

Global Engineering Education: A partnership between Rajagiri College (Cochin, India), and Old Dominion University (Norfolk, VA)

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Abstract

As part of its efforts in global engineering education, the College of Engineering and Technology at Old Dominion University has established a cooperative agreement with Rajagiri College in Cochin, South India, for a 2+2 B.S. Computer Engineering degree. That is, students will complete the first two years of the program at Rajagiri College using syllabi and curricular material from Old Dominion University. Students will complete the final two years of the program at Old Dominion University. The basis for the agreement includes the accreditation of Rajagiri College under Mahatma Gandhi University and University Grants Commission of India. Qualification and experience of the faculty, the college facility, established relations with other US universities, familiarity with US education system, efficient management, and financial commitments were assessed to make the cooperative agreement viable. Currently, 15 students are enrolled in the program, which began in September 2000. Five Old Dominion courses are scheduled for web-based delivery to Rajagiri beginning in Summer 2001. Old Dominion faculty interact with their counterparts at Rajagiri College for course delivery and assessment. Competency examinations, created and graded by Old Dominion faculty, will be used to assess student performance during the first two years of the program.

The program is expected to be a “win-win” agreement for all parties involved. Rajagiri students will benefit by the ability to attend a US college of engineering at a much lower total cost than would otherwise be possible. They will also be introduced to the US system on a graduated basis. Rajagiri benefits by being able to begin an engineering program with a great deal of help. Old Dominion University benefits by being able to attract high caliber students that otherwise would not come to the US. All parties benefit by the daily interactions between faculty and students of diverse cultures separated by 10 time zones and two oceans, yet closely linked electronically in today’s global village.

1. Introduction and Background

Old Dominion University is a state-supported, mid-size urban university located in Norfolk, Virginia. Old Dominion University is a relatively young institution, having begun as branch of the nearby college of William and Mary in 1930, beginning independent status about 10 years later, attaining university status in the 1970s, and having been classified as Carnegie Doctoral/Research-Extensive Institution in 2000. Today, the University has an enrollment of

12,000 undergraduates and 7,000 graduate students, and a total of 65 baccalaureate programs, 64 masters programs, and 21 doctoral programs. Two of the distinguishing characteristics of Old Dominion are its commitment to distance education and its commitment to having a diverse study body that includes a large number of international students. In the area of distance education, Old Dominion has been a pioneer ¹ with its TELETECHNET delivery system, which primarily uses one-way video and two-way audio broadcasts to deliver educational programs throughout Virginia and beyond. Today, TELETECHNET enrollment has expanded to approximately 18,000 registrations, with approximately 15% of all student credit hours now delivered by distance education. In the international arena, Old Dominion now has over 1,000 international students, slightly more than 5% of the student body. However, the percentage is higher at the graduate level, and lower at the undergraduate level.

To emphasize the institutional commitment to both distance education and international programs, Old Dominion has addressed both of these in its five-year program strategic plan.² Specifically, two of the 10 strategic initiatives included in the plan are:

UNIVERSITY STRATEGIC INITIATIVE 5

Old Dominion University will increase the range and quality of its academic programs and support services offered at distance education sites and higher education centers.

UNIVERSITY STRATEGIC INITIATIVE 6

Old Dominion University will be recognized as the premier international university of the Commonwealth of Virginia.

As an institution, Old Dominion University is looking to strengthen its international programs, and also to leverage its capabilities and experience in distance education. Old Dominion University already has developed several agreements with non-US institutions for cooperative arrangements; unfortunately, for a variety of reasons, most of these agreements result in very few students actually coming to Old Dominion University. Most of the current international student body is comprised of students who chose to come here individually. However, institutionally, Old Dominion University is seeking to promote such agreements and explore novel methods that will result in more active programs. Old Dominion University is also willing to explore novel “outside-the-box” methods for such arrangements.

