AC 2011-748: ENGINEERING INTERNSHIPS IN SOCIAL ENTREPRENEURSHIP: DEVELOPING PARTNERSHIPS AND STUDENT PERSPECTIVES

Camilla M. Saviz, University of the Pacific

Camilla M. Saviz is an Associate Professor of Civil Engineering at the University of the Pacific. She received B.S. and M.S. degrees in Mechanical Engineering from Clarkson University, an M.B.A. from the New York Institute of Technology, and a Ph.D. in Civil and Environmental Engineering from the University of California, Davis in the area of hydrodynamic and water quality modeling. She joined the University of the Pacific in 1999 and is a registered Professional Engineer in California. Her current research interests include sustainable engineering and engineering education.

Abel A. Fernandez, University of the Pacific

Abel Fernandez is Professor and Director of the Engineering Management Program at the University of the Pacific, Stockton, California. He holds the Ph.D. degree in Industrial Engineering from the University of Central Florida, M.E. and B.S. degrees in Electric Power Engineering from Rensselaer Polytechnic Institute (RPI) and an M.B.A. also from RPI.

Dr. Fernandez has over 13 years of system engineering and project management experience with TRW Inc. and the Harris Corporation. His final position at Harris was Director of Product Marketing, an executive level position in which he was responsible for all applications engineering and strategic planning for the Controls Division of the Harris Corporation, a Division with over US$ 60 million (then dollars) in annual sales.

He joined the University of the Pacific in 2000 and is a registered Professional Engineer in the State of Texas. His present research interests are principally in multidisciplinary engineering education and engineering economic analysis.

Elizabeth A. Basha, University of the Pacific

Elizabeth A. Basha is an Assistant Professor of Electrical and Computer Engineering at the University of the Pacific. She received a S.M. and Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology as well as a B.S. degree in Computer Engineering from the University of the Pacific. Her Ph.D. research focused on distributed event prediction on sensor networks, especially the application of river flood prediction in Honduras. Her current research interests include sensor networks, event prediction, renewable energy, and international development.

Andria Patricia Ellis, University of the Pacific, School of Engineering and Computer Science

I am a senior civil engineering and geology student at University of the Pacific in Stockton, CA, and plan to graduate in May 2011. My motivation to pursue these technical degrees is fueled by my goals to provide real solutions to real problems through the development and implementation of stable and secure technologies that may help improve lives and the environment. While maintaining an attitude of optimism and levity, I believe in taking risks that have the potential for character building and personal growth. I also strive to continually develop as an individual, professional, student, family member, and friend. I was a participant in the Ambassador Corps Fellowship program through University of the Pacific’s Global Center for Social Entrepreneurship and spent three months during the summer of 2010 in Bangalore, India, assisting with housing and sanitary infrastructure projects for the urban poor. In my spare time, I enjoy ultra-light backpacking, playing old-time fiddle, journaling, creating wheel-thrown ceramics, exercising, shooting firearms, traveling, and spending time with my family.

Miss Kristina Hammarstrom
Feliciano Leon
Mr. Jerry Bruce Hildebrand
Mr. Spencer Ton

©American Society for Engineering Education, 2011
Engineering Internships in Social Entrepreneurship:  
Developing Partnerships and Student Perspectives 

Abstract 

The School of Engineering and Computer Science and the Global Center for Social Entrepreneurship (“Global Center”) at the University of the Pacific are collaborating to provide social entrepreneurship summer internships for engineering students. Social entrepreneurship applies business principles to ventures focused on solving social problems and has traditionally held greater appeal for international relations and business majors than for engineers. Partnering with an existing social entrepreneurship internship program, this collaboration specifically seeks to involve engineering students in meaningful experiences abroad. The Global Center for Social Entrepreneurship is a multi-disciplinary center providing students with hands-on projects and leadership opportunities in social entrepreneurship. The summer internship program seeks to provide an enriching experience for participants and to raise awareness of the broad application of social entrepreneurship within the student community. These opportunities allow students to learn first-hand that successfully implementing projects in emerging countries requires strong technical skills and a fundamental understanding of local conditions. A project’s long-term success hinges on the designer’s understanding of local cultural, political, and contextual factors.

