

## **2006-1630: DEVELOPING A WIN-WIN ENVIRONMENT WITH SERVICE-LEARNING**

### **Guy Hembroff, Michigan Technological University**

Mr. Guy Hembroff is an Assistant Professor within Michigan Tech University's School of Technology Department. His research interests are within the areas of cyber security, network protocols, encryption methods, health-care security, and biometrics. He has six years of industrial experience as a systems engineer and advanced network engineer. Mr. Hembroff is currently pursuing his Ph.D. degree in Computer Information Science.

### **Yu Cai, Michigan Technological University**

Dr. Yu Cai is an assistant professor at School of Technology in Michigan Technological University. His research interests include network protocols, distributed systems and cyber security. He received his Ph.D. in Computer Science from University of Colorado in 2005. He is a member of IEEE and ACM.

### **Scott Amos, Michigan Technological University**

Dr. Scott Amos is Dean of the School of Technology at Michigan Technological University. Previously, he was Head of the Department of Industrial Management in the College of Business Administration at Southwest Missouri State University, Springfield, Missouri and before that he developed and directed a Construction Management Technology program in the Department of Mechanical and Manufacturing Engineering Technology at Weber State University, Ogden, Utah. He is a registered professional engineer in Minnesota, and Certified Professional Constructor with the American Institute of Constructors. He retired from the USN Civil Engineer Corps (CEC) with the rank of lieutenant commander.

# **Developing a Win-Win Environment with Service-Learning**

## **1. Introduction**

One of the critical challenges facing higher education today is how to fill the gap between industry's requirements, expectations, and the preparation of undergraduate students beyond the classroom. Faculty and students alike often come to the same conclusion: even a course that is organized, challenging, and contains well-developed labs, can only take an individual so far. Simply, there is no replacing the value that industry experience provides to students before they enter the workforce.

Broadening the spectrum, there are many challenges facing our global economy. The most popular being economics. Financial survival is a constant concern throughout all levels of industry and each organization utilizes different approaches and strategies to handle these challenges. This may include outsourcing the labor and manufacturing of a product to an alternate, less-expensive location or perhaps instituting an innovative low-cost technology to help reduce overhead costs. Organizations across the world continue to search for ways to reduce their expenses in order to become or remain financially stable.

Combining the challenge for higher-education to give students industry experience while providing a method for organizations to maximize their services with little or no fiscal expenditures, results in a process called service-learning [1]. This term refers to educational activity in partnership with a public or non-profit agency, organization, or project within the community. Service-learning from an academic viewpoint is normally completed in one of two ways. The first, curricular service-learning, is a process in which the project is integrated into an academic course and carries academic credit. The second, co-curricular service-learning, complements academic work but is not directly connected to a course or academic program and does not carry academic credit. Both of these methods, when implemented effectively, have the ability to produce a variety of benefits for both the students and organization involved.

## **2. Background**

The Computer Network Systems Administration (CNSA) program [2] at Michigan Technological University (MTU) has developed an effective service-learning program between its undergraduate students and the community that surrounds the university. The CSNA program was established in 2003 and prepares students for careers in network engineering, security engineering, and systems administration. Although each of the program's core courses have been designed to incorporate a "hands-on" lab section that is offered in conjunction with the courses' lectures, the students often have a difficult time applying the material learned throughout the course directly to industry. To help alleviate this issue, MTU's CNSA program created its first service-learning partnership with the Regional Educational Media Center (REMC) [3] of Michigan and the Copper Country Intermediate School District (CCISD) [4].

REMC is directly responsible for providing and maintaining the technological education services of the CCISD. REMC provides each CCISD building with access to voice, video, and data equipment (including phones, computers, data projectors, TV, VCR, and video conference

equipment). REMC is also responsible in providing Internet access to allow students to participate in virtual fieldtrips, utilize streamed video, videoconference, email and access educational Internet sites. In addition, REMC maintains a consortium-wide fiber optic network to transfer voice, video, and data for each of the CCISD locations.

