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Service Learning Models Connecting Computer Science to the Community

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Abstract

Service learning is an educational experience that enables students to apply material learned in the classroom by volunteering in a real-world situation. This paper provides a brief review of service learning and describes two models that the computer science department at Saint Anselm College implemented successfully.

1. Introduction

In recent years, changes in technology and rapid increases in the diversity of users have focused attention within computer science education on appropriate responses in the computer science curriculum. Students' sensitivity to the needs of many different user populations, experiences working with users who have different needs and perceptions from themselves, and increased attention to concepts such as accessibility and universal usability have all been stressed as critical issues for computer science education [7]. Increasingly, computer science courses have begun to incorporate service-learning programs to help meet these challenges. This paper provides a brief review of service learning, including a sampling of the ways service learning is being incorporated into computer science programs. We also provide a description of two service-learning models that we have successfully implemented in computer science at Saint Anselm College: one for an upper-level computer science course, and one for a service course.

2. Service Learning

Service learning is an educational experience that provides students the opportunity to apply experiences gained in serving people in the local community to their understanding of material learned in the classroom. It is an increasingly popular teaching tool in high schools and colleges throughout the United States. Many institutions encourage (and some require) students to take advantage of service opportunities in order to apply or observe principles learned in the classroom outside in the community. Service learning also cements bonds between educational institutions and the communities in which they reside. It provides help and support to those in need and facilitates interactions between students and members of the community who might not otherwise have contact. Service

learning programs may also increase a student's personal perceptions of self-efficacy and empowerment [2].

Recent studies of service learning have begun to demonstrate the value of community service in facilitating the understanding of course material, helping students achieve personal and educational goals [9], and stimulating student interest in course material and related issues [3]. Markus, Howard, and King [8] found that classroom learning and course grades increased significantly because of students' participation in course-relevant community service. A study by Richard Kendrick at SUNY Cortland [5] showed that students in a service learning section of a large class improved on several indicators. Kuh [6] points out that experiences outside the classroom are an important venue where students develop an appreciation for people from background different from their own, and cultivate skills that enable them to relate personally to those individuals.

A recent study published in the Michigan Journal of Community Service Learning [1] explored the factors that motivate and deter faculty use of service learning. The authors point out that although faculty value service learning to improve student-learning outcomes such as improving analytical skills and problem solving, certain disciplines have been more likely to implement service-learning courses than other courses. For example, service learning has been most frequently used in the social and behavioral sciences, social work, education, human ecology and agriculture, and less frequently used in the physical and biological sciences, math, engineering, and computer sciences. According to the authors, non-service-learning faculty are often deterred by a concern that service learning was not relevant to their particular discipline, and that it is essential that success stories which highlight service-learning's academic benefits be shared by faculty in the same discipline. Some recent examples of the successful

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use of service learning in computer science have met this challenge. A panel moderated by Leah Jamieson [4] presented a variety of service learning programs that have been implemented in computer science and engineering. One such program at Purdue University established a team of students whose goal was to develop a small laptop designed especially for pre-teen girls, with the hope that girls and young women will become more involved with technology. Another group of students developed a database used by the local county government to track probationers. Sanderson and Vollmar [10] have developed a primer that other faculty can follow to establish programs for service learning in computer science, including suggestions in such critical areas as institutional and departmental support, how to select a project and prepare students and the community partners before the program begins, and assessment of student performance.

2.1 Service Learning at Saint Anselm College

Professor Dan Forbes first introduced Service learning in 1988. The formal development of a campus-wide service learning program under the auspices of the Center for Volunteers in 1989 places it among the earliest such programs in existence nationally. Currently, the college offers service learning in eighteen courses by ten faculty members from six academic departments. Service learning is as an optional assignment in these courses, and academic credit earned for this work does not generally exceed 20% of the final grade. Through the efforts of students, faculty, and administration, the College has been able to form collaborative learning partnerships with elementary and secondary schools, as well as with numerous health, social service, and criminal justice agencies.

2.2 Service Learning in Computer Science

The Computer Science Department has offered service learning since the fall 2001 semester. The department currently offers it in two courses: CS 01 Computer Applications and CS 23 Human Computer Interaction (HCI). Since the initiation of the program, eighty students have participated. Participation in service learning projects is strictly voluntary. Students know at registration, which courses/sections offer a service-learning component. Even within courses that offer service learning, service learning is optional and an alternative project is always available.

Students complete twenty hours of service over the course of the semester. The twenty hours include orientation and training sessions, travel back and forth to the service-learning site, a reflection meeting towards the end of the semester, and producing any deliverables at the end of the semester. Two computer science majors act as student coordinators for the computer science projects. They liaise between the students, faculty, Center for Volunteers, and clients.

Computer Applications is a service course offered to non-computer science students each semester. Students learn the underlying concepts of how a computer works and how to use the Microsoft Office suite. They also learn how to use the Internet, email, and other tools such as the course management system Blackboard effectively.

Human Computer Interaction is an upper-level course taken by junior and senior computer science majors. The course focuses on design strategies for making software usable by real-world people for doing real-world work. Topics include such areas as interface design, software evaluation, usability issues, computer-supported cooperative work, and ethical issues. A semester-long project is always assigned. The department offers HCI every other year in the fall semester.

2.3 Preparing Students for Service Learning

Students participating in service learning must attend an orientation prior to accepting an assignment, and a reflection meeting towards the end of the semester. These sessions are organized by the Center for Volunteers for students from all disciplines. Students learn about the program and about the commitment and the responsibilities a service learner must undertake. Students sign a contract that clearly lists the goals and responsibilities of their individual assignment. Computer science service learners receive additional training from the computer science student coordinators. The computer science student coordinators are available to troubleshoot any problems that arise during the semester.