During Summer 2010, two undergraduate engineering students and one graduate student from the University of the Pacific held internships working for social entrepreneurial organizations in developing countries. Civil Engineering undergraduate Andria Ellis worked with SPARC in Bangalore, India, where she performed population surveys of slum inhabitants and electronically mapped slum boundaries. She used these data to design a database that tracks slum boundaries and population characteristics to facilitate micro-financing and infrastructure development within the slums. Kristina Hammarstrom, an Engineering Management undergraduate student, spent eight weeks with Cheetah Conservation Fund (CCF) in Namibia. Her duties included tourism data analysis, goat cheese business planning, cheetah care, and analysis of production methods for ‘bushblok’, a fuel log produced using an invasive thorn bush that poses a threat to wildlife. She proposed processes to improve efficiency and productivity for bushblok production. Feliciano Leon, a Civil Engineering graduate student, worked with AVINA in Santa Cruz, Bolivia, where he helped plan and coordinate an international conference on community water management programs. His duties included gathering information on water quality and water infrastructure needs in small communities and identifying potential collaborative partners for regional community water organizations.

The students were able to apply their technical skills towards gathering, collating, and analyzing data. More important, they were required to apply general problem-solving skills in environments where language, culture, technical support, and supervision were very different from levels experienced during more ‘traditional’ internships with engineering firms in the United States. Students specifically cited understanding the roles of engineering and communication in a broader societal context as invaluable lessons learned from their experience.
Introduction

Engineering students are expected to understand the social, environmental and economic impacts of engineering at local, national and global levels. In their report, “Engineer of 2020”, the National Academy of Engineering, envisions “a future where engineers are prepared to adapt to changes in global forces and trends and to ethically assist the world in creating a balance in the standard of living for developing and developed countries alike”\(^1\). More specifically, the ABET Accreditation Criteria for Engineering programs require that accredited engineering programs demonstrate students have “the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context”\(^2\). The challenge is providing means for students to gain this broad educational perspective.

Universities have responded to this challenge through new courses, degree programs, and extracurricular opportunities focused on the socio-technical aspects of engineering. A number of universities offer courses on design of context-appropriate technology appropriate for the developing world\(^3\)-\(^6\). Several innovative courses and programs integrate the social benefit of engineering as the central theme\(^7\)-\(^11\), while other universities provide formal programs for students to go abroad for study, work, or service learning\(^12\)-\(^14\). Service learning has taken many forms within engineering programs and has been found to assist in students’ professional development\(^15\)-\(^17\). In addition, although not often formally linked to academic programs, globally-focused engineering student organizations, such as Engineers Without Borders and Engineers for a Sustainable World, reflect students’ growing interest in international development, eradication of poverty, environmental action, and application of technology for social benefit\(^18\)-\(^19\).

However, the issue of sustainability of such efforts in terms of faculty time and university resources is not yet resolved\(^20\). Perpetuating these socially focused initiatives is an important issue in smaller schools where limited resources constrain new initiatives, but, in an era of shrinking resources, also affects larger institutions. The issue of sustainability of such efforts may be addressed by creating synergistic partnerships among different academic units that capitalize on diverse capabilities offered by each participating group. Socially-focused curricula have traditionally been the purview of liberal arts programs, with established procedures, student involvement and funding. This is the case at the University of the Pacific, an institution with a strong liberal arts tradition, where the Global Center for Social Entrepreneurship (“Global Center”) is the central hub of social entrepreneurship activities. Attempts to introduce socially-focused engineering groups at the School of Engineering and Computer Science were stymied, not by lack of student interest, but by insufficient faculty resources to provide leadership and continuity during the critical first years. A strong personal relationship between the Director of the Global Center and engineering faculty led to a collaborative effort to identify pioneering engineering students who would benefit from, and who could help enhance, the center’s social entrepreneurship summer internship program. This partnership benefits engineering students, expands the center’s multidisciplinary span, and provides a natural linkage between engineering education and social entrepreneurship.
Social entrepreneurship is a hybrid innovation that applies business and management skills to tackle chronic societal problems with sustainable solutions. The mission of the Global Center for Social Entrepreneurship is to actively engage the university community in all aspects of this field through academic curricula, internships and apprenticeships, applied research, local and global community outreach, and career opportunity development. Through its program of activities, the Global Center seeks to develop solution-minded pragmatists who are pioneering practical, inventive, and sustainable approaches to address the world’s most pressing social issues: poverty, disease, malnutrition, environmental degradation, injustice and illiteracy. The Global Center receives a key part of its activity support from its Board of Stakeholders who provide strategic planning, student mentorship, programmatic development, student internship opportunities, curriculum development, strategic alliance networking, and financial support. The Board consists of 20 professionals that include recognized social entrepreneurs, corporate CEOs, non-profit directors, foundation presidents, microfinance specialists, venture capitalists, academicians, and individuals with expertise in management and fundraising.