The CCISD is a service agency that provides special support services, special help and special equipment to educators in its 13 constituent local school districts, in addition to serving as a liaison office between the districts and the Michigan Department of Education. The responsibilities and role of the CCISD have grown over the years in proportion to the needs of its constituents and in accordance with the State and Federal requirements. The CCISD serves the citizens of a rural three-county area, covering 2,457 square miles, in the northern part of Michigan's Upper Peninsula. These three counties include Baraga, Keweenaw, and Houghton, which is where Michigan Tech University is located.

To reduce costs and become more effective, REMC recently implemented an initiative to centralize the majority of its computer technology equipment and services. This transition allows REMC to centrally configure, maintain, and backup each school's data, implement and monitor a consistent and reliable email system, scan for viruses, worms, and Trojans before permitting data to pass in or out of each school's system. These tasks are accomplished by centrally maintaining strict firewalls, access-lists, and anti-virus definitions. In addition, all of the voice and video conferencing is centrally managed. This new direction removes the responsibility from each school to manage and maintain these technologies individually and places the burden of accountability on REMC's main office.

Although the centralization of the technology was logical, there were additional challenges that made its implementation and continuous maintenance difficult. The first challenge was monetary, while the second was finding qualified individuals to help support the system's new central architecture. In the past, funding from the state and federal governments, usually in the form of grants, provided sufficient financial support for the schools' technology initiatives. However, this has not been the case in recent years. Like many other educational institutions, REMC has experienced a significant decrease in the funding that it receives. Faced with this obstacle, REMC had to incorporate an innovative solution to this growing problem.

Michigan Tech University's CNSA program had designed and submitted a service-learning recommendation to REMC that included the CNSA students providing computer and network support for the organization and surrounding schools. REMC decided to implement the CNSA's service-learning approach as a possible solution to their problems regarding the funding and searching for qualified employees. Instead of having to hire additional network engineers and systems administrators to their already financially strained organization, REMC took in qualified CNSA students to assist with the technology centralization initiative for the CCISD area schools. They then utilized these students to help maintain the systems and networks associated with the CCISD.

### 3. Service-Learning Benefits

This service-learning partnership was initiated in the summer of 2005. The design of this service-learning approach consisted of a co-curricular architecture, in which selected students from the CNSA program participating in this venture would work on projects and assignments for REMC that relate directly to the CSNA curriculum, however the students would not receive academic credit for their efforts. This collaboration has proven to be very successful not only for the students involved, but also for REMC, CCISD, Michigan Tech University, and the surrounding community.

Although this service-learning agreement between Michigan Tech and REMC is still in its adolescent stages, many benefits have been already realized. The students involved have received positive industry experiences by working within an environment directly applicable to their major of study. For example, CNSA students played a large role in the centralization project for REMC by: developing sufficient redundant storage area drives and scripts for each school to back up the schools' data both centrally and automatically; creating and implementing a centralized firewall and security environment to protect each of the schools' network systems; developing an effective IP address scheme that grants more consistency and security throughout the schools; and creating and maintaining a central web site where schools can ask technical questions regarding the network's architecture and maintenance.

The post-centralization project has proven to be equally successful and beneficial. Students have worked on projects that consist of wireless network implementation and security, database development, general network troubleshooting, and sophisticated monitoring of the network's devices. Students have also been given the opportunity to configure and implement video-conferencing hardware and software for multi-point sites involving, teachers, students, the board-of-education, or members of the community. These experiences have enabled the students to become exposed to additional technologies that are not detailed in the classroom.

Students have also benefited indirectly from this experience. Concepts such as teamwork, ethics, responsibility, self-confidence, and job satisfaction are reinforced on a daily basis. In addition, students gain a respect for working within a budget along with the value of a positive attitude in the work environment. Students have also learned from the mistakes that they have committed within this service-learning partnership. These mistakes allow the students to grasp the consequences of their actions within a real-world environment. This experience, while difficult for the students at first, is humbling but effective. Often labs can become scripted and students can alleviate mistakes due to the lab's predictability. However, within industry, many variables are unforeseen and an individual must respond to the immediate crisis. Students experiencing this occurrence, quickly learn how to deal with these types of incidents in an effective manner and come to understand the complexities that a job may entail.