2.4 Service Learning in Computer Applications

Service learning in Computer Applications is tied to the Digital Divide project at Saint Anselm College. The Digital Divide project connects three generations within the local community: senior citizens, college students, and 3rd grade elementary school students. Seniors receive a computer loaded with software and are provided with internet access. All costs associated with the program are paid for the seniors. The service learners impart the knowledge and skills acquired in class to the seniors. The student coordinators also provide the service learners with a list of suggested tasks to complete with the seniors. These tasks are based on the content of the Computer Applications class, feedback from the seniors, 3rd grade projects, and seasonal events. The senior citizens each have a 3rd grade "buddy" from a local elementary school. The seniors interact with the 3rd graders via email to exchange pen-pal letters, and research project topics on the internet. The 3rd graders, as well as the college students, provide an avenue for the seniors to feel a greater part of the local community. The program opens up a whole new world of communication for the seniors to keep in contact with family and friends elsewhere, and to find information pertinent to them, e.g., hobbies, medical advice. The benefits extend beyond computing - friendships are formed

and the college students get a very different perspective on the elderly. This semester computers are also being installed in the homes of some 3rd graders. Instruction is available to the families if requested.

2.5 Service Learning in Human Computer Interaction

Students in Human Computer Interaction have the option of participating in service learning to fulfill the project requirement for the course. All projects in HCI emphasize the human aspect of computing. Students are expected to apply what they learned in the classroom to the project, and to make observations while interacting with their clients. The experience gives the students a real life example of the difficulties people have with computers. Where possible students are encouraged to think of "solutions" to the problems or to recommend better design practices based on their experience. Students have worked on a variety of projects. One group designed a web site for the local Big Brother/Big Sister program. Students met with the staff and members to learn about the goal, the content, and user-population of the website. The staff and members acted as test subjects during the design and implementation phases. The result was a website that even novice computer users could easily navigate. Another group evaluated a software package used by the staff at a local library. The staff had trouble figuring out how to use the software correctly and found the manuals were too technical. The students interviewed the staff about the difficulties, performed a heuristic evaluation of the interface, and learned how to use the software. The students wrote a new manual that explained clearly how to perform the tasks that the librarians needed to do, and how to troubleshoot the most common problems. They also provided training. Communication between the students and the librarians was an on-going process. In a third project, students studied how humans process and use information and applied it to teaching computer skills at a battered women's shelter. These women applied their new skills to create resumes in the hope of acquiring sustainable employment.

In all projects, the students quickly learned not to assume anything about a target user population. It surprised them that "simple" things that they took for granted, (e.g., using a mouse to navigate an interface), were not intuitive to all users. They also had to make allowances for people with disabilities, sometimes this was as simple as enlarging the icons on the desktop. At the end of the semester, they all felt a sense of accomplishment, and some even continued working with their clients after the semester ended.

3. Grading Service Learning Projects

One of the concerns about implementing service learning into any curriculum is how to grade the service-learning portion, particularly when the service learning work is different in nature to the type of work usually assigned in the course. In both Computer Applications and Human

Computer Interaction the service learning projects account for 20% of the students final grade.

Computer Applications service learners write a weekly journal about their visit. At the end of semester, students write a paper in MS Word describing the overall experience; they create a spreadsheet in MS Excel listing the hours spent on the project and they use some built-in functions and display information in chart format. Students import the spreadsheet into MS Access and create a report; finally, they prepare a PowerPoint presentation that they would use if they had to give a talk on their experiences. The students in HCI also have to deliver an end of term paper that describes their experiences, and that explains how they apply certain concepts that they learn in class to their service-learning project. The deliverables in HCI for those doing service learning or non-service learning projects are the same.

At the end of the semester, the agencies or clients fill out a report on each student indicating if the student completed the required number of hours and carried out the duties agreed on in the original contract. This is returned to the professor. The CFV also notifies each professor about students who fail to attend a mandatory reflection meeting. The student's grade for service learning is then calculated based on the information in the above reports and on the quality of the documents they hand in.

4. Measuring Success: Feedback from Students and Clients

The overall success of the project can be measured on two levels, pedagogical and personal. On a pedagogical level, students have the opportunity to put what they learn in class into practice and to see the course contents' applicability to real-world situations. On a personal level, students feel that they have made a difference, and have provided a unique service. The following quotes, which are representative of the feedback obtained since the initiation of this project, testify to the success from both the students' and seniors' points of view:

- "Seeing him so animated about learning motivated me to keep teaching him new aspects about the computer. ... For me, taking part in this program was a huge success. ... it was good for me to learn how to work with people on a new level ...teaching. I now have an appreciation for those who teach because it can be frustrating when somebody doesn't really understand something that may seem so easy to you." (Student)
- "To my surprise I knew more that I thought I did." (Student)
- "The idea of human-computer interaction is quite abstract in class, but being able to observe in real life makes it a lot easier to understand." (Student)
- "I enjoy the program because it allows me to communicate with my kids. I am always wanting to learn more and am eager for the next lesson." (Senior)
- "At this age, everything seems to go downhill and is negative. I feel this program gives me something positive to look forward to in life. It helps me stay connected with the current society." (Senior)

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Another measure of the success of the program is the increasing number of students participating in the program. New students come into class wanting to participate because of what they have heard from previous participants.

5. Future Directions

Service learning has added a new dimension to these computer science courses. Service learning will continue to be offered in the foreseeable future. Other computer science courses are being examined to see how service learning can be incorporated into the curriculum. We are also in the process of conducting a survey to measure

change in college students' attitudes toward the elderly, and initial results look promising. We look forward to sharing a full-scale analysis of our results in the near future.

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