

## **AC 2009-1282: INTERNATIONAL LEARNING EXPERIENCE IN CHINA FOR ENGINEERING STUDENTS AT OAKLAND UNIVERSITY**

### **Xia Wang, Oakland University**

XIA WANG (wang@oakland.edu) is an assistant professor in the department of Mechanical Engineering at Oakland University. Her research and teaching interests lie in the areas of fluid mechanics and heat transfer, with an emphasis on fuel cell technology. She is the faculty coordinator of the 2008 OU SECS trip to China.

### **Gary Barber, Oakland University**

GARY BARBER (barber@oakland.edu) is the chair of the Mechanical Engineering Department at Oakland University. His research and teaching interests lie in the area of tribology. He is the co-faculty coordinator of the 2008 OU SECS trio to China. He participated in advising students' project.

### **Laila Guessous, Oakland University**

LAILA GUESSOUS (Guessous@oakland.edu) is an associate professor in the department of Mechanical Engineering at Oakland University. She received her Ph.D. (1999) from the University of Michigan and joined OU in August 2000. Her research and teaching interests lie in the areas of fluid mechanics and heat transfer, with an emphasis on computational methods. She has also served as the program director for the NSF and DoD funded Automotive Research and Industrial Mentorship REU program at OU.

### **LianXiang Yang, Oakland University**

LIANXIANG YANG (yang2@oakland.edu) is a professor in the department of Mechanical Engineering at Oakland University. His research and teaching interests lie in the area of modern optical measuring techniques. He is the co-faculty coordinator of the 2008 OU SECS trio to China.

### **GuangZhi Qu, Oakland University**

GUANGZHI QU (gqu@oakland.edu) is an assistant professor in the department of Computer Science and Engineering at Oakland University. His research and teaching interests lies in the areas of operating systems, networking security and computing. He is the co-faculty coordinator of the 2008 OU SECS trio to China. He participated in advising students' project.

### **Ishwar Sethi, Oakland University**

ISHWA SETHI (sethi@oakland.edu) is the chair of the Computer Science and Engineering Department at Oakland University. His research and teaching interest lie in the areas of artificial neural networks, and statistical pattern recognition. He is the co-faculty coordinator of the 2008 OU SECS trio to China.

# **International Learning Experience in China for Engineering Students at Oakland University**

## **Introduction**

The U.S. has long been the worldwide leader in science and technology and continues to be so. However, in a growing global world and with an increasingly diverse U.S. workforce, it is becoming paramount for U.S. engineers and researchers to develop the skills and background necessary to effectively work, communicate and innovate on an international scale and to be able to collaborate on complex engineering and research projects with colleagues and collaborators across the world. Countries such as China and India, by virtue of their size, are graduating ever increasing numbers of engineers and scientists each year and are making great strides in scientific research. The effects of the globalization of science, engineering and manufacturing have been particularly felt in rust-belt states such as Michigan and Ohio where the loss of market share by the big three U.S. automakers has resulted in large job losses and a migration of a growing number of qualified engineering students and professionals to other states in search of job and educational opportunities [1-2]. In Michigan in particular, where Oakland University is located, there is a growing awareness for the need to maintain a high quality workforce that is able to innovate in the areas of manufacturing engineering.

Much has been made in the literature about the cultural differences between the U.S., European, Asian and other educational systems [3-11]. Although exchange between U.S. scholars and researchers and counterparts from developing or emerging countries has been taking place for a long time, much of that exchange has been unidirectional in the sense that typically, foreign scientists come to U.S. institutions to conduct research and make use of state-of-the-art laboratory facilities, rather than the other way around. The number of foreign students at U.S. universities is significantly higher than that of U.S. students at foreign universities. However, if the U.S. is to remain competitive in a global economy, it is important that future engineering leaders and researchers be given the opportunity to experience firsthand what it is like to work in a foreign engineering environment and to establish a network of contacts that could lead to future international collaborations. With that in mind, the department of Mechanical Engineering and the School of Engineering and Computer Science (SECS) at Oakland University (OU) have organized a number of short-term exchange programs with Chinese Universities for OU engineering students. This paper will focus on some details of the organization of one of these programs, including pre-departure preparation, on-site activities and post-program assessment. Emphasis will be placed on the lessons learned: what worked, what didn't work and what improvements can be made in the following years to ensure the sustainability of the program.

