

Providing Curricular Assistance to a Third World University Computer Science Department

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ABSTRACT

Helping third world universities to improve their computer science curricula is an important obligation that first and second world computer science departments have. For third world countries, a technically skilled workforce that can compete in today's modern world is imperative for sustainable development.

In this paper, we will describe a liaison between Montana State University (USA) and Don Bosco University (El Salvador) that resulted in the first author teaching three advanced computer science topics at Don Bosco University. The pedagogy related to teaching advanced topics to students of a different culture while being translated is described.

We hope that this paper will convey how rewarding such an experience can be and to encourage other liaisons between computer science departments in the developed and developing parts of the world. Although the specifics of the experience described in this paper will almost certainly differ from your own, we believe that many of our general observations might be useful should you have the chance to be involved in a similar experience.

Categories and Subject Descriptors

K.3.2. Computer and Information Science Education.

General Terms

Experimentation.

Keywords

International Collaboration. Computer Science Pedagogy.

1. INTRODUCTION

One of the most delightful aspects of being a computer science educator is the possibility to broaden one's pedagogical horizons by seeking experiences outside of one's home country. For example,

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the Fulbright program [6] provides funding for professors in the U.S. to assume 2-10 month lecturing and/or research positions in foreign countries. Seeking international experiences can lead to many benefits for the home institution including an internationalization of the home curriculum [7], a better understanding of gender issues [1], [8] and a better understanding of international students and the role that their culture plays in their academic performance. Even more importantly, these experiences can have a social impact by helping the host university to improve its curriculum.

In December 2002, the first author was invited by the second author to spend one month at Don Bosco University in a suburb of San Salvador, El Salvador from July 15 – August 15, 2003. Please refer to Figure 1. At the time, the second author was the director (department head) of the computer science department at Don Bosco University. During one month in El Salvador, the first author taught three advanced computer science topics as one week mini-courses, gave guest lectures in courses, helped with curriculum development, and gave a presentation at an IEEE CONESCAPAN conference [3]. The experience was very beneficial for all parties involved.



Figure 1. Map of El Salvador.

The paper is organized as follows. In section 2, a brief overview of Don Bosco University is given. In section 3, the funding for the experience is explained. In section 4, the advanced topic mini-courses are described. In section 5, general factors that led to a successful experience are covered. In section 6, specific teaching advice is given. In section 7, ideas for improving the experience are explored. And in section 8, ideas and prospects for building upon the initial relationship between the two universities are enumerated.

2. DON BOSCO UNIVERSITY

Don Bosco University [2] was founded in the mid-1980s in Soyapango, San Salvador in the country of El Salvador. The mission of the university is

To offer superior scientific and technological education with a solid humanities base to the people of El Salvador, especially the poorest young people. The aim of the training is to produce people illuminated by the Gospel who can be the protagonists in a changing society.

There are approximately 3500 students enrolled at the university, of whom over 900 are studying to earn a bachelor's degree in computer science. The computer science faculty consists of a director, 7 full time faculty, and 10 part time faculty. To be a member of the faculty, one must minimally hold a bachelor's degree.

3. FUNDING

The funding for this experience was split between the U.S. Embassy and Don Bosco University. The U.S. Embassy provided the plane ticket to and from San Salvador. Don Bosco University provided a \$1100 honorarium, a guesthouse that included breakfast and laundry services, and a per diem.

To procure the funding, the Cultural Affairs Division of the U.S. Embassy in San Salvador was approached six months in advance of the visit with the proposal. The Cultural Affairs Division has part of its budget specially earmarked for "development" activities and accepted the proposal to purchase the plane ticket readily.

Once the plane ticket funding was secured, Don Bosco University was approached with the idea by the director of the computer science department. Because the U.S. Embassy had already committed the airline ticket, the university was quite amenable to the idea of providing the honorarium, the guesthouse, and the per diem.

4. MINI-COURSES

The purpose of the mini-courses was to introduce advanced topics to the faculty and students of the computer science department of Don Bosco that are not currently offered, but will be offered starting in 2004. Because most of the computer science faculty hold bachelor's degrees in computer science, the director of the department decided that one effective means of providing faculty training would be to invite a guest lecturer who could introduce three advanced topics through one week mini-courses.

Three such mini-courses were offered. There was a one week, 19 hour Common Lisp mini-course, a one week, 15 hour neural networks mini-course, and a 10 hour theory of computation mini-course. A repository of the mini-course materials is publicly available at [9].

4.1 Common Lisp Mini-Course

The Common Lisp seminar consisted of 5 three hour lectures and 2 two hour labs. The average attendance at the seminar was 35 people. The attendees were mostly Don Bosco upper division students and faculty, but also included a few faculty members and upper division students from The Central American University "José Simeón Cañas" and The University of El Salvador (both located in San Salvador).