In addition to embracing the University strategic objectives, the College of Engineering and Technology understands that the shape and structure of higher education must change dramatically to meet the needs of a transformed world.³ In the fall of 1997, Siemens organized an international conference entitled “Research and Engineering Education in a Global Society.” The result of that conference was a unanimous declaration by the participants: The Berlin Declaration.⁴ Of the ten points of the declaration, four were judged to be particularly relevant and actionable by the College: 1) Engineering education must recognize the need for and promote the exchange of students and educators; 2) Universities must become part of global information networks in order to stimulate multicultural professional cooperation and differing approaches to engineering education; 3) Engineering education must introduce global marketing strategies and structures to attract students from other countries and cultures; and, 4) Global research cooperation across different cultures, disciplines, structures and modalities requires

people in science and industry to exercise mutual respect, promote communication, and create flexible organizations that share best practices. The opportunity to develop a program that would touch upon these four points came about when Professor Sacharia Albin, a faculty member from the Department of Electrical and Computer Engineering and second author of this paper, visited his home in the state of Kerala (India) and also gave an invited talk at Cochin University in Cochin in August of 1999. Among those present in the audience were administrators and faculty from Rajagiri College (also located in Cochin), a branch of Mahatma Gandhi University. These administrators expressed an interest, based on an apparent high local demand, in developing undergraduate programs in engineering. Rajagiri had previous experience in cooperative arrangements with other US schools in the areas of business and social work, but had no experience of any sort in engineering programs. Therefore, they were eager to work very closely with a US school to develop such a program. Professor Albin returned to Old Dominion University in late August of 1999 and began the long process that culminated in the agreement reported on in this paper.

2. Developing the Agreement

In order to develop an agreement, several “thorny” issues involving both Old Dominion University and Rajagiri College had to be resolved. Note that the basic assumption was that Indian students would complete the first portion of the program at Rajagiri and the final two years of the program at Old Dominion University, culminating in an engineering degree from Old Dominion University.

The basic issues involved:

1. The academic program
2. Financial considerations
3. Systematic differences between higher education systems in America and India
4. Getting “buy in” from all the parties
5. Status of Rajagiri college
6. Accreditation issues

2.1 The academic program

All parties agreed up front that, to the extent possible, the academic content of the program should be identical to that taken by students completing their entire degree at Old Dominion University. The only real issue was which courses would be taken at Rajagiri and which would be taken at Old Dominion University. Ideally, the courses in the first two years (or three years for the case of an MS program) of the regular curricular were to be taken at Rajagiri, and all courses in the remaining two years were to be taken at Old Dominion University. The only difficulty with this basic strategy was that facilities at Rajagiri were not adequate for some of the engineering laboratories normally required by sophomores. Thus, it became necessary to modify the ordering of some of the courses. In any case, very early on, plans of study were created for each of four scenarios:

2+ 2 program culminating in BS degree in computer engineering

- 3+2 program culminating in an MS degree in computer engineering
- 2+2 program culminating in a BS degree in electrical engineering
- 3+2 program culminating in an MS degree in electrical engineering

That is, for each program, students would study for two or three years at Rajagiri and then for two years at Old Dominion University.

2.2 Financial considerations

A major concern for both Old Dominion University and Rajagiri was the development of a pricing structure that would not be prohibitively expensive to Indian students, yet that would still cover the costs of the program at Old Dominion University. In particular, as a state-supported school, Old Dominion University is required to charge “full costs” to out-of-state and international students. Faculty proponents of the program argued that the marginal cost of educating these students is quite low, since these students would not be coming to Old Dominion University otherwise, and they would mainly increase existing class sizes, thus providing economies of scale, and that therefore it should be possible to charge these students only slightly more than in-state tuition rates. However, such arguments did not appeal to the financial team at Old Dominion University, and the final tuition rates agreed to were based on the computed “full cost” rates. As a consequence, in order to make the program not prohibitively expensive to potential students, it was deemed necessary to increase the number of credit hours earned at Rajagiri to 75 hours, with only 50 hours earned at Old Dominion University for a 125 hour BS degree. However, as discussed below, increasing the number of hours earned at Rajagiri above 60 created another set of problems, for which a solution was ultimately found.

Another difficulty on the financial side was that it would have been advantageous, at least from the perspective of a student and his/her parents, to specify with certainty what the total cost of the education at Old Dominion University would be including tuition, fees, books, room, and board. The first few drafts of the Memorandum of Understanding were developed on this basis. However, since it is impossible to predict with certainty all the relevant costs two years into the future, and because of the state rules previously mentioned regarding the need for full costing to out-of-state students, ultimately such a guaranteed fixed cost could not be agreed upon. Rather, the costs of major items were specified with an estimated inflation rate.

