

AC 2007-1449: LESSONS LEARNED: OUR FIRST ENGINEERING STUDY ABROAD PROGRAM

Carol Gattis, University of Arkansas

Carol S. Gattis, Ph.D. is an associate professor of Industrial Engineering at the University of Arkansas. She also directs and develops new programs for the college-wide study abroad efforts in addition to her duties as director of recruitment, retention and diversity.

Findlay Edwards, University of Arkansas

Findlay Edwards, Ph.D., P.E. is an associate professor at the University of Arkansas conducting research in the areas of stormwater treatment, electrolytic treatment of waters, and ballasted flocculation. He has taught environmental engineering classes for ten years at the University of Arkansas and New Mexico State University.

Lessons Learned: Our First Engineering Study Abroad Program in India

Abstract

The outsourcing of engineering work overseas is dramatically increasing, especially to India. U.S. universities are also experiencing large increases in graduate students from India. Many engineering graduates will eventually manage, work with, or work for people in/from India.

The University of Arkansas, College of Engineering created the Engineering Study Abroad in India Program beginning summer 2006. The program's purpose is to introduce UofA students to Indian culture and history while studying engineering, to build connections with undergraduate and graduate engineering programs in India, and to bring awareness of the UofA engineering program to Indian students and faculty. Few India study abroad programs exist, and those that do tend to focus on only the student experience. Our program also focuses on building relationships with Indian universities, students and faculty.

Creation of the program entailed: 1) determining program goals and budget, 2) creating the administrative framework for this unique program, 3) locating an appropriate engineering college in India to host the students and faculty, 4) selecting the UofA faculty member/courses to be taught, 5) selecting and preparing the students, and 6) working out the program details.

Lessons learned during this first program year include how to deal with: 1) administrative problems associated with setting up courses taught off campus, 2) foreign expenses, 3) locating a university with appropriate credentials/facilities, 4) student selection, 5) living conditions in a developing country, 6) student culture shock and safety requirements, and 7) extracurricular activities.

The final phase of the program included an evaluation which was used to guide future program improvements. Methods of evaluation included: 1) student journals, 2) faculty debriefings, 3) student debriefings, and 4) program successes documentation. The areas that have been targeted for improvement include: 1) expanded pre-departure student awareness, 2) more explicit specifications of what is expected from the host institution, 3) and better coordination of extra-curricular activities with classes.

We feel the first year of the program was a success and provided many valuable lessons for the future of the UofA Engineering Study Abroad in India Program.

Introduction

The outsourcing of engineering work overseas is dramatically increasing, especially to India. Many U.S. based corporations are creating large research centers in India due to the large talent pool and low costs. This changing nature of the world economy makes it essential to provide our students with the cross-cultural tools to become successful professionals in the global workplace. Many of our engineering graduates will eventually manage, work with, or work for people in/from India, so it makes sense to give students an opportunity to live and learn within the

Indian culture. At this point in time, few study abroad programs in India exist; India was the destination for only 0.9% of U.S. students who studied abroad in 2004-2005.¹

Faculty led study abroad programs benefit both the student and the faculty. U.S. faculty can build bridges of research and education with their peers at Indian universities.² Professors can make connections while in India to begin joint research, create a pipeline for quality graduate students, share educational methods, and be better able to understand their Indian students' culture. In fact, India is the leading source of international students coming to the U.S., comprising 13.5% of the world total, with engineering as the second most popular major.¹

Engineering Study Abroad Programs

Study abroad courses in the humanities and social sciences abound, available through many U.S. universities and study abroad consortiums such as University Studies Abroad Consortium (USAC) and International Student Exchange Program (ISEP). Few humanities and social science courses are required in an engineering degree program, so engineering study abroad opportunities need to be expanded. Concern over course transferability from an institution abroad to an ABET accredited program is warranted. Although ABET does not accredit programs outside the U.S., they do recognize substantial equivalency programs and mutual recognition agreements^{3,4}. Courses under these program umbrellas are likely transferable to ABET accredited institutions.

The number of U.S. engineering students studying abroad has remained flat in recent years, even though the total number of U.S. students studying abroad has doubled over the past eight years.¹ Only 2.9% of students who studied abroad in 2004-2005 were engineering students, compared to 22.6% in Social Sciences and 17.5% in Business & Management.¹ Much of this is due to the perception that engineering students will get "off track" and significantly delay graduation if they study abroad.

