Service Learning, Project Management and Professional Development

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ABSTRACT

Much has been said about service learning and its value as a pedagogical strategy. However, very little has been said about its implementation in the computer science curriculum, particularly in the lower-level classroom. This article discusses a semester-long service learning project that was implemented in a freshman-level project management course. Through the development of a website for a local non-profit organization, students were able to apply lecture content while developing professional skills that are applicable for the workplace.

Keywords: service learning; project management; volunteerism; collaboration

INTRODUCTION

When a search for the ideal job candidate is being conducted, what are two areas of consideration that typically rank highly? In most cases, they are education and experience. This puts the recent college graduate at a disadvantage, as they have yet to gain real-world experience in a professional field. Thus, the urgency for institutions of higher education to provide their students with legitimate experience for their resumes remains quite high. The options for doing this might include internships, clinical sessions, club participation, and the integration of service learning experiences into the classroom.

A two-year college located in eastern Pennsylvania offers a series of computer science courses within its School of Computer Science and the Arts. One of these courses, titled "Introduction to Project Management," is a freshman-level course that is required for students enrolled in the Computer Specialist degree program; the Geographic Information Systems certificate program; and the Computer Game and Simulation Development degree programs. Additionally, it is open to the general student population as an elective option, and is offered in both a 100% face-to-face format and a blended distance education format. Since the course has no prerequisites, first-semester freshman often take this course without having taken any other computer courses. During the fall 2015 semester, the students in this course engaged in a semester-long, client-based service project that provided students with a novel setting to apply project management principles while developing their own professional skills.

REVIEW OF THE LITERATURE

Professor Brian Nejmeh of Messiah College defines service learning as "a pedagogical model that actively integrates community service with learning outcomes in a credit-bearing academic course or cocurricular project" (2012, p. xvii). Over the past fifteen years, a substantial amount of research has been conducted in the areas of service learning, volunteerism, and experiential education. Very little of this research, however, focuses in on how service learning can be applied toward the computer science curriculum (Sanderson, 2003). Despite this apparent gap in the literature, the value of service learning in technologically oriented courses has been actualized and continues to be integrated into undergraduate and graduate coursework.

A large percentage of the literature published on service learning in computer science communicates the benefits of this pedagogical style as proven through successfully implemented projects. Research has shown that service learning has been integrated into computer science and engineering courses since the early 1990s (ACM, 1991, in Martin, 2000). In a very short amount of time, several universities across the country had developed courses that focused exclusively on service learning in computer science (Sanderson, 2003). As the discipline of computer science evolved from its roots in data processing, it was realized that there were more skills that were crucial to this field than technological competencies. Research has shown that service learning experiences, including client-based projects (Marsden, 1994), will help students to develop resume content (Sanderson & Vollmar, 2000), helping students to make contributions to society (Schahczenski, 2002), and develop a sensitivity toward the diversity of various populations (Traynor & McKenna, 2003). The integration of service learning also functions as an adaptation to the current cohort of students, which Seiter (2009) describes as a "civic-minded generation" (p. 1). Further, Seiter points out that student retention in computer science courses will benefit from the integration of service learning activities (Ibid.).

Much of the published literature in this area presents service learning projects in upper-level courses (Gotterbarn, 1992; Sanderson & Vollmar, 2000; Schahczenski, 2002; Sanderson, 2003; Tan, 2005). Siena College professors Mary Anne Egan and Mathew Johnson (2010) recognize that very few freshman-level courses are integrating service learning into the curriculum and "…we need to insert this pedagogical approach as early into the curriculum as possible." (p.8). The integration of service learning into lower-level courses has proven to be a successful pedagogical strategy. Traynor and McKenna (2003) describe a successful project where students were required to volunteer twenty hours of service throughout the semester. Egan and Johnson (2010) explain that the integration of a service learning project into an introductory course had positive effects on enrollment in upper-level courses, particularly in regard to women students enrolling and declaring computer science as their major.

Today, it is widely understood that service learning is a highly effective pedagogical model that can be integrated into computer science courses. It has been proven that service learning can be beneficial to both the upper-level "capstone" courses and the introductory-level computing courses. While most of the published examples seem to highlight successful projects in upper-level coursework, I must concur with Egan and Johnson (2010) that the earlier in the curriculum that students can be exposed to service learning opportunities, the better served they will be throughout their education.

COURSE FORMAT

The course met once a week for two hours and forty-five minutes over a sixteen-week semester. Seventeen students were enrolled, three of which were female and fourteen males. Approximately 65% of the students enrolled (N=11) were freshman and the remaining 35% (N=6) were sophomores. More than half of the students enrolled in the course were majoring in Computer Game and Simulation Development with an emphasis in programming, while others were studying digital arts and web development.

