



Seven Years of Success in Implementation of a 3 + 1 Transfer Program in Engineering Technology Between Universities in China and the United States

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Abstract

An Agreement of Cooperation between Shanghai Normal University (SHNU) and the University of Dayton (UD) to establish transfer and joint BS programs in Electronic Engineering Technology (EET) and Manufacturing Engineering Technology (MFG) was signed in 2003. The plan initially called for development of a “3 + 1 + 1 course” transfer program whereby the first three years of the program are taught in China by Shanghai Normal University faculty, and the last year of the program is taught by University of Dayton faculty in Dayton, OH. This was to be followed by one course to be taught by University of Dayton faculty in China. At the conclusion of the program, students would receive baccalaureate degrees from both Shanghai Normal University and the University of Dayton.

The principal agreement was signed by administrators at the respective institutions, while faculty were charged to later develop the details. Since this program was on a “fast-track” to implementation, faculty at SHNU and UD worked simultaneously to build relationships, modify curricula, and mentor enrolled students. The first cohort of students was recruited and enrolled in the joint degree program at Shanghai Normal University just five months following signing of the agreement, and began their Junior year at the University of Dayton in the Fall 2006 semester.

During the initial years of the program, faculty at UD closely assessed the students’ qualifications and outcomes, and either recommended changes in the curriculum to SHNU, or modified the UD curriculum for SHNU students. The program morphed from the initial concept to a “3 + 1” program where students study for three years at Shanghai Normal University, followed by one calendar year (three semesters) at the University of Dayton.

Teaching in higher education is quite different between China and the United States. To continue development of the program, SHNU annually sends faculty to UD for a semester to learn about teaching and student learning in the United States. Additionally, UD annually sends faculty to teach at SHNU for a 4-5 week period to help prepare students for learning technical courses in English, and to better prepare them for learning at an American institution.

Today, over 100 students in seven cohorts have completed the joint program. The success rate of the program is very high with all but one student in seven cohorts enrolling at UD reaching graduation. Furthermore, nearly 50% of the students have continued on to graduate school, while the remaining returned to China to work in a technical field. The program continues to evolve as Shanghai Normal University students increase their technical education while University of Dayton students learn about working on diverse multinational teams.

About the Institutions

Shanghai Normal University (SHNU)² was founded in 1954. Over the last fifty years, the university has developed from a teachers college into a comprehensive university which offers a large variety of disciplines including philosophy, economics, law, education science, literature, history, natural science, engineering, agriculture and management science. Currently, SHNU has over 4900 graduate students, more than 23,000 undergraduates, and 1705 full-time faculty members.

The Mechanical and Electronic Engineering College of Shanghai Normal University has programs in Machine Design, Machine Manufacture & Mechanical Automation, Automobile Service, and Electronic Information & Automation. The College has 1580 full-time students, 68 faculty, and over 7000m² (75,000sf) of laboratory space.

The University of Dayton (UD)³ was founded by the Society of Mary (the Marianists) in 1850. It has evolved from a boarding school for boys into a top-tier national, private university and one of the 10 best Catholic universities in the nation. The University of Dayton has over 7300 full-time undergraduate students, over 3000 graduate students, and 508 full-time faculty.

The University of Dayton School of Engineering has 1827 undergraduate students, 68 full-time faculty, and over 100,000sf of laboratory space. The School has undergraduate programs in Chemical Engineering, Civil and Environmental Engineering, Computer Engineering, Electrical Engineering, Mechanical and Aerospace Engineering, Engineering Technology (electronic & Computer, Global Manufacturing Systems, Industrial, and Mechanical), and graduate engineering programs in Aerospace, Chemical, Civil, Electrical, Materials, and Mechanical Engineering as well as graduate programs in Electro-Optics, Engineering Management, and Management Science.

Negotiating Terms of the Agreement

While developing the program curricula, faculty at both institutions had to develop an understanding of a foreign business culture. The agreement, negotiated by the Senior Vice President and Provost at the University of Dayton and his counterpart at Shanghai Normal University, articulated the format of the program, admission requirements, tuition and fees, and the responsibilities of each institution. It was agreed that an articulation be developed to transfer students in two programs: Electronic Information Engineering at Shanghai Normal University to Electronic Engineering Technology at UD; and Mechanical Design, Manufacture & Automation at Shanghai Normal University to Manufacturing Engineering Technology at UD. The agreement also indicated that “the two parties will negotiate the curriculum offered...”

