An Innovative Approach to Offering a Global Supply Chain Class for Engineering Managers in an International Context

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Introduction to International Context in Higher Education

There is a growing movement in higher education institutions in the United States as well as in Europe to encourage students to study abroad. The reason for this is so that students can get early exposure to different cultures and experience the intricacies and challenges of working with colleagues from different countries and varying cultures. Additionally, ABET Outcome h states that a student should be able to experience the broad education necessary to understand the impact of engineering solutions in a global and societal context. Furthermore, the book titled *Educating the Engineer of 2020*, discusses how the responsibilities for today’s engineers are greatly different than just a few decades ago. In particular, the book states that engineers of 2020 have to be exposed to working on multi-cultural teams as well as understanding the need of the customer. This is referred to as “customization” which is a buyer – centric business strategy that combines mass customization with customized marketing. Furthermore, there is a strong emphasis on sustainability and on engineers to create a sustainable world. As a result of the above circumstances, which leads to increased complexity, it is necessary for engineers to recognize that they are expected to understand and implement much more than merely the technical aspects of projects, but also to be able to work on international teams, since most engineering firms’ supply chains stretch across international boundaries. For many engineering firms, due to increasing cost pressures resultant from globalization, products are designed in country X, made in country Y, and the customer and after sales support could be in country Z. Hence, the engineer of the 21st century has to be able to work with people in all of these roles; thus making international exposure extremely important to engineering majors—very often, giving them a competitive edge over other engineers who have only been educated or worked in a single culture.

Additionally, according to John Grandin who runs the International Engineering Program at Rhode Island University, the study abroad program also enhances students’ problem solving skills, expands their views, and also makes them more accepting and open to new ideas. These perceived benefits for students were mostly anecdotal and subjective, but in 2012, the Institute of International Education of Students conducted a formal study to evaluate the benefits of international study programs for students. With a sample size of over 3,000 students, they found that, in many cases, studying abroad was a defining moment in a student’s life and also had long-term impacts on the student’s personal growth, intercultural skills, and educational and career attainment.

For the context of this paper, the authors have accepted the definition of internationalization in higher education given by Dr. Jane Knight, who described it as a process of integrating an international dimension into teaching, research and service.
There have also been many professors from U.S. universities who have gone overseas to help make improvements to global higher education, who play important roles in global higher education, and who provide services for changes to be implemented into the education systems of other countries. This also serves as an opportunity for the U.S. professors to be able to learn about other educational systems worldwide and then identify best practices that they can incorporate into their own educational system. There are also many cultural benefits that can be obtained by the internationalization of higher education. In addition to the U.S., there are many regions of the world that are focusing on international education. As a result the landscape of international education can be thought to include several other regions such as the Middle East, Asia Pacific, Africa, Europe, and Latin America.

Despite the growing trends in International Education and the forecast for it to continue growing, there are several factors that should be kept in mind that could affect the growth of international education positively or negatively:

- Government Policies and Cost of Study
- Political Realities and National Security
- Expanded domestic capacity
- Internationalization of curriculum
- E-Learning

Examples of Internationalization in Higher Education

As mentioned above, there is a growing trend in the internationalization of higher education. Even though the U.S. sets the trends when it comes to offering services and consulting to other countries to set up their higher educational systems, the internationalization phenomenon is strongly shaping all across the world, in almost every continent of the world.

An example in Asia is the alliance of Peking University, Seoul National University, and the University of Tokyo to share resources and allow their students in certain approved courses to complete their degrees at one of the partner institutions. Furthermore, in Asia Pacific, Vietnam is emerging as a country that wants to increase the internationalization of its higher education system. For example, Hanoi University of Technology is currently offering masters and bachelor’s degrees with institutions of higher education from Belgium, France, Germany, Singapore, and the U.S. The University of New South Wales will establish for the first time a 100% foreign owned higher education institution in Singapore with a plan to offer undergraduate and graduate programs, which will include a strong research focus.

In the Middle East, examples of internationalization of higher education include Saudi Arabia’s establishment of a new private university that will involve foreign institutions and investors. The University of Arizona and UNESCO are helping to establish the Prince Sultan
University. The Stevens Institute of Technology is cooperating on the founding of Dar-Al-Faisal University, and Harvard University is setting up a campus in the United Arab Emirates. In Bahrain, the University of Hanover (Germany) is planning an affiliation with a new Euro University that is being set up there. Lastly, Egypt is already home to the American University which was established more than 80 years ago.