There are several choices for engineering courses taught in English language in Europe and Australia, such as Georgia Tech's Lorraine program in France and the University of Newcastle in Australia. Only a few options exist for an engineering study abroad in India, such as the one by Purdue University, however many universities are considering creating study abroad programs in India due to its importance on the global scene. The U.S. Department of Education considers the expansion of study abroad opportunities in some areas of Asia, such as India, so important that Title VI funds are available.⁵ At the University of Arkansas College of Engineering, we wanted to give our students and professors the opportunity to experience India through an engineering academic program.

Developing the Program

Building a new study abroad program in a country with a very different culture from our own creates many challenges.⁶ Creation of the program entailed: 1) determining goals and a budget, 2) envisioning the program structure, 3) determining the program location, 4) selecting the faculty and courses, 5) student recruitment and selection, 6) student and faculty preparation, 7) commencement of travel, and 8) assessment.

1) Determining Goals and a Budget

The goal of our program was to give students an opportunity to study in India while getting engineering credit, be embedded in Indian culture, and to create bridges between faculty and institutions for future collegial endeavors.

Six students and one professor were the pilot group to determine the viability of an engineering study abroad in India program. Program planning was initiated in September 2005 for implementation in July 2006. Due to the low number of students in the pilot program, the cost per student was relatively high. \$50,000 was budgeted for a six-week experience that included all student tuition and fees, housing, meals, all travel to and within India (including all excursions), Indian faculty salary, UofA faculty travel and living stipend, visa, insurance and program administration. This budgeted amount did not include the UofA professor salary, which was paid from the standard summer school budget. Large scholarships were provided to the pilot program students to attract the best and brightest.

2) Program Structure

The program needed to address quality academics and student desires for a study-abroad experience. Students want courses/research applicable to their major and degree, competitive tuition and program fees, affordable, accessible and comfortable housing, matching start/end term dates, fun locations, and helpful international coordinators. The six week summer program coincided with our second summer term, allowing students to take any necessary pre-requisites in the first summer term. Students were more interested in a six week term than a semester in such a different culture, and the six week plan fit our pilot program idea. If warranted by student feedback, a longer program would be considered for the future.⁷

Students need to study, but they also need to experience the country and the culture. We scheduled the first week, several weekends, and the last several days with cultural travel and experiences. The first week was spent in the Delhi, Agra and Jaipur region, including a visit to the Taj Mahal. The last five days were spent in southern India experiencing politics, culture, theater and dance with an internationally known musician, professor, and University of Arkansas friend. Weekend excursions were in southern India surrounding Bangalore.

Adding time for travel, the normal six-week summer course was compressed into approximately four weeks; however the contact hours were not diminished and students were assigned pre-travel studying for their courses. The courses were geared for rising juniors and seniors to allow teaching an interdisciplinary degree-credit engineering technical elective. With the compressed time frame, we chose to offer one three-credit hour engineering course (Air Pollution Control) taught by our faculty member and one three-credit hour degree-credit approved humanities course (Culture and Civilization: Field Studies) taught by an in-country Indian faculty member, with oversight by the UofA professor. Providing the faculty member allowed us to offer these as courses taught to UofA standards. Students registered for UofA courses, paid UofA tuition, and the UofA in turn paid the receiving university a program fee that covered the students' tuition and expenses. This allowed us to directly count the courses to the student's degree program,

rather than transferring the credit from one institution to another. It also allows students to use their scholarship and financial aid money to help pay for their study abroad program.

3) Program Location

Choosing the right university is integral to the success of the program. The professor(s) must be good, the university's coordinators must be helpful, and the location must offer after-study opportunities for the students and professor. It is helpful if there are already ties to an institution.

A site visit is critical before making the final location commitment, ideally by the program director or faculty member and a study abroad officer who understands the study abroad student mentality. We initially chose a university in Tamil Nadu, India. Research ties existed between our institutions; quality academics with good facilities, a kind and helpful staff, and a safe environment were all there. However, during the site visit, it was clear that we needed to find another location for two main reasons: 1) this university was extremely isolated, located a long distance from even a very small town with no transportation at the students' disposal, and 2) this was a very conservative university where the women students, including our women students, had to be in the women's dorm compound by 6:00 pm and remain until 6:00 am each day.. We did not feel that this regiment or location would be acceptable to our students and would lead to an unsuccessful program.