Early in the curriculum development process, faculty at UD shared course outcomes and syllabi with their counterparts at Shanghai Normal University. A short time later, SHNU sent their course outlines, which in some cases, bore a very close resemblance in both content and numbering, to the University of Dayton outlines. An initial articulation of courses from SHNU to UD for the first three years of the programs was developed. Based only on course outcomes, it appeared as though many of the mathematics, science, and technical courses would be a good

match between the institutions. However, since each institution had a different philosophy regarding requirements for general education, it was apparent that there would need to be some serious conversation in this area.

In an effort to increase the transfer efficiency of courses, and to reduce the number of credits that would need to be completed at UD, SHNU faculty agreed to modify their programs to better match the first three years of the University of Dayton programs. While it was believed that the Shanghai Normal University curriculum had been effectively changed to better align with the University of Dayton curriculum, the final transcripts told a somewhat different story. When the final transcripts were received, it seems that some of the courses that were indicated in the program were not actually taken.

During the first summer at the University of Dayton, SHNU students remained in their cohort to complete six credits of English Composition, three credits of Communications, and one credit of University Orientation. In the succeeding year, Chinese students were integrated into existing courses in the EET and MFG programs, enrolling in 16 – 18 credits in the Fall and Winter semesters. The original Agreement of Cooperation stated that students would return to China for their remaining UD course. However, upon reviewing final SHNU transcripts, it was determined that students in the first cohort were still missing some University-required General Education courses, and were required to complete these additional requirements prior to receiving their degree from the University of Dayton. UD faculty rearranged the last year of the curriculum to accommodate the missing classes and best serve the needs of the students. Over the past seven years, the curriculum has morphed to provide SHNU students with the outcomes required in the University of Dayton program. The current final year of the current curriculum is shown in **Figure 1**.

Figure 1. Current fourth year curriculum.

Shanghai Normal University				Cohort 7			
2012-13 Course Schedule **							
Electronic & Computer Engineering Technology (ECT)				Global Manufacturing Systems Engineering Technology (GMT)			
Summer 2012				Summer 2012			
CMM-110	Decision Making	1	↔	CMM-110	Decision Making	1	
CMM-111/112	Public Speaking	1	↔	CMM-111/112	Public Speaking	1	
CMM-113	Interviewing	1	↔	CMM-113	Interviewing	1	
ENG-270*	Reading & Writing in the American University	4	↔	ENG-270*	Reading & Writing in the American University	4	
SET-300	ET Transfer Seminar	1	↔	SET-300	ET Transfer Seminar	1	
		Summer 2012 Total	8			Summer 2012 Total	8
Fall 2012				Fall 2012			
ECT-306	Electronic Devices II	3		MFG-208L	Geometric Dimensioning & Tolerancing	1	
ECT-306L	Electronic Devices II Lab	1		MFG-432	Materials & Processes-Plastics & Composites	3	
ECT-466	Microcomputer Architecture	3		MFG-438	Sustainable Manufacturing & Product Design	3	
ECT-408	Data Acquisition & Measurements	2	↔	ECT-408	Data Acquisition & Measurements	2	
ENG-271*	Technical Writing Laboratory	2	↔	ENG-271*	Technical Writing Laboratory	2	
				IET-408	Lean Management Methods	3	
IET-323	Project Management	3	↔	IET-323	Project Management	3	
SET-499	Senior Seminar	1	↔	SET-499	Senior Seminar	1	
IET-317	Industrial Economic Analysis	3	←				
		Fall 2012 Total	18			Fall 2012 Total	18
Spring 2013				Spring 2013			
ECT-357	Microprocessors I	3		IET-318	Statistical Process Control	3	
ECT-362	Concepts & Apps of Comp Operating Systems	3		MFG-240	Manufacturing and Product Design	3	
ECT-452	Feedback Controls	3	→	IET-317	Industrial Economic Analysis	3	
MFG-431	Controls for Industrial Automation	3		MFG-427	CIM & Global Manufacturing	3	
ECT-490	Senior Project	3	↔	MFG-490	Senior Project	3	
PHL-316	<i>PHL-316 Engineering Ethics</i>	3	↔	PHL-316	<i>PHL-316 Engineering Ethics</i>	3	
		Spring 2013 Total	18			Spring 2013 Total	18