2.3 Differences between educational systems

A major stumbling block in the development of the agreement was that, in the Indian system, current programs at Rajagiri are accredited under the umbrella of Mahatma Gandhi University, which includes colleges in several different regions with certain programs in place at each location. Compared to the typical American university, the system in India is much less flexible and much more difficult to change. For example, in a typical Indian program all students take all the same courses every year with no choices possible after a particular degree program is selected. Furthermore, each program of study is standardized, approved, and accredited at a high level in the university system. Although there are advantages to such a system, in terms of maintaining standards in uniformity and quality among different colleges,

one significant disadvantage is that is a difficult and lengthy process to create new programs of study. The reality, relative to the proposed agreement between Rajagiri and Old Dominion University, was that the Rajagiri portion of the new program would not be accredited in the Indian system, nor was it likely that it could be in any reasonable time. Since Old Dominion University typically only accepts transfer credit from international students for courses that are accredited in their own countries, in order not to jeopardize the accreditation status of Old Dominion University, this presented a real dilemma. For a time, it appeared the whole program would have to be abandoned over this difficulty.

The “outside-the box” solution to the above problem was obtained as follows, and again was made possible because of another unique institutional characteristic of Old Dominion University. In particular, Old Dominion University has a long history of working with older, more mature students, who have often obtained non-university based educational experience prior to applying to Old Dominion University. Because of the large number of such students at Old Dominion University, Old Dominion University has established procedures and even an administrative unit that focuses on such issues: The Office of Experiential Learning. Under this program, students who claim to have background and knowledge for specific courses can “challenge” courses by submitting a combination of portfolio materials and a final exam for a course. A faculty member who typically teaches the course then evaluates the portfolio and/or exam, and the student is then awarded credit for the course if the evidence is deemed adequate.

In terms of the program discussed in this paper, it was agreed to use the experiential learning mechanism to give credit for course work delivered in India. In order to insure quality at all levels, and also considering that Rajagiri did not have specific experience with the Old Dominion University curriculum, the following specific procedure was agreed upon. Each course to be taught in India would have a companion Old Dominion University faculty member. This Old Dominion University faculty member would provide a syllabus, suggest a textbook and even specific homework and project assignments, and remain in email contact during the course of each semester. The Old Dominion University faculty member would also create and grade a final exam for the course he or she was overseeing. These final exams were to be administered by a single Old Dominion University faculty member who would go to India at the end of each semester, give and proctor all exams, and then bring them back to the US for grading.

One difficulty with the experiential learning credit approach was that Old Dominion University has a policy that limits the amount of credit obtained with this approach to 60 credits. This presented a problem, since as mentioned previously, 75 credits were needed for students while in India in order to limit the financial burden for courses taken at Old Dominion University. Although Old Dominion University could have waived the maximum credit hour restriction, taking advantage of the distance learning/technology-based instruction under development at Old Dominion University was decided to be an even better policy. Old Dominion University has also been granted permission to offer these type courses out-of-state at in-state tuition rates, thus making the cost reasonable. Thus, five courses (three from Electrical and Computer Engineering, and two from Computer Science) were identified for delivery using asynchronous technology and email for correspondence. An advantage of this approach was that Indian students would be even better prepared and have a better idea of what to expect at Old

Dominion University before arriving here than if they took only courses at Rajagiri (even though courses at Old Dominion University would be tightly coupled with Old Dominion University faculty).

3. Coming to Terms

To come to agreement on the various issues mentioned above, and also to accommodate other secondary issues, numerous meetings were held over a period of about 10 months, beginning in September of 1999. The primary stakeholders in this agreement were:

Department of Electrical and Computer Engineering
College of Engineering and Technology
Office of International Programs
Computer Science Department
Office of Experiential Learning
College of Sciences
College of Arts and Letters
Office of the Provost
Rajagiri College

In order to develop the agreement, all the issues mentioned in the previous section had to be addressed to the satisfaction of all parties. Above all, no one wanted to compromise educational quality. The Department of Electrical and Computer Engineering, the primary driving force behind the overall program, was interested in access to a pool of highly qualified and motivated students, some of whom would undoubtedly continue with graduate school. Since many of the courses to be taught at Rajagiri in the first two years of the program were in the areas of math, science, English, and other general education, faculty from the Colleges of Sciences and Arts and Letters were understandably concerned that most of that part of the curriculum would not be taught at Old Dominion University. Faculty from Computer Science were concerned about the possible lack of adequate computer facilities and experience to teach basic computer science classes at Rajagiri. The Office of Experiential Learning was instrumental in proposing a solution for obtaining credit for courses from Rajagiri, but wanted to insure that the spirit and letter of University policies were followed. Of course Rajagiri wanted to obtain a good education for students at a minimum cost. The Office of the Provost needed to assure that charges to students were adequate to cover real costs and did not violate State policy. All parties mentioned wanted this to be a successful experience for students, but realized there are some inherent risks.

