The Value of Service-Learning
in the CIS Curriculum : A Case Study

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Abstract

This paper discusses the benefits and problems of service-learning projects for CIS and CS courses. Service-learning projects may help faculty in attempting to balance the some times conflicting need to provide content, enhance soft skills, provide activity-based learning, and teach students important concepts such as becoming responsible citizens. Six models of service-learning are presented (Heffernan, 2001) along with significant learning attributes from Fink (2003). A two-course service learning project is presented and the responses of the students and community partner are reported.

Keywords: service-learning, CIS curriculum

1. INTRODUCTION

The original titles for this paper ranged from "How to compress 880 pages of material into one neat and tidy Service-Learning project" to "Why I give my students lots of time in class to work on projects" (in response to my department chair who worries about decreased lecture time) to "How can one course meet the IS 2002 Model Curriculum Guidelines and still expose my students to Service-Learning?" The underlying issue is how to balance the need to cover the theory of information systems theory and practice and provide undergraduate students with the benefit of activity-based learning through Service-Learning projects in a scant 45 hours. Obviously this is not a new challenge nor is it a challenge limited to one particular course or discipline.

In particular, the issue of balance is a challenge to Computer Information Systems (CIS) programs in liberal arts programs. We are constrained in the number of courses allowable in the major while enriched with students who are exposed to a variety of intellectual perspectives. The CIS program described in this paper is in a Department of Mathematics and Computer Science at a small, liberal arts college in Western Pennsylvania. Our CIS students are required to take three semesters of Java programming, discrete mathematics and calculus along with the more traditional CIS curriculum. Two of their required courses are Systems Analysis and Design (comparable to IS 2002.3 and parts of 2002.7) and Software Engineering (comparable to parts of 2002.7, 2002.9 and 2002.10). The content covered in these two courses is mapped out in three courses in the IS 2002 model curriculum. In addition to our CIS students, CS majors may take the Software Engineering course as an elective. This two-course sequence may be the only time our students work on a large-scale, team-based project.

In addition to concerns about students' technical skills, Woratschek and Lenox (2002), Janicki and Kline (2004), Cappel (2002) among others have found that employers are seeking graduates with a wide range of "soft skills" including professional ethics, motivation to work, ability to learn, attention to details, time management, problem solving, maturity, persistence, teamwork, initiative, and oral communications.

Finally, there is a strong desire that students learn the important concepts rather than regurgitating facts (Saulnier, 2005). In a slightly different manner than the classic Bloom's taxonomy, Fink (2003) proposes that learning should go beyond cognitive learning to "significant learning." He proposes six objectives: (1) foundation knowledge, (2) application, (3) integration, (4) human dimension (learning about oneself and others), (5) caring, and (6) learning how to learn (becoming a lifelong learner). These objectives fit in well with our college's mission which includes "Commit themselves to lifelong learning and the acquisition of skills for careers and responsible service as world citizens" (www.westminster.edu)

Let's pause here to review the desirable attributes of these two courses: cover a large volume of technical content (three IS 2002 courses or translated into textbooks -- 816 pages in the first book and 880 pages in the second book), help students improve their soft skills such as communication and teamwork, provide some activity-based learning (or at least a chance to learn by doing), and create opportunities for significant learning. The solution to address these objectives was to employ a Service-Learning approach across the two courses.

2. WHAT IS SERVICE-LEARNING?

Service-Learning is a type of civic engagement that is integrated into the course curriculum and requires that the students reflect on their service activity. Bringle and Hatcher (1995) provide a succinct definition: "Service-Learning is a credit-bearing, educational experience in which students participate in an organized service activity that meets identified community needs and reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility."

Service-learning should include these elements (Furco, 1996):

- Students must provide a meaningful and needed service to the community, identified and asked for by the community.
- Relationships between the College/University and the community site must strive to be a reciprocal partnership.
- Connections between the course objectives and service activities must be clearly conceptualized and articulated.
- Faculty must guide students in understanding the relevancy of their work in the community to the course objectives.
- Faculty must provide opportunities for students to reflect upon their experiences in a variety of mediums.
- Disciplinary knowledge informs the work done by students in the community.
- Classroom activities allow students to learn from other class members, in addition to the instructor.