In Academic Year (AY) 2008-09, the Global Center for Social Entrepreneurship at the University of the Pacific initiated the Ambassador Corps Fellowship Program - a summer internship and fellowship program to place students in social entrepreneurship organizations in developing countries. In addition to the hands-on and cultural experiences, the Ambassador Corps program provided the essential fundamentals for addressing issues in the international arena, cultivating professional relationships in developing countries, and learning about the role of business and management in the context of socially-focused enterprises. Students traditionally associated with the center were studying in majors such as modern languages and international relations, where an experience abroad was already a requirement for graduation. To broaden the center’s student base, the Director of the Global Center and engineering faculty actively recruited engineering applicants to the center’s summer program. It was expected that some engineering students would be receptive to the program as it not only involves socially-beneficial work in the international arena but also satisfies the requirement that all engineering students complete at least one co-operative work experience prior to graduation. A natural partnership formed because some students were interested in travelling abroad and working in international development or service-focused fields. In its first year, two of ten fellowships were awarded to engineering students. The two engineering students completed eight week internships at different non-governmental organizations, both coincidentally in South Africa. In AY 2009-10, engineering students were selected for three of fifteen fellowships awarded. Their experiences are subsequently discussed in this paper. Learning objectives of the well-established School of Engineering and Computer Science co-operative education program were used as a basis for the learning objectives specifically developed for engineering participants in the summer fellowship program. Post-internship written reports prepared by all fellows were used to assess how well each student’s experience met the Program’s learning objectives.

Based on feedback from students and their supervisors and discussion among faculty and Global Center staff after that first experience, application and selection processes were refined, the cultural training component was expanded, and program objectives were formalized. The following sections describe these elements of the Ambassador Corps program.
Fellowship Recipient and Internship Selection Processes

Undergraduate and graduate students from all academic majors are eligible to apply for the Ambassador Corps Fellowship Program. Each application packet includes an information form, cover letter, resume, statement of purpose related to the program, and at least one letter of reference from a faculty member. A two-step process is used to select fellowship recipients:

1. Applications from students who meet minimum requirements for grade point average and participation in the Global Center are reviewed by a panel comprising staff from the center, faculty members with relevant expertise, and one or more past fellowship recipients. Each panel member uses a rubric to evaluate the candidate’s potential based on materials received in the application packet.

2. Applicants who receive a minimum score of 65/100 are invited to interview with the panel.

The review panel ranks fellowship recipients based on the application materials and interviews. Global Center staff identify internship opportunities through their contacts with social entrepreneurship and non-profit organizations located worldwide. The center staff then counsels the students selected to receive a fellowship on placement options. Each candidate conducts further research on the organization and contacts personnel at the prospective social entrepreneurship organization via email, telephone, or online conference to address initial questions. The student makes final selections in consultation with Global Center staff considering academic experience, language requirements, and appropriate fit between the student’s interest and the mission of the social entrepreneurship organization. A Memorandum of Understanding is developed to include the responsibilities on the part of both the student and the host organization.

Funding, Training, and Program Logistics

In the inaugural year, ten fellowships in amounts of $3000-$5000 were sponsored privately by members of the Global Center for Social Entrepreneurship Board of Stakeholders (Advisory Board). These sponsors preside over family foundations, a form of foundation whereby one family contributes all endowment funds and must distribute 5% of the initial endowment annually to 501.C3 organizations. Funds provided by these foundations were used principally for airfare, in-country transportation, and any lodging not provided by the host organizations. Organizations that accepted student interns provided varying levels of in-kind support such as lodging, some meals, and in-country transportation to and from the airport. Each student had a mentor or supervisor who was available to the extent schedules and assignments allowed.

