Impact of International Collaboration on the Learning Environment

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Abstract
In this paper, the impact of scholarly and pedagogical exchanges in Denmark-Norway-Sweden, Egypt-Jordan, and India are presented. Direct measures including student exit interviews, indirect student measures as well as anecdotal evidence and assessment data such as employer surveys clearly show that the study-abroad experience is significant to all stakeholders. Employers get quality employees with the cultural awareness and the needed understanding of the global dimensions of their future profession. The impacts of administrative, time management, and policy decisions on the study abroad program are also discussed. Sabbatical experience and its impact on faculty and student development are presented.

Keywords: Internationalization, Study-Abroad, Global Explorer Program, Sabbatical Exchange

1.0 Introduction and Background
The Engineering Accreditation Commission (EAC) places a high value on the international study experience – in fact it is part of the eleven outcomes that accredited civil engineering programs are expected to integrate into their curricula. As early as 1995, well before the Accreditation Board for Engineering and Technology (ABET) established these eleven criteria, the Department of Civil Engineering and Construction (CEC) at Bradley University recognized the significance of the international experience on the growth and development of young engineers and construction professionals. With the dawn of the Internet age, it became increasingly clear that some international experience was necessary for our graduates to be successful in a rapidly changing multicultural world.

Input from students, employers, alumni, and other program constituents were gathered through surveys and anecdotal evidence. Following a logical process described elsewhere\textsuperscript{1}, Global Explorer Program (GEP) parameters were established. Interestingly, not all employers were on board with the idea of the GEP in a rapidly changing multicultural world. However, when the same potential employers interviewed students with GEP experience, their views changed radically. For example, these employers were reluctant to support the GEP program initially but soon became the most ardent supporters of the program. CEC’s industry partners contribute towards GEP student scholarships, which enables financially disadvantaged students to take advantage of this opportunity.

2.0 Mechanisms for International Exchange of Scholarship
Three mechanisms for international exchange of scholarship discussed in this paper are the GEP, semester-length study abroad, and faculty sabbaticals. Through these mechanisms, students and faculty, including some faculty who had never traveled abroad, benefited from the exposure to new cultures and experiences. Participating faculty became more effective in their classrooms in presenting ideas, concepts, and contributions from various cultures across the world. For example, it is sometimes incorrectly assumed that Western practices relating to sustainability are superior; in fact, the creative use of water such as rainwater harvesting and recycling of wastewater is an example of how we can learn from developing nations. When discussions on such topics are initiated in the classroom, students become more engaged and better informed and the teaching becomes more effective. In time, this global view of civil engineering and
construction permeated the program and students and faculty who did not travel abroad also benefited from exchange of ideas with their colleagues who had learned and taught abroad. Discussions in forums like open faculty meetings disseminate this knowledge to faculty who had not yet traveled abroad. Even students who did not actually travel abroad benefited from the study-abroad experience because they now had faculty bring those experiences to them in the classroom setting at Bradley University.

3.0 The Global Explorer Program
The first winter interim GEP was offered in January 1996 in London, UK\(^1\). To the authors’ knowledge, this was the first program in the U.S. designed for the 2-3 week January interim. The program was ideally suited to students in civil engineering and construction because many preferred to intern with our industry partners during the summer. In this paper, two GEP experiences are presented: one in Scandinavia and one in Egypt-Jordan. The authors agree with Mintz et al.\(^2\) who noted that participatory and active learning experiences were the most significant learning experiences in a study to educate engineers in addressing global societal problems. In fact, participatory and active learning experiences have been emphasized in the GEP since its inception.

