

CSE Volunteers: A Service Learning Program to Provide IT Support to the Hillsborough County School District

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ABSTRACT

Service-learning enables computer science and engineering students to apply and refine their technical skills, learn new soft skills, and make a contribution to their community. At the University of South Florida we have organized a group of computer science and engineering students, called the CSE Volunteers, to provide IT support to the Hillsborough County School District. In spring 2005 over 7% of our undergraduate students voluntarily served in this program. While the work is fairly low-level, the experience for the students and school district has been very positive. Future directions include quantitative assessment, tackling projects of greater complexity, seeking corporate funding, and applying this program to help recruit new students to the major.

Categories and Subject Descriptors

K-3 [Computers and Education]: Computer & Information Science Education – Curriculum.

General Terms

Design

Keywords

Service-Learning, Practical Experience, IT Support, K-12 Schools, School District

1. INTRODUCTION

Service learning is a pairing of community service and active learning. Students engage their learning process by putting into practice the concepts learned in class in a service for the community. Active learning is well recognized as an effective pedagogy for student learning. The role of community service in the lives of our students is increasing. For example, Duke University reports that 75% of the students in their Class of 2004 have participated in community service [3]. Community service gives students a sense of connection. This is especially the case

in large urban regional universities where much of the student population is from the local area. A connection to the community may also be especially appealing to under-represented students, including women students [4]. Service learning has been applied to computer science at other universities [1, 5, 6, 7, 8, 9, 11, 12]. We describe previous and related work in service learning in computer science later in this paper.

In the Department of Computer Science and Engineering at the University of South Florida (USF) we decided to experiment with service learning starting in fall 2004. Our motivations were to:

1. Provide an opportunity for our students to gain hands-on experience to build both their technical and soft skills.
2. Reach out to the community as is desirable for a regional university that has a responsibility to its community, as well as to the state and nation.
3. Become more familiar with computing technology as used “in the field” to improve how and what we teach to our students.

USF is a large, state research institution in a metropolitan setting founded in 1956. USF currently has an enrollment of 42,500 undergraduate and graduate students in 11 colleges and schools. The University has a diverse student population, with 32% of the student body being of minority ethnicity and 60% being women. The entering class in fall 2004 had an average SAT score of 1108 and an average high school GPA of 3.74. The Department of Computer Science and Engineering is part of the College of Engineering. The Department offers three closely related degree programs that emphasize software (CS), hardware (CpE), and business application (IS). All three programs require a calculus, physics, and natural science core. All three programs have two entering “gate courses” in programming and computer architecture. Additional required courses include data structures, operating systems, and analysis of algorithms. In 2003-2004 the Department had 255 undergraduate, 88 MS, and 62 PhD students. Typical of most CS programs in the country, the Department’s enrollment has continued to drop since 2002.

This paper serves as a *case study* of our service learning program. The remainder of this paper is organized as follows. Section 2 describes the IT infrastructure in the Hillsborough County School District. Section 3 describes our CSE Volunteers program including organization, student tasks, student performance, and comments from students. In Section 4 our lessons learned and future directions are outlined. Section 5 covers related work and Section 6 contains our conclusions.

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2. THE SCHOOL DISTRICT

The School District of Hillsborough County is the nation's ninth largest school system, with more than 200,000 pre-kindergarten through adult education students, 208 schools and centers, and a total annual budget of \$2.1 billion. The school district was ranked as one of "the most outstanding school districts in the United States" in the 14th annual Expansion Management Magazine report card of the nation's best public schools. One of the School District's priorities is Updated and Integrated Technology

The school district has a Wide Area Network (WAN) connecting all sites through frame relay. Almost 100 enterprise servers reside at the District Network Operations Center (NOC). Each individual site has a Local Area Network (LAN) and its own additional servers. More than 500 servers, 43,000 workstations and 3,500 switches and wireless access points make up the network infrastructure.

The level of technology varies among schools with some high schools having 6 to 10 servers and almost 1000 workstations. Some elementary schools have provided laptop computers for all teachers as a pilot program. Computers have become essential for all administration functions including payroll, finance, asset control, and human resources. Based on data from the School Technology and Readiness (STAR) Survey, 94% of teachers use technology for communication, 53% of teachers use technology to assess student achievement, and 44% of teachers use technology for instruction to extend learning [10].