There are also several student exchange programs, as well as study abroad programs, that take place between universities all across the world. An example is the study abroad opportunity for engineering management majors at Stevens Institute of Technology in Hoboken, NJ. This is a three-week class that was designed for the students in Italy, which was extremely well received and was at capacity with a waiting list within two weeks of the registration process opening.

Along similar lines, the authors of this paper developed a student exchange program between University X in the U.S. and University Y in Germany. This student exchange program between the two universities is the focus of this paper and the survey results have been discussed as well.

**Implementation Approach of Student Exchange Program**

In April 2015, California State University, Northridge (CSUN) and Technische Hochschule Ingolstadt (THI) signed a formal Memorandum of Understanding (MoU) which included joint research and faculty exchange, as well as student exchange programs. In addition to joint publications and faculty exchange, in Fall 2015, the first student exchange program between the two universities was initiated.

In total, there were a total of 19 graduate students at the master’s degree level that were registered in this class: nine students from CSUN and 10 students from THI. This combination was made possible by the instructors from CSUN and THI pre-planning the curriculum together and then mapping the various topics so that the students from both universities would cover the same content and get a similar experience.

The main aspects of this innovative class were to include an international and practical focus for the students. The international focus was not only based on the common group work with students coming from different countries and different cultures, but the unique focus was to implement the class at the partner-university together with lecturers from both universities as well as from industry. In this case, two professors from the U.S., three professors from Germany, and one professor from Poland were involved in delivering lectures and workshops to the students.

**Organization and Content of the Class and Exam**

The class that was considered for the exchange program between the two universities was a course on Sustainability in the Global Supply Chain, in which students were exposed to all three
aspects of sustainability. However, there was an emphasis on social sustainability as this is a topic that engineers are generally not aware of or exposed to. The format was that the professors from both CSUN and THI would provide the students with significant amounts of theory during the first few weeks of the semester at their respective institutions. The students from CSUN would then, during Week 8 of the semester, travel to THI for a one-week block class of all day classes from Monday to Friday, with each day lasting from 8.00 a.m. until about 6.00 p.m. After the one-week block class, when the students returned to their respective campuses for the remainder of the semester, they had to prepare a group project, in an interdisciplinary team. This team included students from both CSUN and THI working together on the project. The preparation of this project had to be done after the one-week block class using classical communication methods such as email, telephone, etc., and also other more modern communication techniques such as facebook, whatsapp, skype, etc. This also gave the students an experience to work on virtual teams, which is something that all engineers should be aware of before they go out into industry since this is something that they often struggle with. Even on this project, the students had to experience the reality that they will face to work on international teams, including the 9 hour time difference that exists between the US and Germany. These projects were provided to the students by the companies that were visited during the one-week block class including BMW, Audi, Continental, and Faurecia. The goals and objectives of the projects were initially defined by the faculty member at THI who had contacts at the German companies we visited. In addition, during the visits to the various companies, the company representatives discussed the goals and objectives of the projects with the students so it was clear as to what deliverables were expected from them. This way, the students had a hands-on approach to work on sustainability related issues as faced by these companies, and the faculty objective to offer practical oriented topics were fulfilled.

The exams associated with this class to evaluate the students were divided into three parts. There was a presentation that was required of all students on a prior defined topic, an oral exam at the end of the one-week block class, and the final project that was worked on by students of both universities. The oral exam was organized on the last day (Friday) of the one-week block class. The students were asked individually about the presentations and topics discussed at the classes in the form of lectures by the professors as well about the topics related to the discussions at the companies. Therefore, the students were tested for a high level of practical experience.

At the end of the semester, a detailed survey was distributed to the students of both universities. Even though there were a total of 19 students enrolled for the class, only 15 students responded to the surveys. Hence, the results of the survey are based on 15 answers (i.e., a 79% response rate). From CSUN, eight completed surveys (89%) were received and from THI, seven completed surveys were received, which was a 70% response rate. The ratio of the female participants was 37%. From the total of 15 survey responses received, 73% of the students had work experience of approximately four years.
The result of the survey shows that 93% of the students indicated that it was very high or extremely beneficial that this class involved an international component. Especially, the contact of the students between each other was rated very high on a level of 4 where “1 = extremely negative and 5 = extremely positive.” Most of the students claimed to have experienced added value by virtue of the different culture of both groups. This was especially pronounced after the one-week block class while preparing the project work. The difference in the kind of working habits from the students of two universities was mentioned in many remarks. This result gives a strong impression about the importance of international experience in teaching at the university level. Even though the participants already have an average of four years of work experience, it was primarily domestic work experience and did not involve international experiences of working on multinational teams; thus making this a unique experience for many of them.