## **About the Program**

Sponsored by the Chrysler Foundation and Oakland University, the primary purpose of these exchange programs was to provide OU engineering students with the opportunity to work in China with Chinese engineering students on design projects and to learn about Chinese culture and language. A total of 44 OU students have so far taken part in the exchange programs that

were organized in May 2005, 2007 and 2008 at Tongji University in Shanghai and Beijing Jiaotong University in China. This paper will focus on the 2008 Beijing Jiaotong University (BJTU) program, which involved 12 students and 3 faculty from OU.

Located near the world headquarters and engineering centers of Chrysler, Ford Motor Co., General Motors Corp. as well as over one hundred automotive suppliers in southeast Michigan, the School of Engineering and Computer Science (SECS) at Oakland University and the Mechanical Engineering department in particular, have had long running partnerships and collaborations with many automotive companies, as well as research/teaching collaborations with several foreign universities. In developing the plan for this exchange program, the OU faculty team sought to draw upon its numerous professional and personal contacts and collaborators at a number of different universities in China and paid visits to a number of these universities. For the 2008 trip, it was determined that Beijing Jiaotong University would provide the best fit for this program in terms of the compatibility of their research with that of the OU faculty team, and their ability to host U.S. students and provide them with a rich educational and cultural immersion experience.

Founded in 1896, Beijing Jiaotong University is one of the oldest Universities in China. BJTU is a multidisciplinary national key university, covering a wide range of subjects in liberal arts, science, engineering and management. BJTU was one of the earliest universities authorized by the Chinese government to enroll overseas students and hence has considerable experience dealing with foreign students. There are currently over 220 overseas students from about 55 countries and regions studying at BJTU [12]. Furthermore, by virtue of its location in downtown Beijing, BJTU provides exceptional opportunities for students to explore the distinct culture and the metropolitan dynamics of one of the fastest developing countries in the world.

Using a grant from the Chrysler Foundation (which saw the benefit of challenging students to work in and explore a different culture) and from the university's Office of the Provost and Vice president for Academic Affairs, an exchange program involving three departments from the School of Engineering and Computer Science was organized in the spring of 2008. Funds from the grants were used to provide scholarships to 12 students to help defray many of the costs associated with travel. The primary focus of the program was to have OU students and BJTU students work jointly on a team-based design project. Details on the project assignments will be provided later in this paper.

## **Application and Recruiting**

Beginning in September 2007, a flyer was sent to all undergraduate engineering students at OU describing the program and encouraging them to apply for the program. Engineering faculty were also asked to advertise the program to students in their courses. Interested students were required to provide a short CV, transcript and a personal statement explaining why they were interested in the program. The application deadline is in early December. Most students were able to make a decision by this time. There were a few students who were interested in the program, did not know what their plan is in the following summer yet. Those students usually ended up dropping the program before purchasing the airticket. The selection criteria used were as follows:

- Student must be a full time engineering student in the School of Engineering and Computer Science at Oakland University (with engineering major standing)
- Student must be a US citizen or permanent resident in order to qualify for a scholarship
- Student cumulative GPA must be greater than 3.0
- Priority was to be given to those who had no or limited international traveling or studying experience

Out of the 25 applications received, 12 students who demonstrated high motivation and good academic standing were selected to take part in the program. Among these 12 students, seven were from the mechanical engineering department (2 graduates and 5 undergraduates), four were from the computer science and engineering department, and one was from the electrical and computer engineering department. There were four female, and one African-American students. Two of the female students were adopted from Asia, but had never been to China or another Asian country. Two of the students had previously taken part in an exchange program with Germany and one student had travelled to Taiwan; however, the rest of the students (i.e., 75%) had no prior international travel experience. In fact, two of the students had never even travelled outside of the state of Michigan! A brief profile of these students is summarized in Table 1.

