enhance the tenure and promotion process for many professors and in addition can provide other benefits for academicians. "Many faculty members have three job components: research, teaching, and service (outreach). However, there is an increasing tendency for faculty members to be faced with higher expectations in all of these components. We believe that service learning provides a way to become more efficient and effective by combining efforts on these components. The effort on a service-learning project obviously contributes to our outreach component and, as we have mentioned, we believe it greatly benefits teaching. In addition, a service learning project may also provide research, consulting, and grant opportunities for faculty" [5].

Service Learning projects can offer an opportunity for students to experience and manage construction projects in local communities. "A powerful avenue for experiential learning is the inclusion of a service-learning component in the curriculum. Although the implementation details vary among disciplines and institutions, the basic philosophy of service-learning is the application of students' skills to solve a community-oriented project. Students are usually organized in groups, and their solutions many times are adopted for the project at hand. Projects are provided to students by the instructor" [1]. Professors must be willing to devote additional time for such projects but the rewards are worth it. "By using service-learning projects, the professor imitates innovative business practices by promoting altruistic behaviors within the context of course activities. The more students are prepared for and know about business practices, the greater their competitive advantage will be in the workplace" [6]. Service learning

projects can offer management opportunities and much needed field experience for undergraduate construction management students. "Field experiences are a valuable part of the undergraduate curriculum and can help students more clearly understand the relevance of their course work through assigned activities in industry" [8].

AN ACTUAL PROJECT

At the University of Louisiana several classes combined their efforts to complete a large vertically integrated project. The syllabi for three construction and technology courses included service learning assignments and points for the spring of 2000. The three courses: Construction Management 356, Construction Processes, Materials, and Methods 254, and two sections of Industrial Technology 101 were included in an effort to bring real world management experiences to the learners utilizing a service learning project.

Including several different university classes to accomplish a large project requires a significant time commitment for faculty. The scope of managing this large project would have been overwhelming for one individual professor and yet no other faculty volunteered to assist at The University of Louisiana. A graduating senior who had participated in an earlier service learning project inquired about an independent study. After meeting for a short time the senior Industrial Technology student was nominated to the post of CEO of the spring of 2000 service learning projects in Construction Technology. His duties would include coordination, facilitation, and planning of the largest service learning project in the history of service learning and community service at The University of Louisiana.

Students enrolled in Construction Management 356 began work on the service learning project during the first week of the semester. The majority of the students were seniors with a few juniors as this class was an upper division course. The initial lectures in the class were about philanthropy, community service, and service learning. Management concepts, teamwork, and construction project facilitation were partial learning objectives for the semester in the course.

Students in Construction Processes, Materials, and Methods 254 and in the two sections of Industrial Technology 101 were introduced to the concepts of Philanthropy, community service, and service learning through reading assignments and lectures. These students were freshmen and sophomores majoring in Industrial Technology. Many of the students in the Construction 254 section were interested in construction careers. Several of these underclass students had actual work experience within the construction industry.

The CEO of the project visited each of the classes early in the semester to do a mini lecture on the service learning process. The lecture introduced students to the concepts and

to the importance of teamwork and cooperation. A total of 72 students would work together on the chosen project. The CEO met with the Construction 356 class every week in order to set up work committees and to assign managerial tasks. A project selection committee began by identifying charitable community agencies. The committee hoped that one or more of these agencies would have a project that would mesh with the human resources and time available. At the same time a human resource committee was interviewing students in the other classes to assess the skill levels and talents that existed within the large group of students. Other committees formed were a refreshment and food committee, a material procurement committee, and an equipment committee.

PROJECT SELECTION AND EXECUTION

A committee was charged with selecting a project. They discovered multiple community agencies with numerous projects for the construction technology student volunteers. The potential projects and the human resource talents of the student workers were compared with the array of projects and one project emerged as the best fit. A local homeless shelter which provided sleeping rooms, food, and training for the homeless needed numerous improvements to their facilities. The students worked closely with the homeless shelter's managers to define the parameters of the project. The shelter wanted to paint and refurbish 13 dormitory rooms. These rooms would later be used to house homeless men participating in an occupational training program.

The Construction 356 students estimated the materials needed to complete the job. The materials procurement committee began soliciting local lumber and paint dealers for the needed materials. Two weeks before the project was to begin the students were still short of most of the materials needed to complete the project. Out of necessity all those enrolled in construction 356 got involved with materials procurement. One week before the project was to start the students had gathered a great deal more materials than would be needed. Extra materials were donated to the shelter for future projects.

The project was planned for a Saturday in April. Each student in Construction 356 was to be a team leader. The CEO designed an evaluation form, a worker roster list, schedule and assigned workers to 15 different work teams. Each of the 15 students in construction 356 had a team to manage and motivate for the project. The work teams were scheduled to show up in staggered shifts with all teams on the project from 9 AM until 1 PM. Teams began arriving at 7 AM and began masking the wood trim and spreading drop cloths. Later teams began spackling and painting right behind those teams preparing the dorm rooms. The last teams arriving began the cleanup process. The students took scheduled breaks for food and refreshments and at noon a

hot lunch was served to all participants. The project was successfully completed before 2 PM.

