

Work in Progress - Global Engineering Collaborative Undergraduate Engineering Program between the USA and China

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Abstract

Today, internationalization of higher education is one of the important major developments of higher education. Shanghai University of Engineering Science [SUES] and Lawrence Technological University [LTU, of Southfield, MI] have had a multifaceted academic collaboration since 2003. Fifteen American engineering faculty and 1200 Chinese engineering undergraduate students have participated in the evolving collaborative effort thus far. The evolving program has several major components: certificates for undergraduate Chinese participants, graduate work for both Chinese and American students, and American undergraduate participation in a Chinese university.

This paper presents a description and assessment of the ongoing global cooperation program, concentrating on the international flavor of the China-USA higher education program.

Index Terms – Engineering education, global engineering education, collaborative engineering education.

INTRODUCTION

SUES is a strong regional engineering college, focusing on undergraduate engineering in China, as is LTU in Michigan. The initial phase of the collaboration has been a certificate program for SUES students. The SUES students receive a certificate recognizing their achievement of five courses that are taught by LTU American professors, who teach the courses in English in Shanghai. The SUES student undergraduate programs are the Automotive Engineering BS degree and the Electrical Engineering BS degree. The courses include Introduction to Engineering, Introduction to Electrical Engineering, Quality Control, Automotive Microcontrollers, VLSI design, Project Management, Engineering Cost Analysis, Electrical Machines, Control systems. This program is ongoing and has been since 2005. Each year, continuous improvements and enhancements are made to the program. Enhancements and variations have included textbooks, course length, course size, course prerequisites. The program has proved to be very popular with the Chinese students, as it gives them access to global engineering.

GLOBAL ASPECT

This global engineering education program promotes the flow and exchange of teachers and students, strengthens international collaboration on both education and research, improves the academic standards

and quality, increases the number of research projects, enhances international and cross-cultural understanding, and enhances international status of university.

The American professors typically have several sections of each course, and each section will have a Chinese professor to facilitate the teaching in Shanghai. This professor collaboration is essential for a number of reasons. The Chinese professors organize exams, rooms, name pronunciation, and logistical aspects. Both professors work on the syllabus, adjust prerequisites, teaching implementation, and arrange assignments. The lectures are delivered in English, and often this is the first time the Chinese students and professors have had the opportunity to listen to a native English lecturer.

The “global mindset” for both sets of faculty has been very beneficial. The following chart, Figure 1, shows the year and the increasing number of faculty:

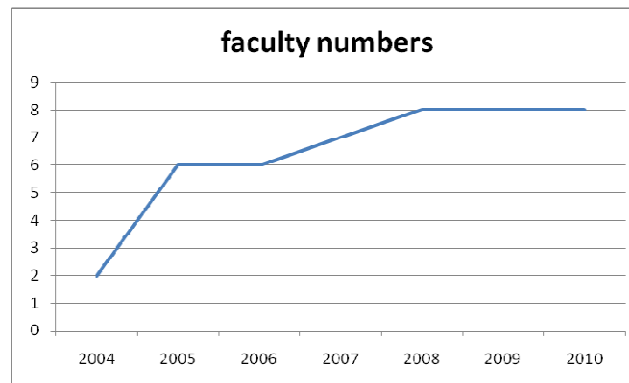


Figure 1 – American Faculty Participation

This shows and reflects the typical learning curve for both institutions. The instructors that return to teach for a second visit to China are stabilizing.

The following adaptations by both institutions have helped to facilitate the collaboration:

1. Participation in the ‘English Corner’ – most professors enthusiastically participate in the SUES English Corner routine, where the students/faculty practice English and gain a global perspective over lunch.
2. Chinese students must pass the ‘CET 4’ [College English Test] in order to receive an undergraduate diploma, and the LTU/SUES collaboration complements and assists in this effort.
3. Increased communication among the faculty of the two institutions. This has been formal [seminars, papers, research] and informal [cooking dinner, local entertainment].
4. Increased language comprehension on the part of the Chinese students. According to Hu [1], “self-esteem orientation and self-fulfillment orientation” are primary motivations for Chinese students to excel at English, and the LTU/SUES collaboration provides this. Other authors [2,3] note the motivational aspect to learning in China.

PLANNING PHASE

Professors of both universities are heavily involved in the curriculum development. The courses are arranged by the SUES administration initially. Then, professors of both universities become involved in the curriculum development. The courses are typically American courses, then tailored to China. For example, Quality Control’s adaptation to China:

1. Heavy reliance on a student group presentation of a Malcolm Baldrige National Quality Award winner has changed to be a presentation on the student's choice of a MBNQA or other national quality award winning company [such as the Deming Award from Japan]
2. American professors are in China for weeks, not months and the Chinese students take the same number of contact hours in an accelerated format. Homework grading would be very burdensome for the American professors, so the Chinese professors will grade homework and exams.
3. Application of Problem Based Learning in each course, so that the Chinese students can actively participate in problem solving, which is essential and at the core of each class.
4. Assessment of the student work is done according to each professor's syllabus. The grade for the class will count toward the B.S. undergraduate engineering degree from SUES, and will also appear on the LTU undergraduate transcript as well [even if only 5 courses appear, and not an entire degree].

EXPANSION PHASE

A number of enhancements are planned for this global engineering education project.

Some of the proposals in process include:

1. American students studying in China, with emphasis on the particular Chinese engineering courses and Mandarin/Shanghainese language immersion. In addition, the advantages of global/Chinese experience for the American student is invaluable. Two LTU American students have attended the World's Expo in Shanghai in 2010. The exposure to the SUES program has provided the needed impetus to expand the program, as well as highlighted the necessary logistical requirements.
2. A variant of the 2-plus-2 program for Chinese students, where the Chinese undergraduate student would spend some time in the USA studying, as well as in China. Presently, LTU has other 2+2 programs with local US community colleges and similar institutions in Chengdu China.
3. Expansion of the courses for the certificate, and possible additional engineering coursework certificates such as an entrepreneurial certificate [which is very popular with undergraduates at LTU].

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