In the Common Lisp seminar, the CLISP [4] environment was used. During the seminar, a combination of PowerPoint slides, hands-on

demonstrations and laboratories were used to introduce the attendees to Common Lisp. Many of the topics of the slides were drawn from Lisp, 3rd Edition [11]. A total of 145 PowerPoint slides were developed and covered in the course of the seminar. All of the slides were in English.

The seminar was a very popular one. At Don Bosco University, there are many computer science courses that teach students how to program in one language or another. Thus, even though Common Lisp was a new language for the attendees, the learning of a new programming language was a familiar activity with which everyone felt comfortable.

4.2 Neural Networks Mini-Course

The Neural Networks mini-course consisted of 5 three hour lectures. One of the five days was spent going over a Common Lisp implementation of an ADALINE network. The average attendance at the seminar was 40 people. The material was drawn from Fundamentals of Neural Networks [5]. A total of 224 PowerPoint slides were developed of which roughly 75% were covered during the seminar.

There were some very interesting differences between this mini-course and the previous one. Because the neural network material is more mathematical, it was covered at a much slower pace than the Common Lisp material. Because of the practical orientation of an El Salvadoran computer science education, extra time was needed to explain the relevant mathematical concepts (such as what the graph of a sigmoid looks like) in order to help the audience understand the material. As a consequence, not all of the prepared material was covered. Thus, an instructor giving a mini-course must be flexible with respect to dynamically reordering the material so as to bring it to a reasonable conclusion.

The attendees of the neural network class enjoyed the mix of theory and practice. Although they were ultimately interested in the practical side of neural networks, many of them commented on the necessity of understanding some of the underlying mathematics.

4.3 Theory of Computation Mini-Course

The theory of computation mini-course consisted of three 3.5 hour lectures. The average attendance at the seminar was 20 people. The attendance at this mini-course was dramatically lower than those of the other two mini-courses for two reasons. First, the mini-course took place right after a one week national holiday. Second, theory is not perceived to be as interesting or as important as more practically oriented materials. A total of 143 PowerPoint slides were developed for the course of which 80 were covered. The material for the course was largely drawn from the early chapters of Introduction to the Theory of Computation [10].

5. OTHER LOGISTICS

5.1 Publicity

The seminars were given advance advertising both on the Don Bosco University campus and at other nearby universities. Because Don Bosco funded part of the visit, it was absolutely critical to have a good attendance at the mini-courses to justify the expenditures. The publicity was a critical factor in making the mini-courses a success.

5.2 Lecture Room

One of the few air-conditioned rooms on campus (an auditorium) was reserved two months in advance for the mini-courses. The auditorium seats up to 50 people. Due to the hot, humid weather and the duration of each day's lectures (roughly three hours), it was extremely nice to have an air-conditioned room.

Due to an extensive infrastructure and relatively cheap rates, cell phones in El Salvador are extremely common. As a consequence, a presenter can expect to hear cell phones going off during presentations more frequently than in the U.S.

5.3 Teaching Aids

A portable whiteboard, a projector, and a laptop were all reserved one month in advance of the visit. The projector and laptop were brought down from the administration building each morning. We believe that the experience would have been simplified had the first author traveled with his own laptop and projector.

5.4 Translation

The format of the mini-courses was for the first author to cover one major point in English and then for the second author to translate the point into Spanish. Although many of the attendees could understand some English and some were there to improve their technical English comprehension abilities, we believe that a critical factor in maintaining a high attendance throughout the mini-courses was the fact that the attendees could hear the lectures in both English and in their native language. As a side recommendation, when presentations are running for three hours, water should be procured in advance for the speakers.

5.5 Transportation

The first author stayed in a guesthouse in San Salvador, about 30 minutes by car (and much longer by bus) away from the university. Careful consideration should be given to the distance between one's accommodations and one's work environment when one visits a developing country.

5.6 Labs

The Common Lisp mini-course included 2 two hour laboratories. The labs were reserved two days in advance and the computers in the lab needed to have CLISP installed.

5.7 Clothing

Universities in El Salvador are more formal than universities in the United States. Appropriate attire is slacks and a dress shirt. Jeans and t-shirts are inappropriate for a presenter, although students in the class sometimes wear these items.

5.8 Personal Connections

The key ingredient for making this experience happen was personal connections. The two authors have known each other since 1996. Furthermore, the second author has an extensive social network in San Salvador that he could tap to pursue approval and funding. We can not underscore enough the importance of these personal connections, at least when pursuing an experience such as this in Latin America.