With a short time line, we ultimately selected the International Center for Management and India Studies (ICMIS) in Bangalore. Bangalore is the 5th largest city in India, the location for many multinational corporation engineering research centers, and the weather is pleasant even during the summer. The Center is in an urban area in the outskirts of Bangalore, so students could explore the surrounding area easily, and have many social and cultural options. ICMIS also provides transportation into the center of Bangalore regularly. ICMIS has the infrastructure to handle the students and provide the excursions on the weekends and the first and last part of the program, and they had the professors already teaching appropriate humanities classes. Even though time was short, they pulled together the program logistics. A site visit sealed the location.⁸

4) Faculty Selection

A solicitation was made to faculty to determine interest in teaching in India. Interested faculty wrote a course description for their proposed interdisciplinary engineering course, the candidates were interviewed, and a selection was made. Selection was based on the relevancy of the course, the ability of the course content to be applicable to multiple engineering disciplines, the perceived ability of the professor to travel abroad leading a group of students, tenure status, and the ability to entice students to participate in the program.

5) Student Recruitment

Student interest was generated by eye-catching flyers and emails to students about the program and the upcoming information session. During the 90 minute interactive information session, discussion and photos of the India experience peaked students' interest. Discussion surrounded

the sensory extravaganza of India, the blend of old and new, the religious and cultural experience, the mixture of rich and poor, and the importance of the country to the engineering profession. A program schedule of class and excursions, program costs, and available scholarships were also included. The study abroad officer described the application, preparation procedures and required pre-trip orientation sessions. Homemade Indian snacks were served.

Student selection was competitive, based on academics, leadership, program interest essay, letters of recommendation, previous international travel and maturity. The six students chosen were awarded scholarships to cover all but \$2500 of the program costs. All of the students were able to find other scholarships to pay for the remaining cost.

6) Student/faculty Preparation

The selected students and faculty participated in multiple pre-trip orientation sessions. Sessions covered food, culture, what to expect, what to pack, required paperwork, and distribution of the documents. Students also researched India and its people in preparation for their trip.

7) Travel

All travel arrangements were made before the students left the U.S. Our UofA study abroad office purchased the airline tickets to and from Delhi, and the ICMIS staff made all internal India arrangements. Periodic invoices from ICMIS were paid by wire transfer as the program arrangements were made.

Experiences

Success of the program hinged on the attitudes and experiences of the students. Selection of the location and excursions were made to give the students positive experiences. The students were selected for participation based on their maturity level as measured by their involvement in their education, leadership in extracurricular activities, and previous foreign travel. Each student was also evaluated based on an essay expressing their interest in the program and how it fit into their life. Finally, a personal interview was conducted to judge the student's temperament and level of interest in the program. A number of incidents occurred that showed that careful selection of the students paid off and helped assure the success of the program.

The first incident occurred upon arrival in Delhi when a pair of expensive walking shoes was missing from a student's luggage. Of course there was nothing to do but move on to the bus and purchase some shoes during the trip, and that is exactly what took place without much ado. The second potential incident involved driving through Delhi in the dark to a two-star hotel, which is a very acceptable level; but many students are accustomed somewhat higher standard hotels these days. Although the section of town was not well lit and the hotel was not "first class" the students were quite accepting of the situation. The third potential incident was within a week when the first digital camera came up missing. The student explained that he hadn't been that careful and the missing camera was partially his fault. As with any trip to a developing country there were many potential incidents that the students accepted, kept their perspective, and continued to enjoy the trip.

Some aspects of Indian culture were the root of a number of incidents that could have had a negative impact on the program. The first aspect is called “IST” (Indian Slip Time), which means that statements such as “We can have that by Friday” or “Sure we can get the boys a washer by 5:00 today” don’t actually mean that it will happen at the appointed time or day. Another aspect of Indian culture is providing less than was promised. We did ask for an air conditioned bus, but we didn’t specify that the air conditioner should cool the bus to less than 30°C. The differences in culture can lead to frustrations, which can sour a day, week, or the entire experience. The students were flexible enough to accept these aspects of Indian culture and enjoy the entire experience.

The UofA students encountered another group of Americans studying abroad in Bangalore and from time to time teamed up with the other group for trips into town or to go out-on-the-town. The other group of students was very negative about their experiences in India (hotels, food, classes, excursions, culture, history, etc.). Although one UofA student did tend to bring some of that negativism back to the UofA group, two of the UofA students were so positive about the entire India program that they were able to completely drown out any negative thoughts. These two students became the unofficial leaders of the group and had a tremendous positive impact on the entire program.

