

ECE Students working with Nursing Students to Improve Rural Health Care

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Motivation

Enrollments in undergraduate electrical and computer engineering (ECE) majors have declined over the last decade by about 25%. One reason to which the decline in undergraduate ECE enrollments has been attributed is the relatively abstract nature of the electrical and computer engineering fields compared to the other engineering disciplines. Furthermore, the present generation of students is interested in service activities, as demonstrated by the large number of students engaged in organizations such as student chapters of Engineers Without Borders and Engineering Projects in Community Service (EPICS) programs. Finally, ECE departments are showing relatively low enrollments of female students compared to many of the other engineering disciplines, especially biomedical engineering, in which enrollments are typically 50% male, 50% female. While the supply of ECE graduates has been declining, the demand for electrical and computer engineers is growing. It is therefore important for us to find ways to increase the enrollments in the ECE disciplines.

New Program Description

To address these issues, we are developing a new program at Villanova University in which undergraduate students and faculty in the ECE Department are working with undergraduate students and faculty in the College of Nursing to use ECE technologies to improve health care in rural communities in developing countries. The inspiration for this initiative came from the IEEE Humanitarian Technology Challenge initiative, in which IEEE volunteers are developing technological solutions aimed at addressing some of the UN Millennium Development Goals.

Villanova University's College of Engineering has been sending students to Honduras and Nicaragua for the last seven years to perform community service activities. The Honduras project, led by structural engineers in the Civil and Environmental Engineering Department, has been centered on providing engineering consulting on building and construction projects in rural communities. The Nicaragua program has been aimed at designing gravity-fed, clean water distribution systems for members of the rural communities surrounding the town of Waslala. Mechanical engineering students and faculty have led this effort. Most recently, I made a trip to Waslala with some mechanical engineering colleagues to investigate the development of micro-hydroelectric power systems. We now have both electrical engineering and mechanical engineering students working together on a senior design project to design the turbine-generator system, the control system, and a power distribution system for a micro-hydroelectric project.

Over the last five years, nursing faculty and students also have joined the engineering students on trips to Nicaragua. They have conducted health care outreach activities, including health assessments and

health education workshops, for the members of the communities surrounding Waslala. While the engineering and nursing students have traveled together on these trips, the students have interacted little after arriving in Nicaragua.

The new effort that we recently launched is to have electrical and computer engineering students and nursing students work together on joint health-care-related projects in rural communities, such as those surrounding Waslala in Nicaragua. Employing small-scale power and communications technology can dramatically improve health outcomes in rural communities of the developing world. Health clinics in these areas often do not have power to provide lighting to perform surgeries at night. In addition, they may employ health-care workers with only basic training, they may have limited health-care records for the community members, and they have limited access to medicines.

Through the use of communications technology based on low-cost wifi networks or mobile, cellular-phone technology, information may be communicated from a remote site to a central clinic in town and can then be analyzed by a trained, health-care professional. A small solar panel with a battery and LED lighting can serve as a self-contained means of providing enough lighting to conduct operations at night. Electronic health-record systems can be used to track the health of community members over time. Finally, power can be used to power small refrigerators to store medicines. Alternatively, communications technology can be used to order medicines from the town.

Clearly, there are many opportunities for ECE technologies to be used to improve health-care outcomes in developing countries. However, the implementation of these technological solutions must be guided by health-care specialists, such as nursing students and faculty. Thus, ECE students and nursing students have a wonderful opportunity to work together on some interesting, meaningful projects in which they can improve the lives of those who are less fortunate.

Student Interest and Next Steps

We have generated significant interest in this new program. Five ECE students—three junior electrical engineering students, one junior computer engineering student, and one graduate electrical engineering student—have already signed up for the program. We also have recruited three junior nursing students. Two ECE faculty members who specialize in computer communications and renewable energy have signed on, as have two nursing faculty.

All the students and faculty are preparing to travel to Waslala, Nicaragua, in May 2010 for a project planning trip. The junior ECE students will then use the assessment trip to prepare a proposal for their senior design project, which they will conduct in the fall semester. The nursing students will obtain academic credit for their work in a Global Community Health course that they take in the spring semester of senior year, as well as in an independent study project. We have prepared and submitted two grant proposals to obtain funding to support this initiative.

We have also started to advertize this program in our Open Houses and have received positive feedback from prospective students. We are hopeful that this initiative, along with other efforts that we are pursuing, will expand interest in the electrical and computer engineering fields.