The curriculum was, in essence, divided into two major components. The first component provided students with an understanding of the various managerial, strategic, and professional skills that are needed for the successful execution of a project. In describing these concepts in correlation to the *Project Management Institute*'s framework, concepts would be presented in a general fashion that was correlated to the service learning project at various points throughout the lecture and discussions. A great deal of time was spent developing proficiencies in various types of analysis, such as SWOT report writing, quality assurance, and the effective management of resources.

The second major component of the course focused on the development of software proficiency in relation to project management. Using *Microsoft Project*, students spent a fairly extensive amount of time each week preparing reports and gaining a general familiarity and proficiency with the program. The notion of thorough, quality documentation was stressed throughout the semester as a means of demonstrating the importance of understanding how to use the software.

The final course grade was determined using the following elements: laboratory assignments (15%), career development projects (25%), a grant writing exercise (10%), and the service learning project (50%).

The goal of the service learning project was to enable real-world application of the project management concepts discussed in class. After reviewing the course roster, I quickly realized that all of the students enrolled in the course are studying technology. Thus, it seemed necessary to implement a service learning project that was technological in nature. According to Hefferman (2001), the experience would be classified as "discipline-based service learning," in that it the project was closely tied to the students' field of study. Further, since the course focused on project management, copious parallels to the curriculum were discussed throughout the semester. Professor Kathy Schwalbe, who is the author of our course's textbook, specifically acknowledges service learning by articulating the value of working with a real client and stakeholders (Schwalbe, 2013). With the help of the college's career development staff, my course was partnered with a local non-profit organization that served to preserve the history of the area. This organization was selected because they did not have an online presence and were looking to develop a website to advertise their events and services. Further, the notion of working with a non-profit organization was appealing, as described by University of Montana professor Celia Schahczenski:

"collaborations with the nonprofit sector have a greater chance of success, since the nonprofit sector and academia share commonalities such as being service, rather than product, oriented and working toward long-term goals that are difficult to measure" (2002, p. F3G-8).

This project, which was designed using what Wiggins and McTighe (2001) describe as a "backwards design," began with a specific end goal, which was to design a website for the non-profit organization. In essence, the students were engaged in problem-based service learning (Hefferman, 2001), in that they were functioning as a team of consultants for the organization who were "experts" in web design and functionality. As Fish (2011) points out, a semester-long project will contribute to the "understanding of project management concepts, tools and techniques as well as student professional development in project planning, writing and oral presentation" (p. 33). Given the diverse yet closely related nature of the students' areas of interest, this cohesion came somewhat naturally in that many students expressed strength in one area, yet unfamiliarity with other areas. In an effort to point out the value in each student's expertise, various managerial units were established that aligned to the *Project Management Body of Knowledge* (PMI, 2013). Utilizing this structure allowed not only for further application of course concepts, but for complete immersion within them.

During the first class meeting, which I structured as a business meeting, the project was broached to the students and project requirements were discussed. From that very first discussion, students expressed rapt enthusiasm toward the project and quickly began interjecting their own ideas and possible areas of contribution. As an "icebreaker" exercise, I asked students to introduce themselves and name three interests, strengths, or areas of interest in terms of project management. In addition to allowing students to develop familiarity with one another, it helped me to see where and how each student could contribute to the project in the long-term. One week later, I invited the executive director of the non-profit organization to our class meeting where the students eagerly welcomed her; many of the students had already placed their ideas into written form (without my asking them to do so) and were professionally yet cordially presenting their ideas to her. It was clear from the beginning that students' enthusiasm toward a real-world project was strong.

Using the *Project Management Body of Knowledge* (PMI, 2013), which was discussed as part of the course's lecture component, an organizational structure was established as a group. This enabled students to reinforce their understanding of each of the phases of project management as well as develop a sense of control over their project. We classified these responsibilities as "managerial units," in which these critical functions were carried out. Many students also expressed interest in taking part in the design and development of the website. Since the course was not design-oriented, I did not require students to do any creative work. However, I offered the option for those who wished to do so, and thus, the students created their own groups which were titled "creative units" to carry out the creative functions of the website. Figure 1 illustrates the breakdown of responsibilities. All students were required to participate in at least one managerial unit, and they were allowed to decide on which units they wanted to participate in.

Division of Responsibilities

Managerial Units	**Creative Units**
Based on PMBOK principles.	*Based upon student delegation.*
Project Reporting	Data Gathering
Integration and Procurement	Media Writing
Scope Management	Design
Time Management	Development
Quality Assurance	Videography
Human Resources	

Figure 1: The division of student responsibilities.

