Exposing Undergraduate Engineering and Computer Science Students to the Asian Business Culture in a Project-Based Abroad Program: An Assessment of Program Challenges

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Abstract – Conducting an international summer program is difficult enough, but combine that with a project-based program that combines undergraduate and graduate technology and business majors from the United States, Europe, and China; working on real project for real companies and providing meaningful results in six short weeks; and you have a uniquely challenging program. The I5 program (Immersion Into International Interdisciplinary Innovation) is a program about technology innovation that itself had to be innovative to meet the growing ABET requirements for meaningful global experience for engineering and computer science majors. It also had to provide the learning experiences that would apply directly to the various engineering, computer science, and business fields to make it worthwhile and desirable for the students. While the coursework and various project plans were demanding, one of the real challenges came in the recognition and accommodation of the cultural differences and the language barriers within the teams, as well as those between the teams and their program sponsors. This paper will document the challenges faced in the deployment of this new study abroad program. It will also include an summary of the student evaluations, especially the impact of the program on the American, the European, and the Chinese students in terms of how they now approach their perspective of the world, different cultures, their chosen discipline, and their outlook on the future.

Index Terms - global business experiences, project-based learning, study abroad for technology majors, technology innovation.

INTRODUCTION

The literature documenting the challenges facing the future of engineering education in the United States can be alarming:

- The future of the United States’ preeminence in cutting-edge technology innovation teeters in the face of lower STEM enrollments in colleges and universities. [1,2]
- Outlook for engineering job growth as forecast by the Bureau of Labor Statistics will grow no faster than the national average between 2006 and 2016. [3]
- Employers indicate that STEM graduates are not prepared for their careers when it comes to global knowledge, business knowledge and skills, project management, written communication, and international perspective. [4,5]
- Concern among the National Academies that the “scientific and technical building blocks critical to our economic leadership are eroding at a time when many other nations are gathering strength.” [6]

In light of these challenges, many beyond the scope of this discussion, there is tremendous opportunity to make lasting improvements in the areas of innovation and creativity, areas for which the United States has been preeminent, and improvements which must also be applied to the field of engineering education in the U.S. In answer to the need for global experiences, international perspective, business knowledge and skills, and project management, the Schools of Engineering & Computer Science (ECS) and the Hankamer School of Business (HSB) at Baylor University have teamed to develop an international, interdisciplinary, project-based summer study abroad program, and to deploy it in its first year in China, where the potential for transformation through technology innovation is at its greatest, and the opportunity to interface with the government, business, and education is available, according to Premiere Wen Jiabao in his explanation of the Proposal of the Eleventh Five-year Program in October of 2005. [7]

The need for international experiences and business skills for engineering graduates is not new, and Baylor University’s response to these challenges has also been documented previously. The I5 program is the culmination of many years of planning, development, and research between ECS and HSB in the areas of interdisciplinary programs, global experience, and integration of business skills within the engineering curricula, and it is hoped that this discussion of the I5 program will be a continuation of the dialogue that was rekindled recently with the publication
of “Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.”

The summer 2007 summer study abroad program is actually the third joint venture between ECS and HSB, and is a project-based course in technology entrepreneurship and innovation, where American, European, and Chinese students from STEM or business fields are led by a graduate student (engineering or MBA) to deliver a technology-based project scoped jointly by the team leader and the project sponsor. The project sponsors are multinational and Chinese companies who have identified potential technology innovation challenges that are anticipated, but not yet at the stage where the company has decided to invest resources in them.

There are many challenges that we faced, both anticipated and unanticipated, that are discussed in this paper as we look forward to the summer 2008 program.

**Challenges Faced**

One may (correctly) imagine many challenges that would arise from the intense culture shock to American students – many of whom obtained a passport for the first time to join this program – as they are thrust into the press of people, confusion of language, the hot, humid weather of Shanghai in July, and the fast paced learning of the I5 program simultaneously. What may be less obvious is that the cultural differences and communication challenges that persist even when organizing a program in China with the cultural differences and communication challenges that are anticipated, but not yet at the stage where the company has decided to invest resources in them.