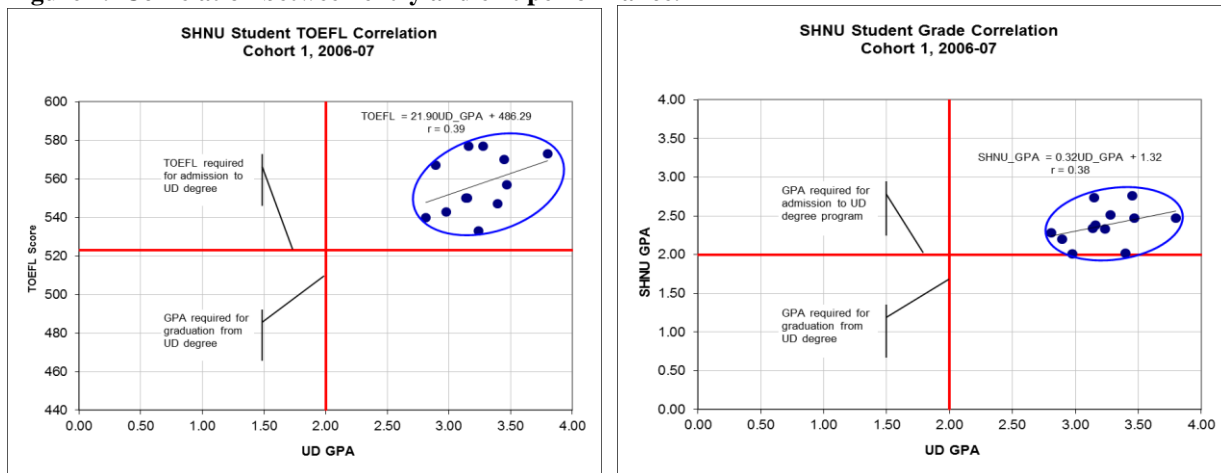
* ENG-270 + 271 will fulfill the University of Dayton requirements for ENG-101 + 102.

Shanghai Normal University administration initially applied for approval from the Ministry of Education for this transfer program. In order to gain approval the Ministry asked for additional contact between students enrolled in the program and US faculty. An agreement was reached whereby faculty from the University of Dayton would periodically travel to Shanghai and “guest lecture” in established SHNU courses. In 2006, three faculty in general education and engineering technology traveled to SHNU to deliver classes during the University of Dayton

spring break. Since the time was short, this method of interacting with SHNU students was very disruptive to UD faculty. However, since the Spring semester at Shanghai Normal University extends some six weeks beyond the end of the University of Dayton semester, this seemed like an opportune time for faculty to travel to Shanghai. In Spring of 2007, University of Dayton faculty spent four weeks delivering course content to upcoming SHNU cohorts. In subsequent years, 1-2 UD Engineering Technology faculty travel to SHNU to teach students enrolled in the International program for four weeks.

While faculty thoroughly reviewed course outlines and materials from Shanghai Normal University courses, there was still some degree of faith that students would have the backgrounds necessary to succeed in an academically rigorous engineering technology program. Entry requirements for students in the first cohort were quite lenient, when compared to students transferring to the University from other domestic institutions. Students were admitted with a GPA of at least 2.0 (out of 4.0), and a TOEFL score of at least 523. The performance of students in this first cohort was closely monitored, and all twelve students completed the program. Following graduation, the students' exiting grade point average was compared with their entry GPA and TOEFL scores to see if entry scores were any indication of overall performance. For this first cohort, there was only a weak correlation between entering and exiting GPA ($r = 0.38$), and entering TOEFL and exiting GPA ($r = 0.39$), as shown in **Figure 2**. Subsequent cohorts showed similar weak correlations, indicating that ultimate success could not be predicted by entry scores. Therefore, entry requirements have remained as they were defined for the first cohort.

Figure 2. Correlation between entry and exit performance.