Throughout the span of the project, each unit was required to submit a weekly memo to the scope management unit that detailed their progress, any breakthroughs or recent developments, as well as any challenges or roadblocks they might have encountered. The scope management unit would then submit a "master memo" to the professor that gave a class-wide status update on the project's direction. Many of the specialized reports such as Gantt Charts

were generated with *Microsoft Project*, while much of the project memoranda was created using *Google Docs*, to allow for ample collaboration and centralized storage. Also, students were required to deliver short, focused presentations at various points in the semester that discussed SWOT analyses, pinpointed potential risks, and provided status reports on behalf of their unit. In doing this, students were able to gain practice articulating their thoughts verbally, as well as reflecting on the project's progress.

At various points throughout the semester, the executive director of the non-profit organization was invited to class meetings. On such occasions, students would present status updates on the development of the website, seek clarification on content for the site, and review various print materials supplied by the Society.

As the semester progressed, students were acquainted with various personnel topics as they related to project management, specifically the writing of a job description and the development of a performance appraisal instrument that measured a team member's performance against their job description. Within the last two weeks of the semester, each unit coordinator was asked to provide a written evaluation of each student within their unit. These evaluations were then reviewed by the professor who wrote a final performance appraisal of each student with grade information included. These students met with the professor to discuss their progress, as well as discuss areas of concern raised by the other students. While the feedback provided by students did not directly affect grading, it acquainted the students with the performance appraisal process as it is used in the corporate sector.

At the conclusion of the project, a banquet-like exhibition was held. At this event, which was attended by college administrators and the non-profit organization's Board of Directors, students presented their contributions to the website and reflected upon the experience. This event served as a mechanism for developing public speaking skills while providing an excellent opportunity for reflection.

FINDINGS

Reflection

One of the most important components of the service learning pedagogical style is the opportunity for reflection. This concept is defined by Bringle and Hatcher (1999) as "the intentional consideration of an experience in light of particular learning objectives" (p. 83). Reflection need not be a monkish activity that is done exclusively in a private setting. In an effort to help students to continue the notion of collaboration and group-wide articulation of ideas, varied styles of reflection were encouraged throughout the semester. Closely following Cairn and Coble's (1993) suggestions, the following methods of reflection were employed:

Spoken Reflection. On a weekly basis, students worked in groups in an effort to fulfill the various managerial and creative responsibilities. Further, students frequently met one-on-one with the professor to provide status updates, explain frustrations or problems, and provide insights on group progress. This is in addition to various large-group discussions and connections being made to the project during the lecture component of the course.

Written Reflection. In its very nature, project management requires a substantial amount of reflection through the necessary documentation and reporting that must be maintained. Throughout the semester, students provided reflection through the various reports, analyses, and charts that were developed using *Microsoft Project*. In addition to this, students also prepared weekly memos, status reports, and emails to the professor.

Training. Since the students enrolled in the course had related but separate areas of specialty, they would frequently provide each other with training in various areas of technology. These included web coding, photo editing, use of *Google Docs*, and document formatting. These experiences, while often informal, provided students with a chance to "replay" their understanding of the concepts aloud, often through tactile as well as audible learning channels.

Celebration. Rather than assigning a written exam, the final assessment for the course was a formal exhibition of the project (Knapp, 2008; Tan, 2005). Through formal presentations, students were able to articulate their thoughts on the entire experience of service learning while gaining practice in ceremonial-style public address.

Throughout the project, I too would participate in reflective activities which I would include students in, as to silently express the value of reflection through demonstration. I did this through short "wrap-up" discussions at the end of class, frequent email messages to the class, and communicating the project to the campus community.

Toward the end of the project, I engaged the campus' student newspaper to write a story about the class project and invited students to participate in the discussions with the reporter. This allowed not only for an additional opportunity for reflection but also recognition for such a diligent class effort.

The service learning project was embraced positively by students throughout the semester. While there was an overall appreciation for this approach, the reasons for such appreciation varied. Through student reflection, I was able to glean various "themes" in terms of student benefits from the service learning project.

The following passages articulate student perceptions of the service learning experience:
It was enlightening because had to not only form design groups but also managerial groups. Because everybody here has different talents, we wanted to assert their talents but also teach them something else. That's a fundamental part of everything. It's not just about you being able to do what you like but also doing what you don't like, because that's a part of life.

I'm really glad that I got a chance to meet everybody in the class because that's something that you don't see in every classroom. I've been in a lot of other classrooms and sometimes you meet the guy next to you and that's it. Here I was able to interact with every single person and got to meet some wonderful people.

This student reflects upon the reflection process:
Writing weekly memos helped our project in communicating with each other, which was very important because we only met once a week for a couple of hours together on the project. So, having these memos was very important in helping us communicate, seeing where each of the groups were on the project, and it helped us achieve our goals and meet our deadlines in a timely and reasonable manner.