There are many challenges that we faced, both anticipated and unanticipated, that are discussed in this paper as we look forward to the summer 2008 program.

1. Communication / Coordination of the Program

The most far-reaching of these elements is also the most fundamental – developing effective strategies for ongoing communication and collaboration between the US school and the Chinese host institution. It is well beyond the scope of this paper to offer comprehensive learning relating to the general challenges of collaborations between entities in the US and China. Instead we will review examples of issues that are directly impacted by choices in design of joint educational programs of this type, and then draw a few conclusions.

The first such example is that I5’s deliberate choice to create an unusually high degree of immersion results in a correspondingly high demand for coordination and clarity of expectations. The advantage of engaging student teams in commercialization projects sponsored by Chinese and Multi-national companies comes with a “price” of placing a communication-intensive demand on the joint leadership team to identify, qualify and obtain firm commitments for projects from these firms operating in China. To be more specific, detailed shared understanding must be developed regarding the type, scope and cost of projects suitable for the class; the selection process must be coordinated and will be influenced by the evolving mix of students skill-sets (as they enroll), and can require reformulation at the last minute if some firms’ needs change and projects turn out to be unviable.

While blocks of this coordinated effort can be accomplished during planning visits 3 to 6 months ahead of the actual program dates, it is a dynamic process that must primarily be coordinated via long-distance communication tools such as emails and phone calls. In contrast, a case-study based approach or even a mega-project at one specific firm would offer simplified communications and lower the demands on the leadership team’s level of collaboration.

In the case of I5’s launch, the choice we made to develop “live” commercialization projects for each team of 5 to 7 students, and the choice to require at least a token payment from the firms put such a high demand on the team that three separate, strategically timed planning trips to China had to be undertaken to make such an ambitious design feasible from year one. This investment by both partners resulted in a nicely varied project “menu” in year one, but in 3 cases out of 7 projects did not achieve the ideal blend of technical and business components needed to fully engage and challenge the cross-disciplinary teams. The learning and degree of synchronization of efforts continues to improve as the second year program nears final readiness, and it is hoped that the clarity gained during this early stage will lead to a much less face-time-intensive planning process in future years.

A second example of communication-intensive demand drivers is the choice to utilize a team teaching model for the course. Because the students are drawn equally from Chinese and American schools, it is an objective of the program to deliver “side-by-side” comparisons of how things are done in a US environment and in China, along
with some historical context that makes those cultural patterns understandable. A unit that compares “Five Defining Moments in US History” with “Five Defining Moments in Chinese History”, for example was designed jointly and faculty assignments made by each institution to deliver the talks. A communication gap became apparent when the Chinese professor interpreted the request as an opportunity to share a series of personal defining moments in his own life instead of the anticipated overview of key events of the past few thousand years in China. While interesting to hear, when compared side by side with the Boston Tea Party, the Battle of Gettysburg, these events did not produce the kind of dialogue we had hoped for, to say the least.

Again, the burden of detailed coordination and ongoing validation of shared expectations is directly tied to choices the program leaders made – we could have just split the class into separate sections for the culture / history topics and let each team (Chinese and American) develop its own approach to sharing with students from the other side. In 2008, we are choosing to utilize experienced cross-cultural trainers to develop modules for the mixed group.

The above examples as well as other experiences have highlighted some themes that need to be recognized in order to successfully develop collaborative US-China programming. The first is that the need for over-communication that is evident even without cross-cultural barriers is greatly magnified in this context: each point needs to be confirmed multiple times and on several levels of detail in order to assure true understanding.

Secondly, there is no substitute for face-to-face communication in any setting, but in China it seems to be even greater, because it is compounded by professional mores that place much lower priority on any requests that are not accompanied by the person being there, and that there appear to be generally higher expectations for advance definition and planning in the US in comparison with China.

Finally, we note that I5’s material, Technology Entrepreneurship, as well as its style of learning are relatively new in the China context. If a more familiar mode of collaboration – working with a Chinese school to simply host a group of foreign faculty and students, for example - were utilized, the demands on the communication skills of the team would have been much lower. Successful collaborators will need to first recognize the extent of the cultural gaps implicit in their programmatic choices and then bridge these gaps by developing mutually acceptable means of tracking progress on various issues, whether that be formal or informal. In so doing, strategies of communication that enable effective collaboration will be found.