Based on positive feedback from fellows and host organizations and on the positive public attention focused on the program, the number of fellowships was increased from 10 to 15 in the second year. Ten fellowships were sponsored by private donations, and five were supported by the Office of the Provost. Given the broad appeal of the Ambassador Corps Fellowship Program, the center has since received commitments from several Academic Deans, including the Dean of Engineering and Computer Science, to support at least one student from their academic unit in AY 2010-11. In previous years, students were not required to contribute funds
Towards their internship other than covering personal expenses, but beginning AY 2010-11, each fellow will be expected to pay $300 towards the experience. While not self-sustaining, these funds can help offset some program costs and demonstrate commitment on the part of the student to following through with the internship.

Prior to their departure, the cadre of fellowship recipients participated in an intensive multi-day cross-cultural training program organized by the Global Center and taught by faculty and staff with expertise in international relations, culture, and anthropology. The training program was modeled after an existing cross-cultural training course required for students participating in the university’s Study Abroad program. Topics ranged from logistical issues, e.g., passports and immunizations, to cultural issues including American values and assumptions, cross-cultural communication, cross-cultural adjustment and problems, cultural norms and gender roles. In addition, the Global Center Director and a former Ambassador Corps intern conduct a role-playing segment that simulates the real life experiences of working for a non-governmental organization in a developing country.

While abroad, students maintained contact with the Global Center staff, reported on their experiences using online blogs and email, and addressed any logistical issues or concerns with the Global Center staff. Engineering faculty maintained periodic email contact with the students. Upon their return, each fellow submitted a final report to the Global Center and to the Dean of their respective academic units. In most cases, the Deans met with students to learn of their experiences, which likely enhanced the Deans’ willingness to support the program in AY 2010-11. Returning fellows also submitted a report to the host organization and attended a debriefing retreat hosted by Global Center staff. One area for improvement identified at the retreat was the need for additional support upon the students’ return in light of their adjustment back to life in the U.S. and the academic environment.

Learning Objectives and Assessment

Engineering students who received fellowships were also asked to submit a report on their internship that included a description of their tasks and overall experience, analysis of what made the organization entrepreneurial, and an evaluation of how the student’s decision to pursue engineering was affected by their experience. The following set of learning objectives was distributed to the students prior to their departure and each was asked to specifically address the learning objectives in their report:

- Explain the role of culture, interpersonal communication, and other professional skills in working in the non-profit/social entrepreneurship sector
- Explain how your knowledge, skills and attitudes helped or hindered you in your assignment
- Explain how you adapted (if you did) and what the outcomes were, what facilitated that adaptation, and what you could have or should have done differently.
- Explain the application of engineering and other principles towards solution of critical societal issues related to your specific experience (e.g., water, sanitation, housing, wildlife conservation)
Explain the role of academic preparation and engineering studies in preparing students (you) for work in the non-profit/social entrepreneurship sector.

- Propose areas for improvement in your academic (technical and non-technical) and professional preparation that relate to your fellowship experience.
- Propose practices and processes (appropriate to University of the Pacific) that can facilitate transitions, training, and recruiting of students for global experience.

These learning objectives correspond to several levels of Bloom’s taxonomy for the cognitive domain, requiring reflection, analysis, and drawing of conclusions based on information synthesized from the student’s overall experience. A rubric, shown in Table 1, was developed to assess the level of achievement of these objectives within the context of the program, as documented in the students’ reports. However, because the rubric was developed after the reports were written and the sample size was small - 3 students - it was not as useful an assessment tool as anticipated on this first application. Proposed changes for AY 2010-11 are to meet with students before they leave for the internships, to explain the learning objectives and rubric, and to have students maintain logs of their activities to facilitate documentation and assessment of the program upon their return.