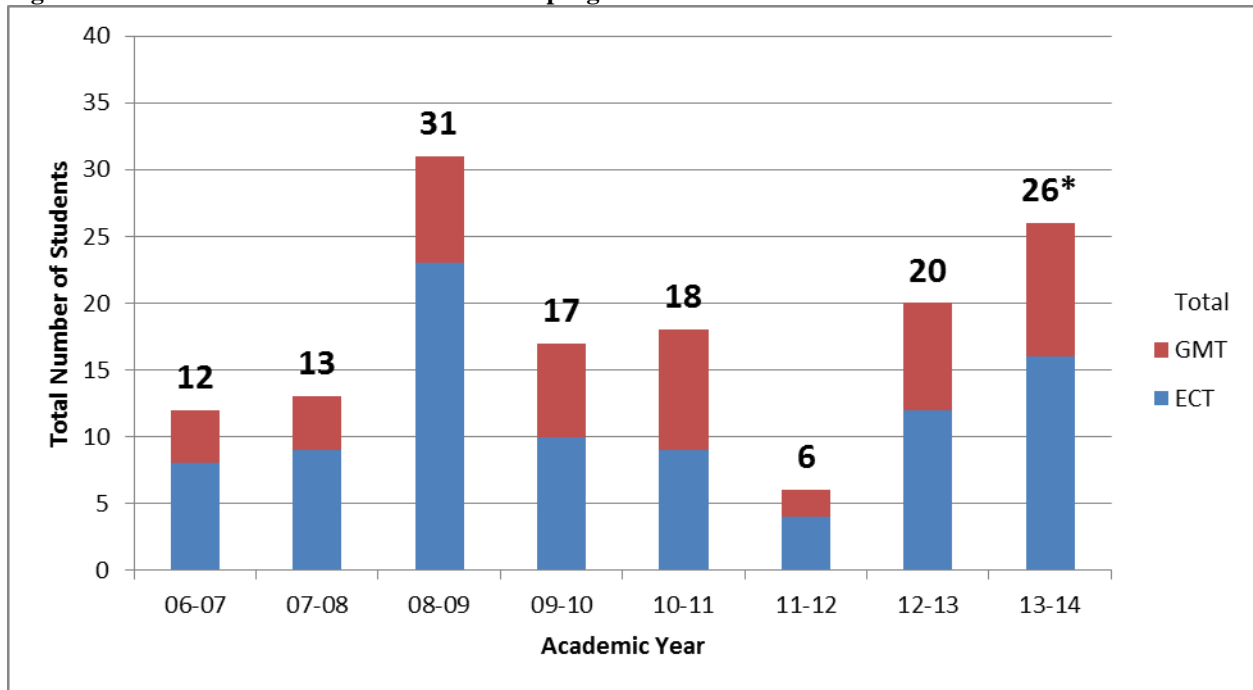
Students were found to have good academic preparation, especially where there was significant reliance on mathematics and basic sciences. However, their ability to perform design based on accepted practices, and their skills in solving more open-ended problems, appeared to present more of a challenge. Students were required to demonstrate an adequate level of proficiency in the English language, as demonstrated by the Test of English as a Foreign Language (TOEFL) scores to be admitted to the University of Dayton. While their conversation skills are good, students still have difficulty with English communication of technical materials, differences in

systems of units, and testing methods. In spite of these challenges, students have quickly acclimated to college life and culture at a Western institution.

Student Success

To date, 117 students in seven cohorts have completed the 3+1 transfer program in either Electronic & Computer Engineering Technology or Global Manufacturing Systems Engineering Technology, as seen in **Figure 3**. For the eighth cohort, approximately 26 students are planning to enroll at the University of Dayton.

Figure 3. Students enrolled in the 3+1 transfer program.



With over 100 students completing the program, trends in student success are becoming evident. Approximately 45% of students remain in the US for graduate school. The remaining 55% of students return immediately to China, and gain employment typically at US or multinational companies. Today, UD alumni in China work for such companies as Lenovo, Mitsubishi Electric, GE, Unilever, ABB, and Exxon Mobile.

Lessons Learned

Differences in culture and communicating though e-mail, halfway across the world, seemed to exacerbate the negotiation process. It was apparent that faculty at both institutions were trying to develop a partnership that was in the best interest of the students. However, while faculty attempted to learn about each other's business culture it was apparent that many of the issues that arose during the negotiation process were due to differences in culture and communications.

In the US, contracts are generally clearly detailed, with all contingencies spelled out, whereas the Chinese prefer less detail and feel that all issues are still subject to negotiation⁴. This was apparent when the signed agreement was delivered to University of Dayton faculty with an understanding that the “two parties will negotiate the curriculum...” The curriculum negotiations took a full three years of development, and were still being worked out after the students were already most of the way through their program.

It is important to develop a strong relationship prior to entering into negotiations. The Chinese refer to “Guanxi,” or the “connection” that is developed between parties⁵. Taking the time to build a relationship between the parties may be time consuming, but necessary in developing a lasting relationship.

Negotiating curriculum across cultures and time zones has been continuous, even as student cohorts are progressing in the programs. This has posed a challenge to ensure a balance between requirements imposed by each institution and accrediting bodies, the reputation of the respective programs, and the best interests and academic preparation of the students. Nonetheless, much has been learned during the development and implementation of this agreement.

Faculty at the University of Dayton have worked with seven cohorts of students from Shanghai Normal University, and continue to develop their skills in interacting with a classroom of multinational learners. Classroom skills for faculty include being more cognizant of communications for delivering course materials⁶. Extra effort needs to be placed on classroom interaction of Chinese students in the classroom. Furthermore, for project-based classes, teams should be designed to include cross-cultural teams that integrate Chinese and American students.

Conclusion

Faculty at both institutions are committed to the success of the program. Program development continues for future cohorts, interaction between students in China and faculty at University of Dayton is increasing, and administrators at both institutions have committed additional resources to assure the continued development and ongoing success of the program.

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