II. Changes in Communication / Coordination of the Program for 2008

Our team now uses a weekly email update sent by the point person on each side, followed by a phone conference the following day / night to discuss. This mechanism functions well between face-to-face interactions which are still needed approximately once per Quarter to execute the I5 Program as it is designed.

III. Student Proficiency in English

Achieving high degree of connection to the Chinese students in the classroom and out is nearly as pervasive and foundational an issue as collaboration and communication between partner institutions. An English language program that requires the degree of interaction and mutual effort as I5 creates a potential problem, in that students who have little interest in the topic of technology Entrepreneurship may in fact have a high interest in an opportunity for so much “English practice”. It is interesting to note that 70% of the Chinese participating rated the program’s ability to improve their English as “very important” as one of their reasons for joining the program, while only 30% of the Chinese students rated their interest in technology entrepreneurship as “very important” to their decision-making process. [8]

As a result, a challenge that we faced in the first year was that over half of the Chinese students had either insufficient English skill or familiarity with the topic to understand the concepts taught in lectures. The manifestation of this problem was that our team leaders and the other American students found it necessary to use a great deal of their allotted project / teamwork time to try to re-teach the material to their Chinese teammates, instead of making progress on the projects.

This was recognized about 1/3 of the way through the 6 week course, and was addressed by recruiting additional Chinese faculty who took on two new roles: (1) they took turns attending the morning lectures, and then hosting a Mandarin language Q&A session for the Chinese students after class with the American lecturer present so that any immediate questions could be addressed; (2) these faculty also served as team coaches for the student teams in addition to the already-provided American faculty coaches, so that as questions and misunderstanding of how to apply the material arose, it would not fall upon the other students to try to explain.

IV. Changes in Student Proficiency in English for 2008

Chinese student qualifications are now much clearer to the partner Chinese schools for 2008, so this problem will hopefully be less severe in any case. An additional safeguard has been put in place, however, to assure that all students are ready to fully engage in this demanding process: a phone interview is required for each Chinese student, conducted by a US faculty or the Director of I5. In this interview the level of preparation for the material, the motivations for participation, and the level of oral English proficiency will be evaluated. In addition to this, the I5 program will investigate the development of proficiency scales on the Test of English as a Foreign Language (TOEFL) and the Test of English for International Communication (TOEIC) as admissions requirements for non-English speaking students.
V. Accommodations

The suitability of accommodations selected is focused only on the time-period of the program’s execution in the summer, but during that time has a profound affect on the tone and sense of how the program is working for the students – the Americans in particular. For a program whose duration is 6 weeks long (during the monsoon season in China), a choice to stay in the finest accommodations represents a decision to put the program out of reach financially for all but a few students. For groups whose stay is this long, and whose budgets are more limited, the choices fall to either 4-Star hotels or in some cases exceptionally well run 3-Star options.

The challenge faced is one of being able to fully qualify each hotel used, and the need to see the actual sets for rooms which will be assigned, since often the quality can vary significantly, particularly if some of the hotel has been renovated. Further it is a challenge to actually “see” the rooms through a western student’s eyes. In addition to the condition of the rooms, we found that since even relatively low-cost hotels charge a very high mark-up on handling laundry, it is necessary to arrange a group “contract” with a nearby laundry to avoid surprisingly high charges when students just use the in-hotel service.

VI. Changes in Accommodations for 2008

Rather than create additional burdens on our US staff and faculty to scout out every hotel in each city we have opted to raise the price of the program enough to allow us to stay in 4-Star hotels except where we have had good experience with particular hotels already and can count on achieving both quality and cost-efficiency. Since our itinerary is not identical, we do not have such prequalified options in each city we will include this year. Over time we will of course develop a set of “most favored hotels” that we can use repeatedly.