Technical support for all of the school and site level equipment, and application support for the various business and curriculum programs is a monumental task. Only about 50% of the schools have full-time school based technical support staff. The Customer Service and Support Department (CS&SD) responds to calls for technical assistance from the schools. Over 37,717 calls for assistance were made in 2004. Of these calls, 68% were resolved over the phone for significant cost savings. Site visits by Area Field Technicians resolved the other 12,083 requests [10]. Current District and Department initiatives, including an enterprise Active Directory rollout, Server 2003 upgrades and data migrations, Altiris Deployment solution, and maintenance of Symantec Antivirus upgrades has increased the need for additional technical support. Altiris is a centralized server-based product suite to support management of desktop PCs [2]. Altiris is used by the school district for automating patch and software updating, and for storing and downloading disk images as a means of repairing virus (or otherwise) damaged PCs.

Funding is not available for more technical support units at the district or school level. The technical support provided by the CSE Volunteers program at USF helps the schools who do not have technology support units.

3. DESCRIPTION OF CSE VOLUNTEERS

The requirement for participating in the CSE Volunteers program is admission into the Department as a student in good standing. CSE Volunteers is open to both undergraduate and graduate students. Volunteering students are assigned in pairs to IT projects in the Hillsborough County School District. The students serve as assistants to IT support technicians and are assigned to schools as needed. The expected time commitment is four hours per week for an academic semester (15 weeks). Students can

Table 1. Summary statistics of CSE Volunteers

	Fall 2004	Spring 2005
Number of schools	6	9
Number of students	14	20
Students earning credit	about 7	14
Women	3	4
Men	11	16
Undergraduate students	11	12
Graduate students	3	1
Repeat students	NA	5

optionally earn up to one hour of independent study credit for their successful participation in the program. The goals of the program are two-fold:

1. Provide a community service opportunity for our students
2. Give our students a meaningful real world experience in the context of service-based learning

Through the CSE Volunteers program our students get hands-on experience in managing large-scale IT operations and the school district get much needed technical support to help maintain their IT operations. The CSE program was initiated in the fall 2004 semester. Table 1 shows the make-up of the volunteers for the first year. In fall 2004 about 4.5% (11 of 255) of our undergraduate students participated in this program. In spring 2005 the number increased to over 7% (19 of 255) with 25% of the student volunteers repeating from fall 2004. It is significant to note that about 21% (7 of 34) of the volunteers were women. This is a greater percentage than the overall departmental percentage (17% of BS graduates last year were women). The fall 2005 semester is just getting underway and we do not yet know the number and/or make-up of the student volunteers.

The number of volunteer hours over two 15-week semesters totals to 2040 person-hours. This is equal to about one person-year and represents a large contribution to the school district.

3.1 Organization and Kick-Off

The first step in organization is to attract students. To do this we must advertise the opportunity. At the beginning of a semester we do three things:

1. Post a flyer on bulletin boards in the Department building including a posting on the much viewed "jobs board"
2. Hand-out flyers in our classes on the first day of class
3. Send a broadcast email to all students

We have established and maintain a website for the program (Figure 1). The website includes information about the program, pictures of student volunteers in action, and descriptions of accomplishments as written by the student volunteers.

Students that respond with a possible interest are invited to a "kick-off" meeting at the beginning of the semester. At the kick-off meeting we have officials from the school district attend who describe their IT environment and needs for technical assistance. A list of schools is made on the board and students indicate where they would like to volunteer. With some give and take, at the end of the session most schools will have two to three students signed-