**Engineering Internships in Social Entrepreneurship**

During Summer 2010, two undergraduate engineering students and one graduate student from the University of the Pacific held internships working for social entrepreneurship organizations in developing countries. Civil Engineering undergraduate Andria Ellis worked with SPARC in Bangalore, India, an organization focused on issues of poverty, sustainable housing, and urban infrastructure. Kristina Hammarstrom, an Engineering Management undergraduate student, spent eight weeks with Cheetah Conservation Fund (CCF), a wildlife conservation organization in Namibia. Feliciano Leon, a Civil Engineering graduate student, addressed issues related to meeting community water needs while working with AVINA in Bolivia.

**SPARC, Bangalore, India**

Andria Ellis is pursuing an undergraduate degree in Civil Engineering with a minor in Geology. She worked with SPARC, a social entrepreneurship organization whose functions are managing microfinance operations, conducting slum boundary surveys and mapping and organizing infrastructure projects in underserved communities. SPARC also facilitates financial savings to create financially-independent households. Ellis’ responsibilities included designing a global positioning system (GPS) mapping program/procedure, collecting biometric data from slum dwellers, and administering surveys to gather data about the needs and housing/sanitary conditions in various slums. Slums are not well-documented in India. To be recognized as a legitimate community by the government and to consequently receive public services such as roads or sewer lines, the slum population statistics must be documented and identified on a map. Ellis developed a mapping and documentation method that was simple enough for an uneducated, young girl - the typical person who would collect and input data - to complete the process, but sophisticated enough to be useful for processing and presentation to government agencies.
The table below illustrates the assessment rubric for the Ambassador Corps Fellowship Program:

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Exemplary</th>
<th>Accomplished</th>
<th>Developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Role of professional skills in non-profit sector</td>
<td>Role of professional skills explained clearly. Several relevant details and/or examples given.</td>
<td>Role of professional skills explained. 1-2 relevant details and/or examples given.</td>
<td>Role of professional skills explained briefly. No relevant details and/or examples given.</td>
</tr>
<tr>
<td>Role of knowledge, skills, attitudes</td>
<td>Role of knowledge, skills, attitudes explained clearly. Several relevant details and/or examples given.</td>
<td>Role of knowledge, skills, attitudes explained. 1-2 relevant details and/or examples given.</td>
<td>Role of knowledge, skills, attitudes explained briefly. No relevant details and/or examples given.</td>
</tr>
<tr>
<td>Role of adaptation</td>
<td>Clearly explains role of adaptation, reflected on experience. Several relevant details and/or examples given.</td>
<td>Explains role of adaptation, reflected on experience. A few relevant details and/or examples given.</td>
<td>Explains role of adaptation, no reflection on experience. No details and/or examples given.</td>
</tr>
<tr>
<td>Role of engineering in societal context</td>
<td>Clearly explains role of engineering as it relates to the experience. Several relevant details and/or examples given.</td>
<td>Explains role of engineering, briefly relates to the experience. A few relevant details and/or examples given.</td>
<td>Explains role of engineering, not related to the experience. No details and/or examples are given.</td>
</tr>
<tr>
<td>Usefulness of academic preparation</td>
<td>Clearly explains role of preparation, reflected on role as it relates to the non-profit sector. Several relevant details and/or examples given.</td>
<td>Explains role of preparation, briefly relates to the non-profit sector. A few relevant details and/or examples given.</td>
<td>Explains role of preparation, does not relate to the non-profit sector. No details and/or examples are given.</td>
</tr>
<tr>
<td>Areas for improvement in academic preparation</td>
<td>Specific areas for improvement identified, several supporting examples given.</td>
<td>General areas for improvement identified, a few supporting examples given.</td>
<td>General areas for improvement identified, no supporting examples given.</td>
</tr>
<tr>
<td>Areas for improvement in training, transitions</td>
<td>Specific areas for improvement identified, several supporting examples given.</td>
<td>General areas for improvement identified, a few supporting examples given.</td>
<td>General areas for improvement identified, no supporting examples given.</td>
</tr>
<tr>
<td>Quality of written report - mechanics</td>
<td>No grammatical, spelling or punctuation errors.</td>
<td>Almost no grammatical, spelling or punctuation errors.</td>
<td>A few grammatical spelling, or punctuation errors.</td>
</tr>
<tr>
<td>Quality of written report - organization and structure</td>
<td>All paragraphs include introductory sentence, explanations or details, and concluding sentence. Complex and varied sentence structure used.</td>
<td>Most paragraphs include introductory sentence, explanations or details, and concluding sentence.</td>
<td>Paragraphs included related information but were typically not constructed well.</td>
</tr>
</tbody>
</table>