Another possibility that may become available is the use of various university guesthouses, for those locations with a host university affiliated with the program. With prequalification of the facilities, this would assure not only close proximity to the classrooms, but also a facility that could accommodate all of the students in the program. According to Jake Chen, one of the USST students involved in the program last summer, “it would help team mates to know each other if we can live in the same facility, on the same campus.”

VII. Program Schedule / Structure

A second issue that created challenges of more limited scope is the structure and schedule we adopted – both at the overall program (how the 6 weeks in China were laid out) and the day-to-day routine. In the broad sense the dilemma faced is that with a program of this length, and so many historic places to intrigue both student and faculty member, that the opportunity to travel each weekend to a new place is very compelling option. With a 3-Star budget, and the inevitable challenges of new hotels and their issues to solve, it turned out to be exhausting – particularly for our students. The excursions to Xi’an, Beijing, and Jinan were all memorable and hard to consider not doing in future years, but if undertaken they must be done with a higher level of service and “fool-proof-ness” that comes from a higher budget. Further, we concluded that every other weekend is more realistic for excursion travel with a group of this nature.

The day-to-day schedule was designed as follows:

- Monday through Wednesday mornings were dedicated to teaching the 6 Modules of the course;
- Thursday morning reserved to bring in speakers from China who could give examples from their own businesses that illustrate the topics we had covered that week.
- Monday through Thursday afternoons were split into two blocks: One to cover a range of cultural and historical perspectives in the side-by-side style described earlier, and Two, a team / project session that included coaching from both Chinese and American faculty
- Friday was reserved for catch-up and (usually) excursion travel.

The principal challenges with this approach to the daily / weekly structure stem from the problems described above – the communications issues resulted in miss-targeted content and the English skills of some Chinese students meant that the team time was consumed re-learning the lecture material. As a consequence, we decided to drop most of the culture and history sessions in lieu of a more extended teamwork time, and increased the level of bi-lingual coaching available. In combination with the adjustments outlined in earlier sections, this proved successful in getting the applied learning back on track, and enabled the students to demonstrate their understanding of the material in the way they conducted their projects.

VIII. Changes in Program Schedule / Structure for 2008

Several structural aspects have been redesigned. First, the program is now collaborating with two Chinese Universities (USST in Shanghai, and Lingnan College in Guangzhou) and each is hosting the group for half of the program time, and then we are locating at a conference center in a third city for the last week, where final reports will be developed and then presented to the sponsors. As a consequence, the opportunity and need for extra trips has been lowered. We will have two day-trip excursions: from Guangzhou to Hong Kong, and from Qin Huang Dao to the Great Wall, but these will be much easier to execute because no hotels need to be arranged and the students do not have to relocate with their belongings each weekend.

Secondly, the format for the integration of the course materials and the “extra” learning has been adjusted. A more coaching-based style of teaching the curriculum in Technology Entrepreneurship is being used, making it more...
experiential in learning style, so that the English skills of each participant are not quite as critical. This has a second benefit opening more of the afternoon sessions for cross-cultural topical discussions and team effectiveness exercises. We have added a staff member to our team with experience in preparing teams for cross-cultural effectiveness, and his approach is also more hands-on rather than lecture based. We expect that the assimilation of the knowledge of culture will actually spike upwards even though fewer “facts and figures” about each country and its history will be shared.

IX. Organizing Meals

In the old adage, “The way to a man’s heart is through his stomach” and perhaps a corollary for summer abroad programs would be “The way to a traveler’s happiness is through her breakfast”. The approach we took to making meals easy and predictable while maintaining affordability was to contract with our hotel to provide buffet breakfast and dinner, and then to have cafeteria cards the students could use at lunch. This failed to produce much “traveler happiness” for two reasons – low quality and monotony. The low quality problem was solved by switching from the hotel as dinner provider to a local restaurant that was willing to serve our group every evening on a head-count basis and bill the program on a weekly basis.

Monotony is a more difficult problem. An eMBA program tour of China or other such trip where people are constantly on the move is suited to having every meal predefined, but in a summer program in which students spend weeks, not hours, in a single locale, there is a cultural richness that they have an opportunity to experience by exploring in small groups with local students, and visit the “local haunts” that the host school participants know. Since the summer program fee is meant to cover these meal costs, this creates a tension for students who have already paid for the “standard” meals and will have additional (though not large) expenses for such meals. We concluded that we can provide a better balance between predictability and flexibility by developing a “standard” option for the group each evening, let students opt out and have the cash allotted for their meal so they can explore.