**Table 1 - Gender, major, class level and ethnicity of 2008 Participants**

<b>Gender</b>	<b>Major</b>	<b>Class Level</b>	<b>Ethnicity</b>
F	Computer Science	Junior	Asian
F	Computer Science	Junior	Asian(adopted)
M	Computer Science	Junior	Caucasian
M	Computer Science	Junior	Caucasian
M	Electrical Engineering	Senior	Caucasian
F	Mechanical Engineering	Junior	Caucasian
F	Mechanical Engineering	Graduate	Asian (adopted)
M	Mechanical Engineering	Graduate	Caucasian
M	Mechanical Engineering	Senior	Caucasian
M	Mechanical Engineering	Senior	Caucasian
M	Mechanical Engineering	Senior	Caucasian
M	Mechanical Engineering	Sophomore	African-American

Although the program was advertised to the students early on in September, we found that it was difficult to get students thinking about their spring/summer plans that early in the Fall semester. Most applications were submitted later in the semester and many of these came about not as a result of the flyers that were sent to the students, but rather as the result of encouragement of talented students by faculty members. Furthermore, although the flyer indicated that scholarship money would be available to help students defray the costs of travel, most students were not aware of that clause or of the dollar amount involved. In the future, we recommend that students from past trips give presentations during the Fall semester (rather than during the summer) to their fellow students to help promote the program.

## Program Structure and Activities

So far, 3 different groups of students have taken part in the exchange program. For the first two programs, which took place at Tongji University(TU) in Shanghai, the exchange students were required to enroll in the OU course, Manufacturing Processes, and attended three weeks of course related lectures at OU before leaving for China. While in China for three weeks, the OU students were teamed with TU students and worked on a design/manufacturing project. This allowed the students to quickly learn how to communicate with each other and understand cultural differences in approaches to engineering projects. In the more recent trip to BJTU in May of 2008, each OU student was instead assigned to work with two Chinese students on a design project as part of a senior level mechanical engineering professional elective course. The international office at BJTU arranged for language training classes and transportation for the students, while the school of mechanical engineering at BJTU helped to select Chinese students and coordinate the project scheduling. Organizing such a program takes considerable planning and coordination. In this section, we will discuss some of the logistics, including pre-departure preparation, activities and project assignments.

### Pre-Departure Preparation:

To prepare our students to study in China, several orientation sessions were organized throughout the Fall and Winter semesters, between Dec 2007 and March 2008. Although it is of course impossible to capture the complexity, richness and diversity of Chinese culture and language in short sessions, we aimed to provide students with some basic information while at OU, realizing that most of their learning would in fact occur through direct immersion in Chinese culture while at BJTU. We hence made use of resources available on the OU campus to provide the student participants with some initial basic Chinese culture and language training. For example, two Chinese language sessions covering basic words used in every day life were organized. Several lectures on Chinese culture were provided by a special instructor in the English department who shared her experiences of living in China, as well as by a professor from the Anthropology department who offers several Chinese culture and language courses at OU. These were supplemented by insights and tips provided by SECS faculty who either have extensive experience traveling or working in China, as well as faculty of Chinese origin. Students who took part in the ME Department's prior China exchange program were also invited to one of the orientation sessions to share some of their experiences. The final orientation session prior to the trip departure was attended by members of the Chrysler Foundation who reinforced the message about the importance of and need for engineers who can work and think globally.

All of the participants were required to have their passports ready by the end of December. Rather than having students apply individually for visas to China, the primary faculty coordinator at OU submitted the participant visa applications as a group through a Chinese travel agency in Chicago with a fee of \$15 per application. It took less than 10 days to get the passports and visas back. Next, flight arrangements were made for the group towards the end of February to ensure that reasonably-priced air tickets were available. Once the travel arrangements were complete, the faculty coordinator contacted the Office of International Students and Scholars at Beijing Jiaotong University to finalize the provisions for housing, training, etc. and to plan the activities on site.