2.1 Models of Service-Learning

Heffernan outlined six different models for incorporating service-learning into various disciplines (Heffernan, 2001):

1. *Discipline-Based Service-Learning Model* where students work in the community throughout the semester and reflect on their experiences on a regular basis using course content as a basis for their analysis and understanding.
2. *Problem-Based Service-Learning Model* where students work with community members to understand a particular community problem or need. This model presumes that the students will have some knowledge they can draw upon to make recommendations to the community or develop a solution to the problem.
3. *Capstone Course Model* where students in the senior year are asked to draw upon the knowledge they have obtained throughout their course work and combine it with relevant service work in the community.
4. *Service Internship Model* where students working as many as 10 to 20 hours a week in a community setting with on-going faculty-guided reflection to challenge the students to analyze their new experiences using discipline-based theories.

5. *Undergraduate Community-Based Action Research Model* where students work closely with faculty to learn research methodology while serving as advocates for communities.

6. *Directed Study Additional/Extra Credit Model* where students make special arrangements with the instructor to complete additional work or explore a subject in more depth.

2.2 What is gained from the Service-Learning Approach?

Service-Learning along with internships, summer jobs and possibly capstone courses helps the instructor move the course content into the "real world." One often-mentioned benefit results from a multi-intelligence approach to learning (i.e., some students learn best by doing, some are visual learners, and so on). When promoting service-learning courses, many benefits are mentioned, including: enhanced learning, connecting theory to practice, fostering civic responsibility, encouraging life-long commitment to service, enhancing employability, improving self-esteem and respect and tolerance for others and making a difference in a community (www.wmwoods.edu/Info.asp?3233).

Few studies back up these benefits, however, Ibara (2007) states "evidence is mounting that academic programs or institutions that emphasize people-oriented relationships, family/community engagement, supportive psychological environments, working in groups, and collaborative learning environments, to name a few characteristics, are not only attractive to underrepresented populations, they also provide conditions for them to thrive and achieve academic success in fields where they have been traditionally unsuccessful in the past" (Ibara, 2007, www.compact.org/20th/all_papers/ faculty) (Bowen & Bok 1998, Ibarra 2001). This benefit may be particularly important to CIS and CS programs as we seek to attract students to our programs.

Of course, there are also some reported benefits to faculty when employing a Service-Learning approach, including engaged students, reinvigorated teaching, improved relationships with students, and increased research and publishing opportunities (www.wmwoods.edu/ Info.asp?3233). In a true partnership, the skills and experience of the community partners are equally valued and the students and/or faculty are not descending from the "ivory tower" to drop a few words of wisdom. Each group is crucial to the Service-Learning experience. Our community partners can benefit from the addition of students to their organizations, helping to meet critical needs. Service-learning can increase the involvement of students as responsible citizens and provide the partners with new ideas and energy and access to college/University resources (www.wmwoods.edu/Info.asp? 3233). As our involvement in Service-Learning projects increases, Westminster College has committed to ensuring that these experiences are positive for our community partners.

There is a large literature base supporting the benefits of service-learning, but it is beyond the scope of this case study to discuss them here.

3. SYSTEMS ANALYSIS AND SOFTWARE ENGINEERING

At Westminster College, CIS students are required to take both Systems Analysis and Software Engineering and most of them elect to take these courses in sequence with Systems Analysis in the fall and Software Engineering in the spring semester. Occasionally, this order is reversed, but not encouraged. In addition, CS students often take Software Engineering as an elective, but cannot take Systems Analysis for credit. In practice, this means that the roster of students changes from the fall to the spring semester which mimics the addition and deletion of team members on a "real world" software project team. Traditionally, there is an on-campus project used for both of these courses. The first off-campus, service-learning project was for AY 2006-2007. This service-learning project was a more difficult, higher-profile project than in previous years.

The textbook selected for the Systems Analysis and Design course was Kendall and Kendall (2005) Systems Analysis and Design 6/e. The first 10 chapters of the book were covered in

depth in the 15-week course. The next five chapters (11-15) were briefly covered – these topics are covered in two other required CIS courses (i.e., Human-Computer Interaction and Database Theory and Design). The last three chapters are covered in the Software Engineering course. During this first semester, students select a project from an instructor-approved list. They are given in-class time to work on the project for about 25% of the total hours.

The textbook selected for the Software Engineering course is the classic text by Roger S. Pressman (2005) <u>Software Engineering: A Practitioner's Approach</u>. Approximately 17 out of the 32 chapters were covered from the possible 880 pages and there is insufficient time to cover all of this content even if a service-learning project was not used! Again, some chapters can be skipped because they are covered in other courses; other chapters were added due to the specific project (i.e., web-based material).