Table 1: Assessment Rubric for Ambassador Corps Fellowship Program

Ellis learned the existing methods used, designed a simpler and less expensive scheme that achieved similarly functional results, and used her knowledge of GPS devices to select an inexpensive model for collecting waypoints. She worked with a team of computer scientists from a consulting company to develop a method for plotting slum boundaries on an internet-based map and incorporating biometric data on slum households. Working with the computer scientists, Ellis used Visual Basic to merge the SPARC biometric database and other existing information into a map generated using Google Maps. As a result, SPARC could visually portray the boundaries of documented slums, zoom in to display data and population statistics for a slum community, and not have to pay for expensive consulting services. As part of her assignment, Ellis also visited slums to collect biometric data and prepared data for state and national information centers for urban poor development so each family could receive a nationally-accepted identification card – again, a required first step to government recognition of individuals and communities.
Kristina Hammarstrom, a senior pursuing an Engineering Management degree, worked at Cheetah Conservation Fund (CCF), an organization focused on the conservation of wildlife and their ecosystems. CCF works with stakeholders within the local ecosystem to develop research, educational, and land use management practices that benefit and preserve wildlife and help the people sharing that ecosystem. CCF has developed many business ventures intended to help the organization become economically self-sufficient, although some of the ventures are more mature and economically viable than others.

Hammarstrom’s duties included tourism data analysis and goat cheese business planning. Hammarstrom conducted market research for the goat cheese production project, implemented a system for data entry, and, based on her analysis of the data, found that the venture was not economically sustainable under existing conditions. Hammarstrom participated in cheetah care and analyzed the production methods for ‘bushblok’, a fuel log produced from an invasive thorn bush that poses a threat to wildlife. She proposed processes to improve efficiency and productivity for bushblok production by observing existing practices, identifying problems, and designing and testing alternative solutions to reduce malfunctions of the process equipment. Through her observations and interviews with machine operators, she developed and proposed changes in operations to reduce energy usage and waste.

Feliciano Leon, a first-year graduate student in Civil Engineering, worked with AVINA, an organization focused on sustainable development in Latin America by encouraging productive alliances among social and business leaders and by brokering consensus around agendas for action. Leon’s responsibilities within the organization included working with members of local community water organizations to strengthen their public services and increase their social impact. His specific duties included planning and coordinating an international conference that served as a major platform for examining community water management models, developing alliances, and creating regional partnerships among neighboring community water organizations. Leon also travelled to and interviewed leaders at three of the major water organizations in the region - key players and ultimately the driving force behind formation of associations among 36 independent community-based entities. The goals of the interviews were to identify opportunities for collaboration and capacity-building in areas such as engineering, management, and financial administration within each organization, and to identify legal and political issues.

Assessment of the Ambassador Corps Fellowship Experience

Through their experiences, all three students developed a broader understanding of engineering as they identified or defined problems, gathered data, analyzed information, developed solutions, and, when possible, applied their skills to solve types of problems with which they were quite unfamiliar. Interpersonal communication, both verbal and non-verbal, was cited as the most important skill used. Interpersonal communication was also cited as the skill most enhanced as a result of the experience - likely due to the fact that each student was required to communicate in a new environment, addressing language barriers and different cultural practices. Each student
worked on open-ended problems, often with little or no direct supervision, so each had to take initiative, gather information, and apply their knowledge and skills in culturally-sensitive ways.

Students identified professional preparation and preparation for applying engineering skills in different environments as areas in need of improvement. The students noted that their academic background had not prepared them sufficiently to work in the non-profit sector specifically, although two of the three students had prior work experience in the public sector through engineering internships. Another area for improvement identified was the ability and creativity required to solve problems when resources are scarce or when different types of resources are used. One student suggested that an elective or project-based course focused on engineering in the context of social entrepreneurship or in developing countries would have better prepared them for the experience.