Coming back to our proverbial traveler’s breakfast and the happiness so derived, one observation worth noting is that many participants found that they were not only able but excited by the chance to try so many new foods, but the one meal that they wanted American-style options for is breakfast. After six weeks of dim sum and soups, most of our participants were pretty desperate for scrambled eggs and pancakes, or at least a good cup of coffee and a bowl of corn flakes. It seems that by providing these options at breakfast, a lot of tolerance is created for adventuresome menus later in the day.

X. Changes in Meal Planning for 2008

Some simple changes have been made: First, establish an unbreakable rule that no restaurant will be selected for ongoing provision of meals only on the advice of locals – the staff / faculty needs to experience each such choice first hand during planning stages of the program. Secondly we are opting for a weekly allowance system for all meals other than pre-organized group dinners / banquets. Even if a student chooses to eat at the “standard” restaurant on a given night, they pay for it out of their allowance for the week. The hassles of handling a significant amount of cash should prove worth the gain in flexibility and traveler contentment.

XI. Incidental Cost Planning for Students

The final issue we note from our first year experience is one that tends to become evident only toward the end of the program – students tend to lose track of their spending and some ran out of funds for incidentals and last-minute shopping. While not a major issue, any program director can attest that it will be better to end a trip on a strong note than a disappointment of some kind. Thus the need here is simply one of clarity, and proper setting of expectations. The only adjustments we will make in future years is to better explain the scope of the bargain hunting in China, and to include a “last chance” shopping area excursion that the students know is on the schedule for the last morning, and that they need to keep in mind as they allocate their funds over the six weeks.

SUMMARY

Embarking on any new program is difficult, especially when the new program impacts curriculum and teaching paradigms in the engineering disciplines. Although the initial offering of the I5 program faced some fierce obstacles, the results from the student evaluation were very encouraging.

100% of the students involved in the I5 program (American, European, Chinese) would highly recommend the program to another student. [9] For 90% of the Chinese students and 90% of the American and European students, the best outcome of the program was developing friendships and experiencing the cultural differences. For the other 10% (in all students groups), the best outcome of the program revolved around the fact that they worked on a real project for a real company, and they were able to deliver results in six weeks. [10] According to Jenny, a computer science student at USST, “I wanted to quit after the first week, and I am so glad I stayed. At the end, I stood up and presented findings to our company, something I would never do before. I am so proud of myself!” [11]

The whole point of organizing a program of this nature is to create a learning experience that is impossible to achieve otherwise. This program is designed to jar the world views of students culturally as well as in the creation of project work and teams that go well beyond their typical classroom experience. In all that, we succeeded, and can continue to improve upon that success.

We have found, however, that numerous arenas are laden with opportunities to push the sense of challenge and adventure to the point of being nearly maddening, and have done some re-engineering to avoid repeating the same ones.
we hit upon in our first year. New challenges are expected –
the design of the program includes interfacing our student
teams with multiple entrepreneurial firms and individuals
and so even the work itself (not to mention the number of
new personalities engaged each year) guarantees it will be
so. We do not ever want to eliminate it because this
openness to new and varied challenges is what make the
program unique, intensely educational and how it creates
value for its constituencies.

Jake, one of the international business students from
USST, gave us a fairly representative evaluation of the
program, “My life is changed after that six magic weeks.
Now everything is new for me because I begin to see them
from different points of view. And I can also accept different
cultures and ideas more smoothly. This change is not very
easy for a traditional Chinese. But I did it and I am very
proud of it. Just as the bible said that once I was a blind, but
now I can see. Recently I am reading some books about
globalization. Then I asked myself what globalization is.
Globalization is neither nation to nation nor company to
company. Globalization is person to person. People come
from different places can communicate with each other
without obstacles. I am glad to find that I5 devotes much
work to narrowing the gap among us. And it really works.”

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