### Arrangements for Housing, Health Insurance and Other Logistics:

On each trip to China, students were accompanied by several faculty members from OU. Some of these faculty members remained in Beijing for the duration of the program; others were there for just a short time. Besides supervising the student projects while in China, the OU faculty members were actively involved with the teaching and research activities at the host schools. All visiting OU faculty members were invited to give research seminars at a couple of universities in China, and a few faculty members also gave guest lectures. The OU Faculty also actively sought research collaborations with faculty members in the host schools, and a few long-term collaborations have resulted from these efforts.

Upon arrival in Beijing, students spent the first day familiarizing themselves with the BJTU campus and recovering from jet-lag. Each student exchanged the equivalent of \$300 into the local currency at the airport for a fee of 50 RMB per transaction. Later, students found that the money exchange could be done in most banks in Beijing for a lower fee. There is hence no rush to do this at the airport.

Although BJTU has a number of dormitories available for student housing, students were housed in an on-campus hotel (equivalent to a 2 star hotel in US), as it provided students with free access to the internet. This proved to be the main communication tool for contact with family and friends in the U.S. However, based on our experience with this program, we highly recommend equipping each student with a cell phone. To avoid high international roaming costs, a phone with SIM card or just a SIM card can be rented for each student. By using such a service, parents and family in the U.S. can always reach the students by calling a local number, and students can call their parents or family if there is any emergency. The importance of having access to phone service became even more apparent to us as the students were in Beijing at the time of the 2008 Sichuan earthquake, which prompted many calls by concerned parents.

Students from BJTU provided our students with a tour of the BJTU campus facilities, including the dining hall, supermarket, library, bank, mailroom, health center, gyms, classrooms, subways, etc. Fortunately, they were all within walking distance. Besides, Beijing is a large city with an excellent public transportation system that students quickly learned how to navigate.

An interesting anecdote has to do with laundry. It is very common that hotels in China are not equipped with washers and dryers. Therefore, our students had to figure out a way of doing their laundry. Most Chinese students do their laundry by hand, but our students hesitated to do that. They showed their sense of resourcefulness by locating a laundry shop was on campus where they could drop their clothes off and pick them up later. They did not however realize that dryers are not popular in China, and were surprised to find out that their clean clothes were wet when they picked them up. They quickly solved this problem by purchasing string and laundry clips to be able to hang their clothes to dry in the hotel.

Students could eat in the dining hall on campus or they could choose to eat out as a group. Since there are strict hours at the on-campus dining hall at Beijing Jiaotong University, our students often ate outside on their own or with some Chinese students. Pictures of dishes are usually shown in most restaurant menus, so students usually ordered their food by pointing at pictures,

speaking the rudimentary Chinese words that they had picked up or with the help of other Chinese students.

Students often have their own health insurance policies through their school or parents. For those whose international travel is not covered by these insurance policies, required international travel insurance was purchased for the students through Inext. The detailed policy of Inext insurance can be found at [13].

#### Project Assignments:

The OU faculty introduced the project assignment to both OU and BJTU students on the second day of the program. The project requirements and team collaboration ethics were emphasized. Since the project required the use of CAD software, teams were arranged in such a way that at least one of team members was familiar with a CAD software package.

Each OU ME student was randomly assigned to work on a team with two Chinese students on a design project as part of their senior design project. Since a full time faculty member was with the students full time in China, the amount of interaction between the student groups and the supervising faculty was significant. Informal meetings were held with each student group nearly everyday in China. After they returned from China, students continued to work on this project, and finished their design by the end of August. The students from ECE and CES developed a website about this exchange program by teaming up with Chinese students. Students gave presentations about their projects to both BJTU and OU students and faculty.

