

Dual Master's Degree Programs Offer Students Combined Resources of Separate Universities and Build Working Relationships between Faculties

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I. Introduction

Because different universities have different strengths, students with access to the strengths at two different universities can exploit a combination of resources unavailable at either institution. In this paper, we describe a master's degree program in which graduate students in engineering take a part of their courses from faculty at the University of the Americas (UDLA) in Puebla, Mexico, and a part of their courses from faculty at Texas Tech University in Lubbock, Texas, USA. When students complete the program, they meet the requirements to receive two master's degrees in engineering, one from the University of the Americas and one from Texas Tech University. Each student receives not only a separate diploma from each institution, but also a certificate signed by representatives from both institutions in which the institutions certify granting this special dual degree.

Faculty members from both institutions supervise each student together. Travel to joint meetings of the supervising faculty for planning the thesis research and for conducting the final oral examination is funded by a grant from industry. The student and the faculty advisors choose which institution will host the oral examination. The same grant provides scholarship support for student participants in the program.

Graduates of the program, who have pursued their studies in two countries in two different languages, are uniquely prepared for the practice of engineering today, when more and more opportunities span national borders. Participating faculty build working relationships based on jointly supervising work of mutual interest and, thereby, strengthen ties between the institutions.

The first two participants completed this new academic program in August 2000. Appropriately, one student began study at the University of the Americas and then came to Texas Tech University. The other began study at Texas Tech University and then went to the University of the Americas.

II. History

The passage of NAFTA created an increasing need for engineers who can practice effectively in both Mexico and the United States of America. In March 1996, Jorge I. Auñón, then Dean of the College of Engineering at Texas Tech University, approached E. R. Brooks, President and CEO of Central and South West Corporation, a utility holding company, about funding a program that would encourage and assist students who wish to develop such capability. In September 1996, the Rector of the University of the Americas, Dr. Enrique Cardenas, and then President of Texas Tech University, Dr. Donald R. Haragan, signed an official agreement that provides an opportunity for students from both the United States and from Mexico to obtain not only a Master's degree in engineering from both schools, but also to learn about the culture and engineering profession in both countries.

A key provision of the agreement between the University of the Americas and Texas Tech University is that each institution may agree to "double count" courses by granting credit to a student for a course taken at one institution towards satisfying the degree requirements at both institutions. Transferring credit is straightforward because the Southern Association of Colleges and Schools accredits both institutions.

Central and South West Corporation funded the project in November 1996 and the program was launched in 1997. Students who began the program informally under an earlier exchange agreement between the University of the Americas and Texas Tech University received dual degrees in 1997 and 1998.

In the fall of 1998, the first students received fellowships that covered the approximate cost of tuition, fees and cost of living for 7 months study away from their home institution. Gabriel Cervera traveled to Texas Tech University to pursue a master's degree in computer science to complement his studies for a master's degree in electrical engineering at the University of the Americas. Victor Perazzoli traveled to the University of the Americas to pursue a master's degree in industrial engineering, also the degree he was pursuing at Texas Tech University. By August 2000, both of these first students had completed all requirements for Master's degrees from both the University of the Americas and Texas Tech University. During the Texas Tech University graduation ceremony on August 12, 2000, both of these first students received their master's degrees from both institutions, as well as the special certificates signed by Rector Cardenas and President Haragan. The delegation from the University of the Americas who traveled to Texas Tech University to join in the presentations included Enrique Cardenas, Rector; Jorge Welti, Academic Vice Rector; Jose Tamborero, Dean of Engineering; Marco Rosales, Dean of Graduate School and Research; and Manuel Ramirez, Chair of Electrical Engineering.

III. Lessons Learned

By August 12, 2000, when the first two students completed the dual-degree program, six additional students had begun the program. Five of these students began their studies at the University of the Americas. One began at Texas Tech University. This difference reflects the

need for intensive language study in Spanish by students who begin their studies at Texas Tech University so that they will feel more capable of pursuing their studies where the instruction is in Spanish. Indeed, incorporation of such a feature into the program was one of the topics discussed when William M. Marcy, Dean of Engineering at Texas Tech University, visited Jose Tamborero, Dean of Engineering at the University of the Americas in Puebla, Mexico, during March 2000. During this visit, the two engineering deans agreed they wished to continue the dual degree program beyond the initial period of funding. They agreed to work with their respective academic departments to improve, refine, and expand the program, as well as cooperate in seeking the necessary funding.

When the first fellowship students began the program, they initially pursued a Master of Science degree, with thesis, at the University of the Americas and a special non-thesis, interdisciplinary, Master of Engineering degree at Texas Tech University. Because it was originally intended for practicing engineers who wished to earn a graduate degree in engineering, the 36 semester credit hour Master of Engineering degree at Texas Tech University seemed attractive because it permitted half of the courses, 18 semester credit hours, to be transferred to Texas Tech University from other universities. With this degree, therefore, students in the dual-degree program could transfer 6 graduate courses (18 semester credit hours) to Texas Tech University from the University of the Americas and complete 6 additional courses at Texas Tech University to accumulate a total of 36 semester credit hours.

When students in the dual degree program inquired about the possibility of pursuing a Master of Science degree at Texas Tech University, which allows more topical focus than the interdisciplinary Master of Engineering degree, rather than pursuing the Master of Engineering degree, reflection showed that 6 courses (18 semester credit hours) at Texas Tech University plus two courses (the maximum normally allowed by the Graduate School at Texas Tech University) transferred from the University of the Americas could meet the requirements for 24 hours of course work for Master of Science degrees at Texas Tech University. Thus, if the students enrolled in and completed 6 semester credit hours of thesis courses required by Texas Tech University, then they could meet all requirements for a Master of Science degree at Texas Tech University, rather than the requirements for the Master of Engineering degree.