3.1 The Scandinavian Experience
Before the first GEP to Scandinavia, pre-planning trips were undertaken to make appropriate contacts with Copenhagen University and Danish Institute for Study Abroad (DIS) and to lay the groundwork for delivery of the course and cultural experience. Issues of safety were paramount and access to health facilities was a priority. The Bradley group flew into Copenhagen, Denmark from Chicago. After getting established at the Kollegium (dormitory), the group began classes at the DIS campus in downtown Copenhagen. Sites visited included Denmark (Rosenborg castle, National Museum, Glyptotek, Carlsberg, Marble Church, Roskilde, DTU, Nyhavn), Sweden (Malmo, Viking Museum), and Norway (Oslo square, Winter Olympics site, Sculpture Garden, Nobel Institute). Figure 1 is a map of the locations visited in three countries in this GEP program. Figure 4 shows GEP students on a visit to the Danish seaside.

The trip from Copenhagen to Oslo was taken by ship (overnight) and allowed the students to experience a cruise-ship type atmosphere and the rare sights and sounds of the Scandinavian seas and coasts in the early dawn. Each student was required to submit a paper after returning from the GEP trip. Nearly all students noted that they were deeply impacted by the overall GEP experience and that they developed a closer relationship with faculty, having observed them in settings not commonly encountered at Bradley University. Office hours were around-the-clock and the students learned a lot about themselves and their peers in this setting. Students adapted well to taking an upper level design class under these circumstances.

3.2 The Egypt-Jordan Experience
Through the global network developed by the author, the GEP was expanded to other countries including Egypt and Jordan in 2002. The co-author (Dr. Maillacheruvu) notes that the Egypt-Jordan GEP was one of the most intense experiences with which he has been associated. Students and faculty learned the intricacies of time management while operating in a new cultural environment. The 42-person group flew into Amman, Jordan from Chicago. The group
visited ancient historical sites and beaches in Jordan including Petra, Dead Sea, Gulf of Aqaba, Jerash, Wadi Rum (Valley of the Romans), Jesus’ Baptism Site, and several sites in Amman. In Egypt, the large contingent from Bradley University visited the Great Pyramids, Alexandria (several sites including the Library and Fort), Luxor (Karnak temple, several pyramids), Coptic Church, Cairo (oldest mosque, oldest church, and oldest synagogue and several modern and historical sites). The Bradley contingent stayed at five-star hotels in Amman (Jordan), on the Nile in Luxor (Egypt) and at the American University of Cairo dormitories. All this was accomplished with four separate courses being taught concurrently: Nonwestern History, Construction Safety, Water Supply and Hydraulic Engineering, and Company Project Management. Students were exposed to the same topics and for the same length of time as on the Bradley campus. Classes were held at partnering universities in Jordan and Egypt, and occasionally in hotel conference rooms.

The course on Company Project management was a huge success, with exceptionally high-level speakers including Ministers from Egypt and Iraq, and the Advisor to the King of Jordan, top management from Arab Contractors League and other prominent individuals. It is easy to see how a student is impacted when he/she hears directly from the person making policies that affect an entire country or organizations so large that they affect an entire region of the world. In exposing Bradley students to these experiences, the author has enriched their cultural and professional knowledge and directly addressed at least three program outcomes (understanding of professional and ethical responsibility, broad education in a global context, and contemporary issues) listed in ABET’s Criterion 3.

3.3 Impact of Administrative Practices on the GEP
The importance of pre-planning trips cannot be overemphasized. Through strategic pre-planning trips taken months before the Bradley contingent arrived on Jordanian soil, the CEC Department was able to successfully complete a very high-quality GEP program, with the large number of activities and locations visited in a 3-week span in multiple cities and locations in two different countries, well under budget! Based on the knowledge of the authors’ knowledge, the GEP offers a significantly richer cultural immersion experience along with a challenging academic program compared to any other similar study-abroad program in the country.