8) Lessons Learned (Assessment)

Learning outcomes and program evaluations were based on 1) student written surveys, 2) student verbal debriefing, 3) student written journals, 4) faculty verbal debriefing, and 5) financial analysis.

Student Written Survey Evaluations

Upon arrival at home, students were required to complete a program survey evaluation form administered through the study abroad office. The table below gives question categories and the associated average score for the India program (1= very unsatisfactory; 2=less than expected; 3=average; 4=very good; 5=very satisfactory).

Category	Average Score (5=best)
Helpful pre-departure preparation sessions	3.9
Quality of the academics – Engineering course (UofA professor)	4.6
Quality of academics – Humanities course (India professor)	3.0
Level of satisfaction with excursions, including integration with academic content	4.2
Balance of structured and free time	3.8
Living arrangements, including conducive to interacting with local community	4.5
Overall program evaluation	4.5

The surveys also contained sections for student comments and suggestions, which included:

- The weather in Bangalore is much cooler than rest of country, which was unexpected.
- Lengthen the program by two weeks to give more time to cover the engineering course material.
- Too many temple tours.
- Enjoyed planning a weekend ourselves; there could have been a little more free time or relax time.
- Internet in the accommodations would have been nice.
- Bring a laptop, lots of bug-spray. Be prepared to see lots of small reptiles.
- The school responded quickly to our needs.
- I thought everything turned out great! The food acclimating could have been better, but not that big of a deal.
- I have become more willing to talk to new people and have learned to enjoy a culture much more different than here or Europe.
- I now think more about our infrastructure, how we are using our resources, and how we treat each other.

From the written surveys, it was apparent that the program was a success, but there was also room for improvement.

Verbal Student Debriefing

Approximately three weeks after the students returned home, we verbally debriefed the students to learn more about their experiences, and get their suggestions for program improvements. The debriefings of the students were filled with positive comments about the program ranging from the overall experience of life in Bangalore, to the instruction, to the living arrangements. Although minor, the students did have some thoughts on program improvement.

The class segment of the program was four weeks long, and the students all felt that this was too short of a time for them to put enough study time into an upper-level engineering class and study for a humanities class and have time to experience Bangalore.

The four male students shared a home near ICMIS, but 20 minutes from Bangalore's central district. This was both beneficial and a problem; they were able to walk to class; but transportation into town caused some inconveniences and problems. The two female students stayed with a family in the center of Bangalore and this was overall a positive experience; they were able to get to town easily and enjoyed interacting with locals; however, getting to class and access to free internet was a problem. The students all agreed that although both locations worked out well, the accommodations in the center of town provided the best experience, since transportation to and from class was provided by ICMIS, yet they could walk out of their room and experience Bangalore without arranging transportation.

The students generally agreed that the excursions and in particular the last week of the program were very structured and they would like more freedom to explore on their own.

Student Journals

The students were required to keep journals of their experiences, impressions, and thoughts throughout the program. The faculty member did not read the journals, but did check every few days to see that the students wrote in their journals. During the verbal debriefing, we asked students to talk about their journals. Several students commented that keeping a journal made them realize how much they grew during this six week period. Some also found it amusing to re-read about their initial reactions to new people, ideas, places, smells, animals, food and culture – things that by the end of the trip they had absorbed, acclimated, and forgotten that they ever found strange. One student commented that he had a “life defining moment” during his time in India, and keeping his journal helped him reach this moment by organizing his thoughts and dreams.

Faculty Debriefing

The debriefing with the faculty advisor was also filled with positive experiences as well as some observations as how the program could be improved ranging from program length to logistics.

As the students recognized, the four week classroom component of the program put stress on the students to keep up with their studies and left little time to explore Bangalore. If an upper level engineering class is to be part of the program it was recommended that the program be extended to give a six week classroom experience.

Although the students saw state-of-the-art pollution control equipment and systems during pre-departure field trips, the expected field trips in India did not occur. India is very polluted, and you can actually see the pollution in the brown air, which the students will never likely encounter in the US. When trying to locate possible sites in India to view pollution control systems in action, the ICMIS team encountered difficulty due to the scarcity of India’s pollution regulations and enforcement that is the catalyst for design and installation of pollution control systems. In the future, engineering courses that could tie in the multinational corporation engineering research centers and call centers would offer more wealth of field trip opportunities.