The following passages include student reflections on their own personal growth:
I am really proud to be a part of this wonderful group because it has made me grow as a person and made me improve myself overall.

This project helped everyone develop some sort of strength with working as a team. Now, not everyone is as shy as they were before.

The biggest thing we learned was the importance of communication. We had a lot of roadblocks with that but we overcame all of them and came out with a quite beautiful product.

These three passages articulate student interest in history and historiography gained from the service learning project:
It was an eye-opener because of the wonderful history that we have around here, and it made me more curious to learn about our city as well as be able to preserve it for the future.

One thing that I enjoyed about the project, besides working with my fellow classmates, was having the pleasure of interviewing [the Society's curator], because I've never interviewed anybody before. It was usually me being interviewed for a job. So, that was interesting.

Throughout the project it was quite interesting to get to know the Historical Society, from the history of the [facility] itself to the museum they have set up over in [the location]. It is a very beautiful place and it was a great learning experience learning about the history of the place itself and the wonderful people that work there.

Satisfaction of Outcomes
The service learning project proved to be an excellent means for satisfying outcomes at both the course level and the programmatic level.

The following are course level learning outcomes listed in the master course outline:
"Apply project management tools and techniques to a variety of projects." Through the service learning experience, students were given a liberal amount of freedom to apply the various concepts presented in lecture and their textbooks in a manner that they believed was the most effective.

"Initiate, plan, and execute projects using best practices techniques." The students were responsible for all stages of the project, from execution to closing, and were expected to apply the PMI framework throughout the process. Mastery of these techniques was measured through frequent written correspondence, reports generated in *Microsoft Project*, and through informal meetings with the professor.

"Monitor, control, and close projects effectively." Students were expected to clearly and thoroughly document all stages of the project, including errors and problems that were encountered. Because the project was a client-based experience, the students respected deadlines and were very clear in voicing and resolving problems along the way.

"Learn to use Microsoft Project software to automate project planning and analysis." A project of such a scope allowed for extensive use of *Microsoft Project*, as well as ongoing practice and repetitive use of the software, which trained the students in its implementation.

The main programmatic outcome that is fulfilled through the service learning project was the ability to **"work effectively with others in a team environment"** (Catalog, p. 80). The experience of completing this project resembled that of a corporate office, with each unit functioning very much like a department. Students had to interact professionally within their units, as well as with other units, in order to efficiently meet upcoming deadlines. Since the entire class was functioning to complete the same goal, what resulted was a strong sense of collegiality, mutual support, and respect among colleagues.

ALTERNATE METHODS OF INTEGRATION

This project was successful in large part due to the structure and size of the course. One might ask how this project could be executed in a larger class section, or perhaps in a situation where the class meeting times were shorter. Could a project of this description be successful in a fifty minute class? The answer is yes. In a situation where students meet for less time but more frequently throughout the week, an added emphasis can be placed on time management and goal setting. Students would be expected to set clear, measurable goals for each class meeting and then be held accountable for meeting those goals. It would also lead to more realistic and detailed correspondence regarding the progress of the project, in that a fuller timeline would be present.

In situations where the class size is large, perhaps in a lecture hall setting, the project could still be executed successfully. In this situation, the various "units" would function as large departments within a fictitious company. Further, the instructor may wish to provide a "class company name" or other form of fake branding to add a sense of unified identity. Much of the project work would be done outside of the classroom, and a heavier reliance on correspondence would be necessary. The benefit of such an approach would be that it would help students to see the importance of documentation of a project at all phases, as they may not have the convenience of face-to-face communication with classmates in another unit. Class time could be utilized in part as a "check in" period, where a representative from each unit addresses the class with status updates, challenges, and other pertinent information. Depending upon the size of the course, this could also provide added training in public speaking.

CONCLUSION

The service learning project was intended to provide students with a means of applying the principles of the PMI Framework toward a real-world situation. In doing so, it was successful in multiple ways. First and foremost, it helped students to develop a sense of appreciation toward service and volunteerism in general. There was a drastic increase in student appreciation for the area's non-profit agencies. Secondly, it helped develop student confidence in teamwork, problem solving, and collaboration. They were able to gain practice in assuming leadership positions and articulating their ideas and viewpoints to large and small groups. Thirdly, the project helped students to utilize technology in a manner that resembles of the workplace. Everyone in the class served a different purpose, all of which were interconnected and valuable. Finally, this experience provided students with a "tangible" experience that they can place on their resumes and will aid them in beginning their careers. While much of the literature published about service learning in the computer science classrooms present these experiences as pivotal to the upper-level classes, I must assert that students need these experiences as early in their education as possible. By helping freshman to develop these professional competencies, they will then be able to make optimal use of their time in college and continue their education with a broader appreciation for service and a professional attitude toward collaboration and teamwork.

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