Just as students have received a variety of benefits from this service-learning experience, the organization itself has received numerous benefits that have validated this collaboration. One of the most obvious benefits realized from this partnership are the monetary savings that the REMC has achieved. By bringing in qualified students, on a part-time basis, REMC was able to pay students a lower wage and did not have to offer them benefit packages, such as health insurance

and retirement programs. This allowed the school systems the ability to work within their reduced budget and effectively complete projects that were vital to their students' education. The organization also gained a repository of qualified students within close proximity of the REMC centralized location. Due to the advanced curriculum created by the CNSA program to prepare students to enter the workforce in the areas of network engineering, security engineering, or systems administration, REMC now has access through the service-learning partnership to continue to bring in qualified students who already possess many of the skills and knowledge necessary to succeed within this technological line of work. According to Mike Richardson, Technical Services Manager/Network Administrator of REMC, "the collaboration with Michigan Tech's CNSA program has given our organization a tremendous opportunity to continue to provide excellent educational technical services to the schools associated with the Intermediate School District that we could not offer based on our economical standing. The CNSA students provide a great deal of assistance to our organization and they benefit from the experience of working in a true working environment (personal communication, November 4, 2005)."

The surrounding community has also benefited from this service-learning program. K-12 students within the CCISD directly receive the benefits from the educational services that the CNSA undergraduates help to provide. In addition, the CCISD offers adult educational classes, programs, and video conferencing to the community. Witnessing the types of educational services that are provided with this technology creates a tangible asset that the community can stand behind and support. Further, the monetary savings resulting from this service-learning arrangement may defer tax increases, which would otherwise be necessary to bring in the finances needed to maintain this educational technology and associated services.

#### **4. Future Integration**

Due to the success of the service-learning arrangement between the CSNA program at Michigan Tech and REMC, additional opportunities were created. To further develop the centralization of the CCISD, add to the stability of this network architecture, and continue to develop and prepare CSNA students for positions with added responsibility, REMC developed a full-time help-desk staffed exclusively with the CNSA students. It is staffed primarily with students that are of freshman or sophomore status. The students are able to attain hours without interfering with their academic schedules.

The help-desk allows the CCISD schools to receive centralized technical support. These issues range from common email problems to more sophisticated network routing complications. The students learn a great deal from this process as they become exposed to a wide variety of technical issues. The CCISD and its employees enjoy having help-desk personnel available to assist them with technical problems, documenting issues, and completing additional projects as needed.

#### **5. Conclusion**

The goal of service-learning is to empower students to satisfy the needs of the community through the services being provided [5]. The result is that students are given an opportunity to help others, enhance their self-esteem and self-confidence, develop a richer context for learning,

expand their civic skills, reaffirm their career choices, and foster learning by joining theory with experience and thought with action. The partnership between Michigan Tech's CNSA program and REMC portrays a compelling picture of how service-learning can be utilized to meet, and often exceed, many of the challenges that face organizations today.

**Bibliography:**

1. National Center for Education Statistics. <http://nces.ed.gov/programs/coe/glossary/s.asp>
2. CNSA at MTU. <http://www.tech.mtu.edu/cnsa>
3. Regional Educational Media Center. <http://www.remcl.k12.mi.us/>
4. Copper Country Intermediate School District. <http://www.copperisd.org/>
5. Sperling, Rick, et al. "Does One Size Fit All? The Challenge of Social Cognitive Development", The Michigan Journal of Community Service Learning, Volume: 9, No. 2, Winter 2003.  
<http://www.umich.edu/~mjcsl/volumes/vol9.2abstracts.html#vol9.2-1>