Students are required to submit a paper documenting their experiences as part of any GEP course; the most consistent student remark in these direct measures was that the GEP was a life-changing experience. Other direct measure tools such as assessment data from student exit interviews also consistently rated the GEP as one of the top experiences in their undergraduate studies through 2012. Indirect measures like alumni assessment also indicated the same. Indirect assessment measures such as assessment forms from employers also indicate the success of the GEP and the willingness of a growing number of employers to fund the GEP scholarship program. These generous GEP scholarships from CEC’s industry partners make it possible for most students to negotiate financial deficiencies and take part in a life-changing experience.

4.0 Sabbatical Experience
4.1 India
A six-month sabbatical at the Indian Institute of Technology, Bombay (IITB) in spring 2011 provided an in-depth look at the delivery of courses at the graduate and undergraduate level at
arguably the best engineering school in India. The sabbatical experience also included visits to several industries and industry association meetings in rapidly developing India and the emerging challenges relating to sustainability and the environment. Further, the sabbatical experience included organization and delivery of high-level workshops to high-level decision makers from state pollution control boards (similar to state EPA agencies) on the topic of hazardous waste management. Finally, exchanges with Planning Commission representatives and ministers provided a glimpse of the priorities in a rapidly developing Indian economy. Meetings with U.S. Department of Energy representatives also revealed complexities in the interaction between Indian and U.S. Governmental agencies. Figure 2 is a map of the locations visited in India as part of the sabbatical program. The Gateway of India is shown in Figure 3.

4.1.1 Experience with students
The cultural differences and the expectations in Indian classrooms are very different from those in the U.S. For example, the first time the co-author (Maillacheruvu) walked into a classroom of an upper-level graduate course consisting of M.S. and Ph.D. students, students got up and remained standing until they were asked to sit; this is in stark contrast to expected behavior at most U.S. universities where students would not be expected to get up (or remain standing) when a faculty enters the room. Most graduate students worked on funded projects, including consulting-type projects, which prepared them to deal with the practical problems in engineering and science. Communication skills varied widely among the students, similar to what one would expect in the US.

Undergraduate students were generally of high caliber - fewer than 2% of applicants at IITs are admitted. Discussions with groups of undergraduates were typically more animated than with graduate students and a generally freer exchange of ideas took place. Undergraduates were curious about the college life and culture in the U.S., and many had relatives or friends who were studying at U.S. universities. Graduate students were more reticent in this respect, although some showed an interest in pursuing doctoral studies and post-doctoral work in the US.

4.1.3 Scholarly activities
The co-author worked with graduate students on several research projects. In general, the analytical capability of students was exceptionally good and they were resourceful solving difficult engineering-research problems. For example, adverse health effects of hazardous air pollutants on workers in the Indian ship-breaking industry are difficult to quantify, assess and analyze; students considered many options and ultimately developed new field and analytical techniques to solve such complex problems. However, many needed guidance in technical writing and in presentation, not unlike what is encountered at U.S. universities. Several writing projects were initiated with IITB faculty and a close working relationship has developed between faculty from the two universities. Asolekar et al.,³ represents one of the outcomes from the sabbatical experience, where the mechanisms of balancing societal priorities with technology in rapidly developing India are discussed. The publication explores sustainability innovations in the Indian context, some of which can be effectively applied to solve environmental and economic problems anywhere, including in the West. Scholarly collaborations on various topics relating to sustainability and environmental engineering practices in India and the US, are in progress.

4.1.4 Workshops on Hazardous Waste Management
Interaction with members of the Planning Commission and the top-level decision-makers in the Central Pollution Control Board (CPCB - equivalent to the US Environmental Protection Agency), as well as several officers in the Indian Administrative Service (IAS) enriched the sabbatical experience in India. Hazardous waste management in India is still a developing field and a workshop for practitioners and regulators from the Andhra Pradesh Pollution Control Board was conducted to discuss state-of-the-art in technology and regulatory practices. This was a unique opportunity to learn about Indian laws and regulations pertaining to environmental management and sustainability practices. The workshop was a resounding success and the CPCB invited the IITB team including the co-author to hold a second workshop a few weeks after the conclusion of the first one. The co-author was also invited to make presentations to high-level decision makers in the Indian government. Following these two workshops, both of which were immensely successful, based on feedback collected through assessment instruments in India,
additional workshops have been modeled along these lines. In due time, the co-author will interact further with the IITB team on these and other ventures. A direct outcome of the workshops was the development of material for a book on hazardous waste management.