In the end, compromises were made in order to obtain a signed agreement between Old Dominion University and Rajagiri. Some of the key compromises agreed to include:

1. Rajagiri would pay an up-front course development fee, with funds to go to individual Old Dominion University faculty responsible for each course.
2. The agreement was modified to begin with only a 2+2 program in computer engineering, rather than four options as were originally intended.

3. The course sequencing was modified in some cases to account for the limited facilities at Rajagiri.
4. The pricing structure was set as the Old Dominion University full-costs rates.
5. Indian students were allowed to delay taking SAT exams.
6. A reduction in the number of students in each group from 50 per year, as originally intended to 25 per year.

4. The Memorandum of Understanding (MOU)

Based on all considerations mentioned above, an MOU was prepared and signed by officials of both Old Dominion University Rajagiri. The MOU, approximately 11 pages in length plus a one-page appendix with a detailed curriculum plan, contains sections on:

Academic Matters
Financial Matters
Responsibilities
Other Faculty and Student Opportunities
Legal Matters

This agreement contains specifics of the issues mentioned in this paper. After thorough review by faculty and the Office of International Programs, the document was also modified by the Old Dominion University legal counsel to assure proper form and adherence to laws. The document was officially signed in India in early July 2000 and then signed at Old Dominion University in early August 2000.

5. Status Report

The two first authors of this paper visited Rajagiri in late June and early July 2000 to meet with faculty, look at the facilities, and talk with some prospective students. The culmination of this event was the MOU signing ceremony, held on July 5 and reported in the press. After this time, Rajagiri used its contacts and advertised the program in various media. Also, the President of Rajagiri visited Old Dominion University in early August 2000 and participated in the signing ceremony at Old Dominion University. At the same time, Rajagiri faculty were matched with counterparts at Old Dominion University for each course to be offered in the Fall 2000 semester. Because of the lateness in the final signing of the MOU, and since no student recruiting began until July 2000, only 15 students, rather than the 25 mentioned in the MOU, were accepted to begin the program in Fall 2000. Classes for these 15 students began in September 2000. At the time of the writing of this paper, competency final examinations are being administered at Rajagiri by the second author of this paper.

6. Summary

A novel cooperative agreement has been initiated between Old Dominion University in Norfolk, Virginia, and Rajagiri College in Cochin, India. Unlike many previous agreements signed with international schools, this agreement is much more specific, has much closer cooperation, and is expected to have much higher enrollment. In steady state, even under the present

agreement, 25 students are expected to come to Old Dominion University each year as juniors, after having completed the first two years of Old Dominion University's curriculum. If the agreement works well, the intention is to expand it to other programs in engineering and computer science. The agreement was made possible by the cooperation of many parties at both Old Dominion University and Rajagiri. An extremely important point, which made the difference between success and failure in getting this program off the ground, was the continual "championing" of the program by Professor Albin, the program's initiator and driving force. Although separated by two oceans and 10 time zones, these two schools are both highly committed to student education in a global age. This agreement will bolster Old Dominion University's intention to be recognized as the premier international university in Virginia. Solutions to the many problems that will undoubtedly arise as this program continues will serve as a valuable microcosm of cooperation in a global age.

Bibliography

1. Swart, William, Savage, Anne and Stanley, William, "A Ten-Year Perspective on Delivering Undergraduate Engineering Technology Programs Via Distance Learning at Old Dominion University," Invited Paper, *1998 Accrediting Board for Engineering and Technology (ABET) Annual Meeting Proceedings*, Seattle, Washington, October 1998.
2. Old Dominion University Strategic Plan: 2000-2005 (<http://web.odu.edu/ao/affairs/strategic%20plan%202000-2005.pdf>).
3. Condit, Philip and Pipes, R. Byron, "The Global University," *Issues in Science and Technology Online*, Fall 1997 (<http://www.nap.edu/issues/14.1/condit.htm>).
4. Hernaut, Fruno and Theis, Dietmar, "Research and Engineering Education in a Global Society," Webzine "Research and Innovation," Issue 1/1998 (http://www.siemens.com/FuI/en/zeitschrift/archive/Heft1_98/artikel08/).

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