Upon their immediate return, the fellows had expressed some concern about not accomplishing as much as they had hoped or had not applied ‘engineering skills’ as they had expected. However, by using the learning objectives as a basis for the self-assessment exercise, the students were able to reflect on their experiences in a broader context, identifying relevant technical and professional skills that they did apply and those skills they developed while working with their respective organizations.

**Strategic Partnerships: Collaborating With Other Units Within a University**

The Ambassador Corps Fellowship program and its role in engineering education demonstrate two key principles that can be applied at other institutions, namely, formation of strategic partnerships with other university entities and identification of funding sources.

In the partnership between the School of Engineering and Computer Science and the Global Center at the University of the Pacific, the Global Center provides administrative support, logistical support and opportunities to network with social entrepreneurship organizations abroad. The SOECS provides students with skills that are eagerly sought-after by social entrepreneurship organizations. SOECS faculty provide expertise, planning assistance, and review of the program by engineering faculty. While not all institutions have such a center nor can form such a center, engineering programs can collaborate with other academic units to provide similar experiences. This may require looking beyond the obvious or typical circle of engineering collaborations (e.g., math, physics or other engineering programs) to partner with programs such as business, international studies, and study abroad. These groups can help identify partner organizations to host students, provide logistical support for the students travelling abroad - functions that engineering may not have the capability or capacity to support. In doing so, a successful collaboration will require flexibility on the part of all involved to identify how the partnership can benefit each group and a willingness to learn from and teach one another.

In funding such an enterprise, numerous internal and external options exist. Family foundations support and fund social entrepreneurship in developing regions; connecting with these organizations provides sustainable support for a base number of fellowships. These connections through the Board of Stakeholders ensured the initial funding of 10 fellowships. Beyond that,
additional funding was sought from internal University entities such as the Office of the Provost and Dean of the School of Engineering and Computer Science (who has sponsored a fellowship for an engineering and computer science student). As the students’ education is enhanced by participation in such programs, a case can be made to academic units for financial support. Finally, competitive grants are offered through organizations such as the National Collegiate Inventors and Innovators Alliance (NCIIA) to start or expand such programs; applying to these is a current strategy to expand the existing program.

Conclusions

Schools of engineering recognize student interest in service-focused work, the interest of some students in going abroad, and of the need to provide students with a broad-based education transcending traditional engineering subject areas. Service learning programs are a natural means of satisfying ABET requirements and meeting student interest. However, initiatives outside the mainstream are sometimes stymied by a lack of resources or are dependent on the energy of an individual faculty member for long-term sustainability. These factors at best jeopardize, but often become insurmountable barriers to, the viability of service-focused programs in engineering.

Collaboration between engineering programs and other academic units can provide a means by which engineering students can systematically participate in service-based or international internship programs. Partnerships such as that described in this paper establish engineering internship opportunities that otherwise would not exist. Success depends on the willingness of the partners to flexibly accommodate, and appreciate, each other’s needs. Furthermore, each partner must contribute to the success of the collaboration. In the case described herein, the Director of the Global Center for Social Entrepreneurship has a strategic objective to broaden his center’s student base outside traditional boundaries. Engineering participation in the summer fellowship program expands the center’s student base and enhances the transition to a true multidisciplinary center. The Global Center, on its part, adapted the Ambassador Corps Fellowship Program to meet the specific needs of engineering students (e.g., accepted learning objectives established specifically for engineering fellows). From the perspective of the School of Engineering and Computer Science, collaboration with the Global Center for Social Entrepreneurship provides the infrastructure and administrative needs (e.g., placement services, procedures, staff, training, student monitoring) for a type of service-focused internship experience that cannot be supported by existing resources within the school. Such programs may not be practicable for or attractive to all students, but, for those students who are interested in such opportunities, these partnerships can pave the way for non-traditional and highly enriching experiences for all involved.

Acknowledgements

The authors gratefully acknowledge the Cordes and Peery Foundations for their generous support of the Ambassador Corps Fellowship program.
Bibliography