The mechanical engineering project completed by the students consisted of designing an ejection device to remove defective products from a conveyer belt (see Appendix 1 for more details about the assignment). It was specified that the mechanism would be mechanically driven. The use of pneumatic or hydraulic cylinder was not allowed. While in China, the design groups concentrated on brainstorming to come up with possible designs, sketching their best concept and performing engineering analysis on their solution. Analysis typically included: statics, dynamics, and stress analysis of key components. After the OU students returned from China, they formed a design group which evaluated all of the designs produced in China and selected the one that best satisfied the design criteria. The students then completed the remaining design, analysis and part selection. Finally, they constructed a prototype which was presented to OU faculty.

In China, the students initially experienced some communication problems. These were solved through the use of sketches, writing equations, and Chinese/English dictionaries. In general, students were gratified that they shared a “common language” of mechanical engineering. They found that the fundamentals of the BJTU and OU students were similar. The biggest difference in approach to this design project was that the BJTU students emphasized mathematical analysis as the first step in their design process, while the OU students emphasized conceptual design with a greater concern for economics as the first step in the design process. Overall, the students felt that the combination of these two approaches ultimately led to a better design than the use of either the BJTU or OU approach by itself.

One difficulty with the project was that the Chinese students were not receiving credit or a grade for their participation. In spite of this, they are enthusiastic contributors and worked hard. However, in the future, we will recommend BJTU that the Chinese students participate as a member of their courses and receive a grade for their effort. We feel that this will allow the Chinese students to participate at an even higher level.

#### Language and Culture Training:

Besides the project time, OU students worked closely with Chinese students to learn more about Chinese culture. During the weekends, OU students, accompanied by some Chinese students, explored many historical sites in China. They visited the Great Wall, the Summer Palace, the Tiananmen Square, and the Temple of Heaven, among others. They also visited modern buildings including the Olympic Stadium (Bird's nest) and the Oriental Pearl Tower in Shanghai. The OU students also attended the charity fund raising event for the Earthquake in Wenchuan, China.

The international office at BJTU offered our students a 10 hour formal Chinese language training class. Our students were tested at the end of the training sessions. The average score of the oral exam was 91/100, and the average score of the written exam was 54/100. Although short in duration, the OU students benefited a lot from the language training program. By the time they left China, they had no problem eating in the street, asking for directions, exchanging money in a local bank and bargaining at a flea market. It was however unrealistic to expect students to make any meaningful progress towards writing or reading Chinese characters in a 10 day span; We will hence remove that portion of the language training in future years and will focus exclusively on oral language skills.

#### Industrial Site Tours:

Students visited several facilities in China including the Beijing Jeep Co. plant, Shanghai GM, and Microsoft China. They observed the assembly process at Beijing jeep, which, according to our students, was much more labor intensive compared to similar assembly processes at Chrysler in the U.S.. Students also had the opportunity to talk with the engineers from Beijing Jeep about the automotive industry in China. Students also visited GM Shanghai, which, however, was on a maintenance break during our visit.

#### Average Student Expenses:

The actual expenses incurred during this trip by each student were within our initial budget predictions and were in fact relatively reasonable. The average expenses per student were \$3214, which included the round trip air ticket, visa application and processing fee, lodging, food, ground transportation, course tuition (4 credits) and other miscellaneous expenditures. Part of these expenses was covered by the grants from the Chrysler Foundation and the university's Office of the Provost and Vice president for Academic Affairs; the remainder was funded by the students themselves.

## **Assessment**

#### Program Assessment:

To measure the success of the program, a post-program survey was made to assess the success of various aspects of the program. Questions posed to students included the following:

- In what way has the trip helped you towards working in a diverse environment?
- Did the project provide you with an ample experience in terms of working with Chinese students? Give suggestions to enhance such an experience for next year.
- Are there some activities that should be included for next year?
- Are there some activities that could be removed/minimized without affecting the program?
- What was your biggest accomplishment on this trip?
- What impressed you most during this trip?
- What are your concerns about this trip? List the things that need to be improved or added for the next year's program.
- What about the Chinese language program? Give suggestions and your opinions on the program format, content, and the final test.