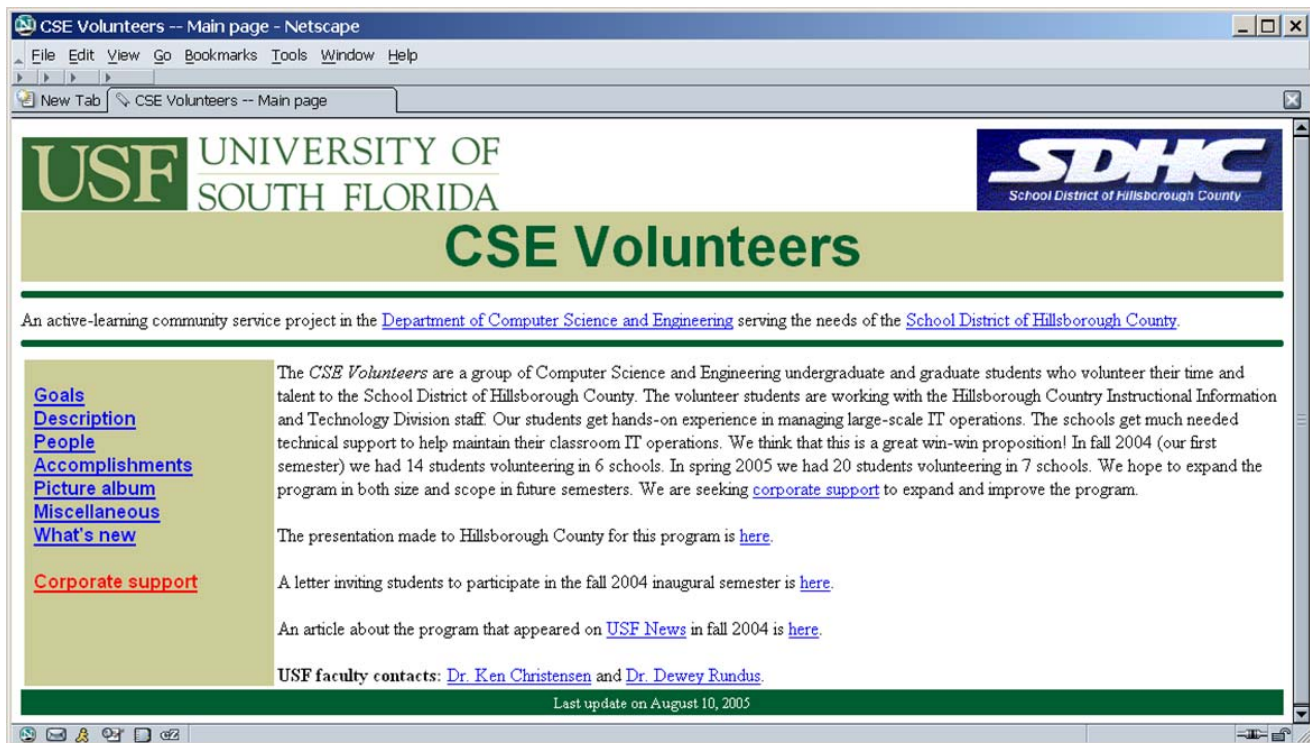


Figure 1. CSE Volunteers homepage (<http://www.csee.usf.edu/~christen/volunteer/>)

up. We have one elementary school on the USF campus property. This school is reserved for students who do not have transportation. The list of schools is made-up by the school district and typically includes many schools in impoverished areas. These schools are often relatively technology rich, as a result of grant programs to help needy schools, but lack greatly in technical talent to use their newly bought technology. Technology grants rarely include funding for technical support.

Students need to serve during regular schools hour (8am to 3pm). In order to work around their class schedules, most students select Friday as their volunteer day and serve in a single four hour block. Most K-12 schools in the district have strict dress codes for students and teachers. Our students are made aware of the dress code and asked to dress in business casual (e.g., no t-shirts, no flip flops, and so on) when they serve.

3.2 Student Assignments and Tasks

Once students have been assigned to schools, the next step is the first day orientation. For their first day on the job, they are met by a school district technician and, depending on the school, the school technology person. The students are taken around the school and introduced to key people (e.g., the head librarian if the students will be working on PCs in the library – this is often the location of many PCs). The students are also shown the procedures for signing-in and out of the school.

Many of the schools in the school district are undergoing technology “refreshes”. Thus, a very typical assignment for our students is to set-up new PCs. The students also actively maintain and troubleshoot existing PCs by responding to trouble tickets. Typical work includes dealing with viruses and other security issues, and also installing new software. Our student volunteers

do not directly interact with the K-12 students, but interact instead with teachers, administrators, and technicians. Some student teams have had special assignments, such as enabling PCs to display television feeds (this entails installing hardware and software in PCs), refurbishing old donated PCs, and building specialized carts that contain a laptop, LCD projector, and other media playing and display equipment. These carts are then checked-out by teachers (thus saving the cost of having this equipment permanently installed in every classroom). In spring 2005 we had two cases of the schools “running out of work” for the students in mid-semester. In at least one of the two cases this was because an expected shipment of new PCs did not arrive as scheduled. We intend to monitor for these kinds of situations very carefully in future semesters.