4. THE EFFECT OF A SERVICE-LEARNING PROJECT

4.1 The Effect on Course Structure

The students in the Systems Analysis and Software Engineering courses opted to work on a service-learning project with the Lawrence County Community Action Partnership (LCCAP). Lawrence County is a rural Pennsylvania county and Westminster College is located in this county. LCCAP is composed of three agencies that seek "to involve the community in assessing local needs and attacking the causes and conditions of poverty." (www.lccap.org). (Note: in Lawrence County, 11.3% of all residents live in poverty.) LCCAP agencies include: 1) Lawrence County Social Services, Inc., 2) United Community Services of Lawrence County, Inc., and 3) Allied Coordinated Transportation Services, Inc. LCCAP agencies include:

Head Start, In His Hands Ministries, Lawrence County Homeless Coordinator, Housing and Urban Development Counseling Agency, Medical Assistance Transportation Program Administrator, and Child and Adult Care Food Program Sponsoring Organization.

In Systems Analysis, (the first semester), the students collected information about LCCAP through a kickoff meeting and several on-site visits. A pressing need for this non-profit organization was to update their web site and to create an easily maintainable structure. Due to staffing limitations (much to the students' amazement, the IT department consists of one over-worked employee), information on the web page was weeks, if not years out-of-date. The students analyzed the situation, gathered data, and redesigned LCCAP's existing web site. One major problem was gathering recent descriptions of the various programs offered at LCCAP. The final design was presented to LCCAP near the end of the semester and LCCAP staffers were asked to bring comments and feedback to a meeting at the start of the spring semester (about a month later).

In this first course, about 25% of the class time was spent on project-related issues with the remaining time spent on lectures, bi-weekly quizzes, and other exercises. (This compares to about 20% of in-class time in prior semesters.)

Students in the second course expanded on the web site work done in the fall semester. They refined, built, and tested the revised web site for the LCCAP. The students were responsible for learning any new software and hardware necessary for the web site and training the LCCAP personnel on the new web page.

The largest compromise made for this second course is the amount of lecture time versus the amount of time in class given to work on the project. Approximately, 40% of the class time was devoted to "work days" in which students reported on meetings with their client or with experts (e.g., our webmaster), taught each other some of the necessary software (e.g., the database software, apache server software, Contribute, and advanced web topics), or worked on creating the web pages. (This compares to about 25% of the time in prior semesters.) {As a side note, it is the author's belief that this course should allow students the opportunity to explore technical areas that are not taught in our regular curriculum. In the first

semester, one of the decisions students make about the project implementation is what knowledge they lack that they are willing, occasionally eager, to learn. This experience appears to increase their confidence and prepare them for the realities of being a lifelong learner in a discipline that demands constant updating of skills.}

Again in Software Engineering, the students had lectures, bi-weekly quizzes, and a few assignments that did not directly relate to the class project. The lectures had abbreviated content with a greater expectation that the students would read the textbook for the full details. Based on some comments from the students' evaluation, it is not clear that they really read the textbook. Instead they seemed to rely heavily on the class slides which is not a deviation from other courses in which class slides are available to the students.

4.2   What Did Students Learn?

When comparing the final grades for these two courses with previous four semesters with smaller-scale projects (non-service-learning), the current courses had slightly higher grades, but the differences were not significant. Removing the scores for the projects from the calculations and relying just on assignments, quizzes and exams, there was also no significant differences between these two courses and previous ones. This is reassurance that the diminished attention to course content did no harm.

The remaining question is – did the service-learning project do some good? For students, service-learning can: enhance learning, connect theory to practice, foster civic responsibility, encourage life-long commitment to service, enhance employability, improve self-esteem and respect and tolerance for others and make a difference in a community (www.wmwoods.edu/Info.asp?3233).

For our community partners, possible benefits include: meeting critical needs, increasing the involvement of students as responsible citizens and providing new ideas and energy and access to college/University resources (www.wmwoods.edu/Info.asp? 3233).

The following sections provide some comments from LCCAP and the students in the courses. While these comments are not quantifiable proof that the service-learning approach was valuable, they do indicate that these students were motivated and that our client was pleased with the results. In fact, the instructor was pleased with the amount of motivation and effort used by the students in completing this project.

4.3   Our Community Partner Responds

When asked about the relationship with the Westminster students in these two service-learning courses, Emily Rowe, coordinator of volunteer services for LCCAP stated "LCCAP is hoping to gain an invaluable and continued partnership with not only Professor X's CS and CIS students but with Westminster College as a whole. LCCAP is proud to be involved with offering a wide variety of service learning projects to students throughout Lawrence County." Emily continues, "The CS and CIS students have gained knowledge about how LCCAP works and the many services that we provide to the local community. The students have agreed to assist LCCAP with enhancing our agency's visibility by redesigning and redeveloping the LCCAP website. The overall project will also benefit Lawrence County as a whole in that it will be accessible to other agencies, organizations, businesses and consumers alike, including those with special needs." (personal communication, April, 2007).