6. CULTURAL TEACHING ADVICE

In general, we observed that the following teaching tips are very effective in El Salvador:

1. Hands-on labs are a very effective and popular way to give attendees first hand experience with the subject at hand. In El Salvador, almost all education is practically oriented and laboratories underscore the practicality of the material.
2. It is critical that the lecture material for all of the mini-courses be prepared in advance. Although it took about 100 hours of work, it was well worth the effort as there was little time for lecture development once the first author arrived in El Salvador. The mini-courses are available on the Internet [9].
3. It is very convenient to have the lecture material available electronically. PowerPoint was chosen for the mini-courses, but any such program would have sufficed. This kept the presentations moving at a better pace since the presenter did not need to use the whiteboard very often. It also simplifies the translator's life as he has a visual reminder of the material.
4. 20 minute breaks were given to the attendees every 60 to 75 minutes. Because most of the presentations ran for three hours, allowing the attendees enough time to take a break and/or get coffee is imperative for retaining their ability to pay attention.
5. Teaching advanced computer science topics works best if either one can speak in the audience's native language or if there is an able translator present.
6. Soliciting questions during the presentations is very important. The culture of a classroom in El Salvador is a very formal one where students typically do not ask questions. However, during a three hour presentation, it is critical to encourage questions throughout so that the attendees are not confused. Once the attendees realized that questions were welcomed, they quickly overcame their initial shyness and participated actively.
7. At the end of each mini-course, persons who attended all of the presentations received certificates signed by both the presenter and the translator. We believe that the certificates were a nice memento to the attendees as well as an incentive to attend the entire mini-course since the mini-courses were not for any type of credit.
8. A web site was constructed that had all of the PowerPoint and class materials on it. Several students commented that they really enjoyed having a chance to review the materials both before and after the presentation. In addition, these materials provide a resource for faculty who might potentially teach the topic in the future.
9. The information on each PowerPoint slide should be kept to a minimum. The attendees tended to want to read the slides when there was a lot of text on them. The comprehension appeared to be much better when there was less text and attendees were paying attention to the explanations instead of the words on the overheads.
10. Three hours is about the maximum period for a presentation. Even with rest breaks, it becomes difficult for both the presenter and the attendees to stay focused for longer periods.
11. Interjecting some off-topic, cultural material into the lectures is a helpful method to keep the interest level high. It also can make a personal connection between the lecturer and the

attendees. For example, attendees were very interested to learn that the population density of El Salvador is roughly 140 times the population density of Montana. Attendees were also very eager to hear what types of things a U.S. citizen found different or strange in El Salvador.

12. One interesting cultural difference between the U.S. and El Salvador is the notion of time. In El Salvador, timeliness is not as big of a virtue as it is in the U.S. Although we decided to start each day's presentation in a timely fashion, it was very common for more than half of the attendees to show up somewhere between 15 and 30 minutes late.

7. IMPROVEMENTS

Although we were delighted with the outcome of the mini-courses, there were a few areas where improvements could be made

1. The instructor of the mini-courses should bring his or her own laptop, loaded with all of the software that is needed to conduct the presentations.
2. In El Salvador, the Internet should not be depended upon. Although it is generally available, it is down much more often than in the U.S. Laboratory assignments that are Internet free are more reliable.
3. The mini-courses were typically offered from 9 a.m. – noon. However, some of the computer science faculty were unable to attend due to teaching conflicts. More thought should have gone into scheduling the time for the mini-courses.
4. Although we informally surveyed the attendees to get feedback on the mini-courses (it was very positive!), we should have also developed a formal feedback mechanism.

8. THE FUTURE

There are many exciting potential future collaborations between Montana State University and Don Bosco University.

First, as Don Bosco University continues to develop its curriculum, it might be desirable to have a guest professor visit for an entire semester instead of just one month. The academic year at Don Bosco is broken up into a 1st cycle (January – May), a 2nd cycle (June – October) and an intercycle (November-December). The guest professor might teach a course that had never before been taught and while doing so, train one of the local faculty members to be able to teach the course in the future. The guest professor could also generate ideas for student senior projects and even consult with faculty on potential research directions.

Second, a professor from Don Bosco University might come to Montana State University to spend a semester. Since most of the faculty at Don Bosco University have bachelor's degrees, the visitor could come for the semester with the intent of (1) starting a master's degree that could be completed back in El Salvador and (2) taking courses that would help the faculty member to be able to offer new courses. The authors are pursuing having their respective institutes construct articulation arrangements that would facilitate such an arrangement.

Third, computer science textbooks will be sent from Montana State University to Don Bosco University. The library at Don Bosco University currently does not have a very extensive collection of

English computer science books. Although faculty at Don Bosco receive free examination copies of textbooks in Spanish, most of the leading computer science books are in English and have not yet been translated into Spanish. In the future, extra computer science textbooks will be shipped from Montana State University to the Don Bosco library and Don Bosco University will pay for the shipping. This is a win/win situation. Many of the Montana State computer science faculty have more textbooks than they know what to do with. By sending them to Don Bosco University, the extra textbooks will be truly appreciated and will help foster the growth of computer science at this university. For Don Bosco University, there is the obvious benefit of receiving expensive textbooks that benefit both students and faculty. The cost of shipping textbooks at a bulk rate is very inexpensive in comparison with the cost of actually purchasing the textbooks.

Thus, we have very high hopes that the future relationship between our two institutions will be a productive one! We also hope that this paper might provide the impetus for other connections to be made between developing world and developed world universities. Such connections can only benefit the computer science community worldwide!

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