The students are independent in maintaining their work hours. At the end of each week we ask the students to email to all their peers (and to us) their informal status. These chatty emails (which we always respond to!) serve as a communications vehicle as well as a status report for us to follow student performance. From these status emails we also learn about technical issues.

3.3 Student Performance

The performance of our students is evaluated via the status emails we review and by direct visits to the schools. In our school visits we interview the students, teachers, and staff that the students work with. We discuss both the technical work that the students have been performing as well as general “soft” issues of punctuality and attitude. The students are always very enthusiastic to show us what they have been doing. The teachers and staff greatly praise the students, and this feeling of “being wanted” significantly adds to the experience the students get.

3.4 Comments from Student Participants

We asked the student teams in fall 2004 to submit statements describing their accomplishments. Long Ngo and Jen Gatza volunteered at Cahoon Elementary school. Cahoon is an elementary school in an impoverished area in Tampa. Here is the statement (abridged) from Long and Jen:

"Cahoon switched from a Mac platform to PCs about two years ago and already they are plagued by spyware, malware and the occasional virus. They welcomed us with open arms. Mike Studenberg, the regional technician, started by outlining a plan to help get the school into shape. Principally, we used PXE and Altiris to remotely manage each of the 80-or-so computers on campus. While doing so, we developed a long-term maintenance plan to be sure that computers are kept malware and virus free. Overall this has been a great learning experience for Jen and I as we discover where educational knowledge meets real world experience. Perhaps most importantly, we have had the opportunity to work with all kinds of people with different skill levels, backgrounds, and personalities."

The accomplishments at Clark Elementary School (located in the fringe suburbs of Tampa) are described (abridged) by David Kuczynski and Robert Ivey:

"When Robert and I both showed up to Clark, we were immediately put to work. Despite the fact that almost all of the computers at Clark are Macs, Robert and I quickly learned the ins-and-outs of these machines and were able to start working on a mountain of tech requests. After the number of requests had subsided to a much lower level, we then started to work on the computer lab, re-imaging all of the machines and categorizing computers with problems. In the future, along with the usual tech requests we might tune-up the Clark web homepage or enable more TVs to become computer displays."

The accomplishments at Lewis Elementary School are described by Kenneth Shelton, Camilo Brand, and Oscar Melendez:

"Also we created 10 'presentation carts' which each contain a digital camera, a Ken-a-vision Video Flex (which can be used in conjunction with LCD to function as an overhead), an LCD projector, a DVD/VCR player, and a computer. These machines will be shared among the teachers and used to help facilitate material in the classrooms. Our plans for the future are to push out Norton Antivirus Corporate 9.0, update the Administration's e-mail software, and possibly update the school website."

These statements highlight the most common tasks of handling trouble ticket items and configuring desktop PCs (using disk images and image servers),

4. LESSONS LEARNED

We believe that our first year experiences with the CSE Volunteers program has met our goals for the students involved, for the school district in which they volunteered, and for our Department. The students benefited in at least three ways. The students:

1. Had an opportunity to experience a real IT environment with its incumbent challenges, frustrations, and resource limitations.
2. Could feel good about the contribution which they were making.
3. Were able to add this experience to their resumes.

The school system also clearly received benefits. The tasks which the volunteers accomplished were generally things which would have needed to be done (e.g., setting up newly acquired desktop PCs). Sometimes the tasks were extras which were of benefit, but which would likely have been held in abeyance (e.g., the construction of new media carts). In all cases, the work which the volunteers accomplished improved the school environment while simultaneously freeing time for the regular IT staff. Finally, our Department benefited from the program by making a clear statement of our desire to directly aid our local community. Direct involvement with the community is of growing importance at USF, and this is likely also the case at other regional universities.

4.1 Future Directions

We have begun the second year of the CSE Volunteers program and have introduced some modifications. Beginning this year we will institute a more formal assessment of student learning and contributed service. Using surveys we will assess what technical and soft skills the students have learned. We will also employ surveys in the schools in which the students serve to assess their performance – both technical and attitudinal.