4.4   Student Responses

Justin S., a junior CIS major, remarked "In all honesty, it's probably the most useful class I've taken at Westminster. It's not just writing down what Dr. X lectures about and then reciting it back to her on a test but applying what she teaches you in an important real life project to experience first-hand how it can be used." Peter L., a CS major, describes the second course as "a very hands-on, real life experience. We had a real deadline to deliver a final product to a client rather than the typical 'turn in your homework by Friday' scenario. I think this different approach helped me to learn a lot" (personal communication, April 2007).

Courtney G., a graduating senior with a degree in mathematics and an IS minor "CS221 and CS351 were on a completely different playing field than my other classes at Westminster. It was a valuable learning experience to get outside of the classroom and be a part of an extensive project" (personal communication, April 2007).

With respect to helping the community, the students were proud to contribute. Courtney G. states, "It was nice to feel as though we could contribute something to the community. I feel like we were able to provide LCCAP with a solid base on which they can build a website. These courses have taught me a lot about teamwork and communication. They both demanded that the group work hard to serve LCCAP and the community in the best way possible. I was most surprised to find how eager LCCAP was to work with us. They were open to our ideas and were willing to help us in any way they could throughout the project." Will M. also believes that the class helped the community, "I believe that we made their web site easier to navigate and easier to update. So more people could get the information they want. And so the information was not out of date" (personal communication, April 2007).

The projects also seemed to help students who learn from a hands-on approach - "It was a lot more hands on experience than normal classes. It gave us a feel for what a real task in the real world would be like. The class just didn't require us to learn new ideas and concepts but also made us apply them on a daily basis. Personally, I think it was lot better than just hearing lectures day in and day out on the material. I am a visual learner and hands on learner, so this class taught me so much." Daniel O., junior business major and IS minor. He continues, "One thing that I learned is always set time aside weekly to complete the task. Don't just think you can get everything done in one day. There are always problems and crises that comes up. You can't predict everything that's going to happen with a task, so be ready to adapt to meet the

changes. If you don't adapt then the project will fail" (personal communication, April 2007).

When asked if anything surprised him about this experience, Daniel replied, "The amount of problems that arose out of the project is what surprised me. School work is usually design to have the least amount flaws or problems to arise. But for the real world, it's all about adapting the problems that arise."

The service-learning project also helped two students find jobs and internships. Ed D., a graduating CIS major, accepted an internship with LCCAP for the spring semester and also took a social work class at the college to learn more about the issues facing LCCAP. Courtney G. accepted a systems analyst position with a local company based on her experiences in these two courses.

5. CONCLUSION

For the students in these two courses, the service-learning project helped in the following areas:

1. Foundation knowledge – no significant differences were found in the mastery of course content. The students appeared to understand the necessary foundational knowledge and seemed to realize the need for such knowledge more clearly. One anecdotal story – no matter how much configuration management is stressed, students appear to ignore the topic until the moment (or sadly, moments) when one student copies over another's work. When asked what the most important guideline they would tell the next class, these students said "Lack of configuration management hurts, a lot!". (Of course, they also mentioned that "food is good," referring to some late night work sessions and a pizza delivery or two.)

2. Application – as with any project, the connection between the foundational knowledge and "real world" experiences is extremely valuable. Students have the opportunity to practices systems analysis and systems building skills along with the soft skills of teamwork, communication, and time management, among others.

3. Integration – The opportunity to integrate the problems of a non-profit organization (lack of money, people, skills) to real solutions gives our students a connection to real people and invaluable ideas. E.g., "there are always problems and crises that come up."

4. Human dimension – students hopefully discovered that they can make a difference. Several of the students volunteered to set up 27 computers for Lawrence County Head Start during the second semester. Without the exposure to LCCAP that the service-learning project provided, these students probably would not have been willing to donate a Saturday.

5. Caring – hopefully the students moved closer to one of the college's mission statements - "Develop and demonstrate moral and ethical commitments to neighbor, society, and the natural world consistent with the understanding of self."

6. Learning how to learn – the students had to teach themselves several software packages during the service-learning project and gained confidence in their capability to do so. The ability to become a self-directed learner is an important part of their education and this project helped reinforce that idea.

The final area to report on is whether the faculty gained any benefits from this service-learning project (i.e., engaged students, reinvigorated teaching, improved relationships with students, and increased research and publishing opportunities).   The answer is a resounding "YES," despite the increased time involved and a couple of sleepless nights (if anyone has a good idea of how to get students to ramp up earlier, please let me know).

6. ACKNOWLGEMENTS

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