At this point, it became clear that if students in the dual degree program enrolled in thesis courses simultaneously at both universities and worked on thesis projects supervised jointly by faculty members from both institutions, the students' work not only could satisfy the degree requirements at both universities, but could provide, in addition, a practical means for developing working relationships between members of the faculties at both institutions. As a consequence, we allocated some of the funding from Central and South West Corporation for the travel back and forth between the University of the Americas and Texas Tech University needed for the faculty members from both institutions to work together with the students in coordinating the thesis projects and administering the final oral examinations. We implemented this new policy early enough that the final oral examinations for the Master of Science degrees earned by Gabriel Cervera and Victor Perazzoli were conducted by faculty from both institutions. We expect more collaboration between faculty members at the two institutions in supervising present and future students in the dual degree program.

IV. Descendant Programs

Based on the favorable response from students, faculty members, and administrators at both institutions who participate in the dual degree program, Texas Tech University is initiating variations on the intra-institutional dual degree as a means of utilizing funds from industry to forge strong cooperation between academic institutions for the benefit of students and faculty at the cooperating institutions.

In May 2000, the President of Prairie View A&M University, Charles A. Hines, and then President of Texas Tech University, Donald R. Haragan, approved and signed a dual-degree agreement made to them jointly by the deans of engineering and the chairs of the departments of electrical engineering at the two institutions. The form of this agreement is similar to the one between the University of the Americas and Texas Tech University, but the motivation is different. The Department of Electrical Engineering at Prairie View A&M University has been working with Texas Instruments to expand its graduate program in topics related to the semiconductor industry. Texas Instruments and other cooperating semiconductor companies, such as Applied Materials, have supported the development of a successful program in semiconductor product engineering at Texas Tech University. This master's degree program includes several specialized courses and laboratories that are not easily reproduced in their entirety. For each student, it also includes a generous fellowship and an internship in the semiconductor industry during which the student, faculty, and engineers in industry work together to identify an appropriate MS thesis topic and an appropriate person in industry to help supervise the thesis work.

The dual-degree agreement between Prairie View A&M University and Texas Tech University permits students to earn two Master of Science degrees, one from each institution, by completing half of the required courses at each institution and by completing a thesis jointly supervised by faculty members from both institutions, and industry. Thereby, students from Prairie View A&M University gain access to the special courses and laboratories at Texas Tech University. The Department of Electrical Engineering at Prairie View A&M University gains assistance in attracting additional graduate students. Texas Tech University gains additional students for its program in semiconductor product engineering. During the 2000 fall semester, the first student began study in the two-year dual degree program in semiconductor product engineering conducted jointly by Prairie View A&M University and Texas Tech University.

Again with the encouragement of Texas Instruments, the College of Engineering at Texas Tech University has begun working out the details of a different kind of dual-degree program with Texas Woman's University, which offers no academic programs in engineering. Under the proposed agreement (approval expected during the 2001 spring semester), students begin their studies at Texas Woman's University, where they pursue baccalaureate degrees in physics or computer science. Before completing the requirements for their baccalaureate degrees from Texas Woman's University, they move to Texas Tech University and begin pursuing a Master of Science in Electrical Engineering degree, perhaps, but not necessarily, within the program in semiconductor product engineering. Some of the graduate courses taken at Texas Tech

University would count not only toward the MS in Electrical Engineering degree from Texas Tech University, but toward the baccalaureate degree from Texas Woman's University, as well. The total number of semester credit hours required to earn both the baccalaureate and MSEE degrees is about 150. With this program, students at Texas Woman's University gain more seamless access to an engineering degree. Texas Tech University gains additional students for its engineering graduate program, and the industrial sponsor gains access to students with an unusually diverse academic background.

An important potential outcome of this program with Texas Woman's University is the attraction of students to careers in engineering who otherwise might not have considered this possibility. Ordinarily the leveling requirements to enter a graduate program in engineering weigh heavily against students with non-engineering baccalaureate degrees. Coordination of programs between the faculties of two cooperating institutions mitigates this issue to a major degree. Graduates of these dual-degree engineering programs are very well prepared to enter the engineering profession. Entering the engineering profession at the master's level is frequently mentioned as the direction that engineering may evolve as a whole.

Institutions like Texas Woman's University and Prairie View A&M University provide environments that many women and minorities find less intimidating than larger universities. While smaller institutions provide high quality academic programs, they cannot afford the expense of operating programs with as large a variety of academic content as those at larger institutions. The pairing of larger institutions, such as Texas Tech University, and smaller institutions, such as Texas Woman's University and Prairie View A&M University, adds diversity to graduate programs of both institutions, as well as provides broadened horizons for their students. Industry benefits from access to highly capable graduates through a very modest investment of funds. Because universities do most of the screening and recruiting, industry avoids these costs. In the final analysis, industry expends about the same amount to support a student in these programs as they would expend in recruiting a new hire from traditional engineering programs.

V. Conclusion

Intra-institutional dual-degree programs show promise as a means of utilizing funds from industry to forge strong, but flexible, cooperation between academic institutions for the benefit of students and faculty at the cooperating institutions. Substantial support for fellowships and scholarships is essential to attract strong students to the dual-degree programs. Joint supervision of student projects by faculty members from each institution seems essential for the strength and persistence of the relationship between the institutions. Such joint supervision requires modest funding for travel between the institutions for both faculty and students. Industries that support these efforts can benefit from early visibility among these students, who have the advantage of diverse academic backgrounds.

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