RESULTS

Multiple good outcomes came out of this effort, some were intended others were not. The students in all the class sections were pleased to participate. Helping the needy, working in teams, and a chance to do something different were a few of the positive comments made over and over in class discussions. Administrators at all levels in the university were pleased and complimentary in their comments. The project received media attention from a local television station. A reporter and cameraman came to the project and did a human interest piece, it was televised the weekend of the project. The students in construction 356 felt that the project was challenging and rewarding. The construction 254 and industrial technology 101 students are anxious to do future projects.

SERVICE LEARNING IN ENGINEERING

The engineering curriculum poses some challenges to the aspiring faculty interested in infusing a service learning component. Faculty should consider that service learning is very well established in the social science and humanities disciplines and in other academic areas where clinical opportunities provide an avenue for service learning. Campus Compact, a national organization supported by university presidents who are committed to integrating community service into the undergraduate experience, found 11,000 courses with a service learning component in its member institutions in a 1998 survey [9].

Many professionals provide free service to their communities such as medical doctors, dentists and attorneys. It can be interpreted that the National Society of Professional Engineers (NSPE) codes of ethics can provide for community service. If one examines section III, professional obligations, no. 2, the NSPE code states "Engineers shall at all times strive to serve the public interest." Therefore engineering students and faculty should consider community service as an opportunity to practice engineering within the university setting [10].

The service learning project selection phase for engineering faculty can be difficult. The difficulty seems to be one of lack of familiarity with the concepts of service learning and often faculty doubt the value of community service. Moffat and Decker, in *Service Learning Reflection For Engineering: A Faculty Guide* [11], state "engineering relies heavily upon linear, black and white thinking with little room for personal introspection and reflection." Service Learning causes students to look at the gray areas, which inevitably come up when dealing with social issues. The classroom reflection that occurs as a result of a completed community service project allows students to

discuss the societal impact of engineering. The authors conclude that engineering faculty utilizing Service Learning has an opportunity to inspire students to think in new and dynamic ways [11].

SERVICE LEARNING IN A STRUCTURES CLASS

The traditional Structures class utilizes textbooks, the lecture, homework, and in some cases the laboratory to teach the course. However, Structures courses in the Construction Science department at Texas A&M University do not have laboratories for instructional purposes. This lack of laboratory facilities is why a service learning activity could prove very effective. A structures service learning project could serve as a live laboratory for Texas A&M construction students.

The proposed project should serve the needs of the local community, provide a learning and service environment for students, and the lesson could double as an actual laboratory experience. This could be accomplished by working with a local town and its parks department. A single city park would be selected for study. The students would inspect all structures and park improvements such as gazebos, playground equipment, walk bridges or other suitable structures. The structural inspection would be documented with photographic images and a formal engineering report. The report and documentation would be given to the city engineering office along with recommendations that the students would prepare.

The instructor would act as a facilitator, mentor, and expert advisor for the students. The project would serve the needs of the community, enhance the learning outcomes for the students, and bring good publicity to the university and to the construction science department. The experiential nature of the project allows for a needed dimension in the structures curriculum. A hands-on lab that could be used every semester with new groups of students without the costs normally associated with traditional labs.

DRAWBACKS AND IMPROVEMENTS

Anderson and Sungur [5] found some drawbacks of service learning. It tends to be very time consuming if it is not carefully managed and organized. Faculty must oversee and add service learning into the course, which takes extra effort and time. Service learning is not a neatly packaged part of a course when implemented. Timing of projects may not be convenient. Community organizations have needs and deadlines that may not fit into an academic calendar. Faculty members may need to adjust the course if problems emerge. Personalities of faculty are important, the more adaptable the better. There is often a strong temptation to force a project to fit a given course, but it is best to resist the temptations and find a project with a natural fit to the course. This might be achieved by using service learning in multiple courses to

increase the potential of finding an appropriate project course match. Anderson and Sungur [5] concluded that the benefits of service learning far outweigh the drawbacks.

Senior [4] noted that the first challenge to service learning comes from the newness of its application to technical fields such as construction management. In areas of study such as social work, students are expected to gain a deep understanding of their community. There is an evident link between service learning and their educational goals. This is not the case in construction education. Service learning [4] requires that both the recipient and the provider benefit from the experience. This is one fundamental distinction between service learning and community service or volunteerism, where the provider of the service does not realize any personal gain.

CONCLUSIONS AND RECOMMENDATIONS

Service learning projects are indeed challenging for all academic stakeholders, however the rewards can be exponential. Service learning projects offer faculty the opportunity to teach project management principles in a hands-on format. Integrating multiple levels of students within a project provides a structured training program for future construction managers. The construction management seniors are able to mentor and teach freshmen, sophomores, and juniors principles of teamwork, charity, and construction processes.

In addition if a Structures class adapts a service learning project as described the benefits are obviously very positive. The proposed project can be adapted easily and will likely become a part of structures in the future at Texas A&M University.

The engineering faculty member interested in Service Learning can examine the successes of others in parallel curriculums such as Construction Management. The adaptation of the community service course component seems to have a positive effect on most disciplines. Students gain from these hands-on experiences in multiple ways. The faculty may also develop synergy through integration of the traditional engineering classroom, laboratory, and the community service project.

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