4.1.5 Interaction with Industries
The co-author and key faculty from IITB interacted closely with industry representatives in various fields, including the water/pipe-manufacturing industry, metal-processing industry, chemical manufacturing industry, cement industry, and others to assess/analyze problems as well as find sustainable solutions for industry-specific problems using pollution prevention strategies. A number of field visits were undertaken to industries and wastewater treatment plants in the state of Maharashtra and for a lake rejuvenation project being guided by the IITB team in Jaipur, Rajasthan. The co-author had an opportunity to work with scientists from Sweden, who have a long-standing relationship with the IITB team, on hazardous waste management in the ship building industry. The co-author (Maillacheruvu) was part of the team, which developed some innovative statistical measures to quantify health impacts to workers in this industry in India and around the world. These interactions have helped develop a broader and deeper perspective of the issues and have opened new horizons where meaningful contributions can be made. The co-author (Maillacheruvu) had an opportunity to observe Caterpillar equipment alongside the other major manufacturers from around the world at one of the largest trade shows in the world in Mumbai, India. This experience also gave the co-author a perspective about the U.S. industry and the quality of the products it generates compared with industries from the rest of the world. This has enriched the educational experience in the co-author’s classroom because the discussion is based on actual experiences of the co-author (Maillacheruvu) rather than simply citing or discussing something from a textbook or reference.

4.1.5 Exchanges with Governmental Representatives
The co-author had an opportunity to serve on academic delegations with colleagues from IITB in meetings with the US department of Energy as well as with delegations from other countries such as China. These exchanges, centering on technology and policy, gave the co-author an understanding of how US policy is perceived internationally - particularly policies relating to energy, sustainability and the environment. This experience has enriched the co-author’s understanding of global issues and the complex dynamics of intergovernmental negotiations. When such experiences are brought into a classroom and in scholarly publications like books, both students and the larger society benefit as well.

4.2 United Kingdom
In spring 2009, a faculty member from the UK was invited to Bradley University to immerse herself in the Bradley experience. This faculty sabbatical became a reality based on a long-term relationship developed by the author through the 2004 and 2006 International Conference on Construction Innovations (ICIC), which are presented elsewhere.

4.2.1 Immersion in the teaching experience at Bradley University
The faculty from UK brought a unique perspective with her academic background in the Built Environment and expertise in sustainability. Students were exposed to developments in the field in Europe, with case studies including the London Olympics construction and planning operations. Team-teaching by UK and US faculty considerably enriched the classroom.
experience for students and provided many useful lessons for the faculty involved. Pedagogical exchanges on the techniques of course administration were useful in understanding cultural differences in attitudes of students in the UK and at Bradley University. The perspectives of the faculty from UK was also interesting - for example grading practices are different in the UK and US and a student grade expectations appear to be generally higher in the US.

4.2.2 Scholarly Exchanges
Substantial scholarly work was accomplished in the course of this sabbatical. Joint proposals were written during this period by the author and other faculty at Bradley University in collaboration with the faculty from the UK. A study of teaching innovations using mobile learning technologies is presented in Suresh and Al-Khafaji\textsuperscript{5}. Research on the pace of change in the construction industry, also initiated during this sabbatical, is presented in Suresh et al.\textsuperscript{6} The author has long recognized that real innovation takes place in the interface between fields of knowledge and expertise. Through these collaborative scholarly exchanges, particularly in interface areas, significant advances in the state-of-the-art are possible.