In addition, the visits to the German companies were rated as an interesting experience and added value. In this class, with the specific topic of sustainability in Supply Chains, most of the companies the students visited are in the automotive industry, i.e., they were either OEMs, first tier suppliers, or a logistics hub company.

This oral exam was ranked from the participants with an average score of 4 where “1 = extremely negative and 5 = extremely positive.” Even though there was limited time to prepare for the oral exam, the students still ranked this type of exam very good. Representative statements of the students give an impression about their thoughts of the oral exam. Such statements include, “It was good that we had it. It also felt like it was a prep for a job interview and it forced us to focus during the whole trip,” and “As there have been presentations and company visits during the whole week, my head was filled with a bunch of new information and I was not able to use my knowledge anymore.”

**Challenges Faced During First Time Set Up**

A major challenge of such a class is the organization of the logistics including flights, accommodations, and travelling to the various companies while at the host university location. The participants had to cover their own expenses for the most part. The students from CSUN did get support of $600 per student to partially cover the costs of the trip. The total costs were approximately $1800 - $2000 per person, which was mainly due to the international flight and accommodation for a 7-day period. Another logistical challenge was that the visits to several companies (up to 50 miles away from the university) had to be organized carefully. This included the challenge of contacting the companies, scheduling the time of visit at the company, and also to coordinate public transportation schedules to make sure that everyone arrived on schedule to the location. For the most part, one trip to a company was planned per day, except on Day 4 when we visited two companies. These trips were organized during the block class time period of 8.00a.m to 6.00p.m., with the lectures and presentations held in the mornings and the industry in the afternoons. However, due to painstaking efforts of the faculty at THI who arranged all the industry visits, the logistics and all the visits went off smoothly. In the survey
responses, the students had mentioned the logistics arrangements explicitly as a very positive experience with a value of 4.9 where “1 = extremely negative and 5 = extremely positive.”

Possible Improvements for Future Class Offerings

Based on overall positive feedback that was received about this class, both partner universities plan to continue this kind of interdisciplinary classes in future. Therefore it is of importance to get some critical indications about what has to be improved and what worked well during this first pilot round that was conducted in Fall 2015. Concerning the duration of time of the “block class,” most of the students’ responses recommended to keep it for one week during the semester. Only two out of the 15 students who responded to the surveys proposed to extend this class to 10 to 14 days due to time constraints that were faced, especially for the lectures in the mornings.

An interesting result of the survey is the answer about the prioritization of the added value that the students got from the three phases of this class. The preparation of the presentation individually by each student was ranked with 1.7; the project work after the block class was ranked with 1.8 and the block class itself was ranked on position 2.4. This was on a scale of 1-3 where the students were asked to prioritize the three major activities associated with the class, where 1 is the highest ranking and 3 is the lowest ranking. This is an important indicator that all three parts of the class were considered of importance concerning added value. Even taking into consideration that there might be different background knowledge about topics related to “Sustainability in The Global Supply Chain” between the students from CSUN and THI, both groups have done a similar evaluation. It indicates also, that the one-week block class that was ranked with 2.4 (from the three parts of class) on the lowest level should not be extended past one week. Also, on average, the workload was indicated to be comparable with other classes by students from both groups.

Concerning possible topics to be handled in future classes, some students proposed to increase the breath of topics. In addition to sustainability (especially with focus on the ecological and social part of sustainability) the students would like to discuss topics about lean production/lean Supply Chain Management.

Conclusion and Next Steps

Overall, internationalization in higher education is a trend that is increasing all over the world. Between universities, there are significant amounts of cooperation contracts which exist with a special focus on exchange of students for a whole semester, or on faculty exchange for teaching or conducting research. In addition, various universities also offer summer/winter schools or double degree programs with a defined curriculum. This kind of cooperation can be cited as a standard exchange of students/staff and a common program. There are several advantages of this kind of class:
Students have the possibility to gain international experience in a short time and can earn credit from their home-university for this experience.

The duration of their study program will not be extended, nor will the total number of units in their program be affected.

The cooperation of the university is “really” happening—both partners add value with presentations, organization of company visits, etc.

The acceptance of such programs from the students is very high—even though they have to pay most of the travel costs from their own money.

In the future, both partner universities will continue this kind of program with increased flexibility for several topics of research or practical aspects. This kind of cooperation is definitely of added value for the students and the universities.

References