The students were very interested in taking their own excursion such as the camping trip they took; but, there was little time to do this. If the program is extended to eight weeks total, the students will have more time to explore Bangalore and to take unsupervised trips to nearby towns or sites of interest.

Although it had not been negotiated and the UofA had not asked for it, after about a week in Bangalore, the host institution (ICMIS) provided cell phones to the students and the faculty advisor. This turned out to be very useful for all concerned. The students were able to stay in contact with each other, the staff at ICMIS, and the faculty advisor. In addition, they were able to call for taxis when needed and receive calls from the USA. The cell phones proved to be extremely beneficial.

The staff at ICMIS was very helpful in providing assistance whenever a problem arose; but, they were not quite ready for the UofA team when we arrived. They had intended to put the students

in dormitories, but the dorms were not completed by our arrival, and unfortunately, the back up accommodations were not ready either (washer, cook stove, etc.). Another problem encountered was that the host institution did not conduct a Bangalore orientation, as planned, when we arrived. Although each of the students was able to explore and work out an understanding of Bangalore and available services, it would have saved all concerned some time and headaches if the orientation would have given as planned.

Possibly the biggest problem of the trip was that three of the students were quite unaccustomed to the spiciness of Indian food and did not enjoy eating three Indian meals a day as had been planned by ICMIS. The students missed western meals and Indian food upset their stomachs. These students tried to get by on two meals a day or by eating snacks; but, this was affecting their energy and their enthusiasm of experiencing India. Once we were able to locate a non-Hindu food service provider who would cook beef, eggs, and other western foods these three students were very pleased and were able to enjoy the other Indian meals as well as the entire program.

Financial Analysis

The program expenditures were only 1% over budget. Ensuring all parties understand up-front and in detail what is covered in the program quotes is key to meeting budget expectations.

Increasing the number of students attending the program will decrease the per student cost. To decrease the cost of the program in 2007, we are replacing the expensive structured last five days of travel with ICMIS-hosted travel in southern India. Based on student and faculty feedback, an eight-week program is being considered for 2008 to allow more time for academics and experiencing Bangalore. If an eight-week program format is implemented, two weekends will be unscheduled for students to determine their own activities, at their own expense.

Conclusions

We had a very successful pilot program. Feedback from students and faculty were positive, and we received valuable suggestions to improve the program. Now armed with some experience, we plan to continue this program, initially with ICMIS, then possibly moving the program to another university in southern India as we develop contacts and relationships. The pilot program allowed us to determine that an India study abroad program was feasible for our students and faculty, and to know what/how to modify the program for future success, without the burden and costs of a large group. The students did get to interact with Indian students and live within the Indian culture, so when they inevitably encounter people from India in the future, they will have some understanding of them and their culture. Inclusion of site visits to multinational engineering research centers would be a valuable addition to the program for the students engineering education. Future offerings can include two engineering courses, with the implementation of an 8-week format. The 2007 program will be open to 15 students. In the future, we plan to extend the program offering to students of the South Eastern Conference (SEC) universities. As in any new programs, we had lessons learned, and will provide an improved program for 2007 and beyond.

Bibliography

- ¹ *Open Doors 2005: Report on International Educational Exchange*, Institute of International Education, 2006, Retrieved September 20, 2006 from <http://opendoors.iienetwork.org>
- ² Albin, Sacharia; Swart, William; and Zahorian, Stephen, "Global Engineering Education: A Partnership between Rajagiri College (Cochin, India) and Old Dominion University (Norfolk, VA)", Proceedings of ASEE 2001
- ³ "Does ABET Accredite International Programs?," Accreditation Board for Engineering and Technology, Retrieved January 3, 2007 from <http://www.abet.org/doesint.shtml>
- ⁴ "Washington Accord," Accreditation Board for Engineering and Technology, 2006, Retrieved January 3, 2007 from <http://www.washingtonaccord.org>
- ⁵ U.S. Dept of Education, Office of Postsecondary Education, 2006, Retrieved September 20, 2006 from <http://www.ed.gov>
- ⁶ Mazumdar, A. and Bean, J., "A Global Concentration in Engineering," Proceedings of ASEE 2001
- ⁷ Pathomvanich, S. and Najafi, F.T., "International Partnership in Engineering Education," Proceedings of ASEE 2001
- ⁸ Engle, J. "Creating More Rigorous and Appropriate Study-Abroad Programs", *The Chronicle of Higher Education*, March 17, 1995