5.0 Changing Cultural Landscape in U.S. Universities
The work presented in this paper is useful to understanding how internationalization is rapidly changing the cultural landscape of universities in the U.S. The past decade has seen an increasing number of students enrolled at the undergraduate level, as students from across the world seek high-quality education in the U.S. universities are still adapting to this new cultural paradigm.

The GEP program offers some important insights. It is one thing to talk about cultural differences and religious differences between societies but quite another to actually experience them. Students and faculty have benefited from these experiences and better understand the social and cultural dimension of the internationalization experience. It is critical to understand how industry practices and norms impact business deals and how one can effectively deal with widely different expectations in Scandinavia, Egypt, Jordan, and India. In short, there is no substitute for the experience through GEP and sabbatical experiences. The CEC Department now has students all around the world and our alliances keep building.

These experiences are important in understanding the challenges and opportunities of interacting with young undergraduates from other countries who continue to populate our classrooms in the United States. Cultural sensitivity and a two-way learning process are important for this partnership to be successful. Many of these students will likely be leaders in their own countries when they return. Therefore, it is imperative that a deeper conversation about the changing landscape in American classrooms and those abroad be initiated and nurtured with these future leaders.

Kilgore\textsuperscript{7} (2013) notes that 22 countries other than the US now have programs that are being accredited by ABET. The co-author (Maillacheruvu) visited Vellore Institute of Technology and learned about some of the challenges in implementing ABET criteria in a different cultural setting. As the role of ABET increases in engineering education, cultural exchanges between US universities and those around the world have the potential to become seamless and make it easier, from an academic standpoint, for international exchange of students and faculty. Lessons learned from GEP are likely to facilitate this transition.
Summary and Conclusion
The intent of this paper was to provide insight on the impact of international collaboration on the learning environment. Through the experiences documented in this paper, it is apparent that the learning environment was profoundly impacted through the CEC Department’s Global Explorer Program and the sabbatical exchanges. International exchanges and cultural experiences are not new but the mechanism of delivery through the GEP is unique. The impact was significant on the students, participating faculty. Even the students who did not formally go on a GEP visit were impacted because the participating faculty brought back and shared experiences that enriched the learning environment in their classes. The sabbatical exchange is a strong mechanism for scholarly exchanges that continue and expand the horizons of participating faculty and other faculty who work with them.

Many companies associated with CEC Department’s international conferences have been successful in securing major contracts abroad and benefiting both partners and nations. Collaborative scholarly partnerships have also developed through these conferences and paid significant dividends in scholarship. For example, the Chairman and CEO of Caterpillar Inc. and the author have co-authored a book on sustainability.

The internationalization program in the CEC Department at Bradley University has been instrumental in building bridges with universities across the globe. For example, in the UK the CEC Department has built ties with University of Salford, Loughborough University, Wolverhampton, and the University of London. Similarly in Jordan, Amman University and the Jordanian University of Science & Technology partners. In Denmark, the CEC Department has worked with DIS and DTU. In Egypt, the CEC Department has connected with several universities including Cairo University, Zagazig University, and the American University of Cairo. In India, ties have been built with IIT Bombay, IIT Madras, Vellore Institute of Technology (the only ABET accredited civil engineering program in India), and several other universities.

The future looks very bright for the internationalization program in CEC. Currently, efforts are underway to develop the GEP to United Arab Emirates, India, China, and South America. The reach of CEC’s Global Explorer Program is expanding internationally. CEC’s industry partners are overwhelmingly in favor of the department’s initiative and are firmly behind the GEP program. Our well-wishers and supporters include as the current Prime Minister of Egypt, Advisor to the King of Jordan, and the current Prime Minister of Jordan. Sabbatical exchanges are also being planned, including Fulbright opportunities, to various universities and countries around the world. It is important to recognize that each country and each international cultural exchange brings with it many opportunities. When we keep an open mind and are able to accept that we can learn valuable lessons from our partners, in addition to sharing our expertise with them, we create a win-win situation for everyone.

References