During our initial year, student teams were formed at the beginning of each semester and the tasks which the students would perform and the locations where they would be placed were determined at that time. Now that we, and the school system, have had experience with the program we have concluded that more might be accomplished and the volunteers might be better able to effectively use their time if the student teams could remain together for both the fall and the spring semesters and if their school of assignment could similarly be held constant. Not only would this reduce startup time for the second semester, but it would also allow the volunteers to undertake more complex projects of a longer duration.

A second modification will be a quest for outside financial support. We are seeking corporate sponsorship in order to provide a modest fund of perhaps \$2500 for each of our teams. The students would be able to use this money to purchase items for the school where they were working. These would be small enhancements to the environment which would be difficult to obtain through normal budgetary means. We believe that this would further cement the bond of the students with their school.

Finally, we believe that the CSE Volunteers program may be useful as a motivational tool for our undergraduates. At the beginning of the major, some students become discouraged and uncertain about continuing. Additionally, our discipline is often seen as rather isolated from the community at large. This image does not necessarily resonate with some students who are more focused upon what the computer can do rather than what it is. We would hope that the opportunity to be of direct, applied assistance in the community would help address the latter problem. To help the discouraged or confused new student, we hope to shape our teams so that they include both a student who is just beginning the major (or perhaps not even officially in the major) with a more senior student. Interactions with the more experienced student would hopefully provide a source of advice and encouragement for the new student.

5. RELATED WORK

We are not the first to experiment with service learning in computer science. Many models of service learning – both in relation to the curriculum and where the service is performed – have been implemented in computer science programs. Lazar and Lidtke [5] describe the general issues involved in implementing service learning in information systems curricula and present several examples. Sanderson [8] addresses the general need to develop, apply, and disseminate frameworks of service learning in computer science. Several examples of successful frameworks are presented, including EPICS. The Engineering Projects in Community Service (EPICS) is a service-learning program started at Purdue in 1995 [7]. EPICS initiates long-term, team-based student projects to support community service organizations. EPICS student teams are interdisciplinary across multiple engineering and non-engineering disciplines. The EPICS model is currently being extended to many other universities.

Specific (selected) applications of service-learning to computer science programs are:

- Linos et al. [6] at Butler University describe their experience with adapting the EPICS model to a software engineering curriculum in a small liberal arts college. One project implemented a Spanish language education tool.
- Adams and Runkles [1] at Franklin and Marshall College describe a collaboration of CS1 students with inmates at the York County prison. Students tutored inmates in basic computer literacy skills as a project for their CS1 class.
- Sanderson and Vollmar [9] at Southwest Missouri State University describe a one-hour computer science service-learning elective. Students work through the university-wide community outreach office to identify social service agencies in need of technical assistance. Students work 40 hours in one semester and are graded based on essays (by the students) and evaluations (by the agency).
- Tan and Phillips [11] at Mansfield University describe a two-semester projects course where students solve problems presented to them by “clients” from local companies and agencies. These projects are seen as reinforcing learning and developing professional values.
- Traynor and McKenna [12] at Saint Anselm College describe how service-learning is incorporated into two courses for about 20% of the course grade. Student projects “connect three generations within the community” by teaching computer applications to local citizens.

We note that assessment of service-learning is still largely qualitative based on student essays and presentations, and somewhat informal evaluations by community service partners. There appear to be no quantitative assessment efforts focused on strict measurement of student learning and service provided. Developing methods for assessment remains an open challenge.

6. CONCLUSIONS

Overall we feel that the CSE Volunteers program has been a success in its first year. The program has met its goals of providing a service learning experience for our students. We intend to supplement our informal assessments to include more formal surveys to measure student learning and service.

It has been encouraging to see that even though the activities of the volunteers were often unchallenging technically, the good feeling of being able to provide an obviously needed service made the experience rewarding. We are excited by the prospect of using service learning to attract new students to the major, and possibly also to specifically attract and maintain students from under-represented populations. With school districts throughout the country being resource limited, our program is very likely easily sustainable and portable. We believe that the CSE Volunteers program should be readily transferable to other universities and colleges and we would be happy to provide assistance.

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