Overall, those students attending this trip provided overwhelmingly positive feedback on this trip. We are including some of the student comments below as they provide a sense of the level of satisfaction, as well as suggestions for future improvements.

“This trip has helped me to realize that in the future I will be working and competing in a global workplace and has shown me some of the difficulties that can arise when working in a diverse environment. The most difficult obstacle is the language barrier which I think I handled really well but had to work really hard at it. It has also shown me that people come from different backgrounds and experiences that are totally different from mine. This is very useful for working in a diverse environment because it helps me to look at problems and tasks from a whole different perspective.”

“The project did give us experience with working with Chinese students however scheduling was somewhat difficult.”

“I believe we had a great variety of activities”

“I would have liked to attend a lecture given by the BJTU professors”

“I would not recommend doing the train ride again. Most or if not all of the students did not enjoy it in my opinion. The train was just way too long and made everyone a little uncomfortable. If it was cheaper to fly I think that would have been a better choice and also it would save more time for sight seeing or other activities about Chinese culture.”

“My biggest accomplishment was making friendships with all of the students that I encountered. I think that is the most valuable thing and will help me tremendously in the future when I go back to China again. The students I made friends taught me a lot and I think they learned a lot from us as well. I know that I will keep in contact with them and will hopefully see them again some day. Working with them really helped me to learn more about team work and having them come to dinner and do other fun activities really helped us

bond together and become good friends. I think we will be able to help each other out in the future with our careers and we will be able to continue to learn from each other.”

“I was impressed by Chinese culture and I find it very interesting. I was impressed with how friendly the Chinese students are as well as their strong work ethics.”

“Sometimes it was very difficult to make decisions as a big group so I definitely think that breaking up into smaller groups is more effective and lets all the students really enjoy themselves more.”

For the trip from Beijing to Shanghai, a train ride was arranged instead of a flight. The faculty coordinator intentionally arranged this train ride since it is the most common travel means in China and was intended to give students a more authentic travel experience. However, almost all of our OU students complained about limited privacy during the train ride, a complaint that is mainly due to the cultural difference. Therefore, the train ride from Beijing to Shanghai is not recommended unless students themselves really want to experience it. Additionally, there is no need to hire a tour guide while visiting most places in China. Most of the students prefer to explore the landmarks on their own or in a small group.

Most undergraduate students at BJTU were taking 18 credits (6 courses) per semester, and most of the courses were offered during the daytime, leaving them with limited time to work on the project during the day. Therefore, the BJTU and OU students had to mainly meet at night to discuss the progress of the project. It is usually very hard to find a meeting room on campus at night. The students often had to meet in the hotel lobby. In the future, we might ask the BJTU staff to arrange for a classroom for this international collaboration activity.

#### Project Assessment:

Students spent much of their time during and after the trip to China working on their design projects. Hence, to assess the value and success of this multicultural design experience, it was important to assess the student projects themselves. This was done much in the same way that we evaluate “regular” senior design projects as part of our ABET assessment system. External evaluators not associated with the China trip (in this case, primarily ME professors) attended and rated the student oral presentations and later reviewed the project reports. They reviewed the presentations and materials to establish whether the students had demonstrated some or all of the mechanical engineering program outcomes and the level to which those outcomes were achieved. These program outcomes are:

- a. An ability to apply knowledge of mathematics, science and engineering.
- b. An ability to design and conduct experiments, as well as to analyze and interpret data.
- c. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic environmental, social, political, ethical health and safety, manufacturability, and sustainability.
- d. an ability to function on multi-disciplinary teams
- e. An ability to identify, formulate and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.

- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
- i. A recognition of the need for, and an ability to engage in life-long learning.
- j. A knowledge of contemporary issues.
- k. An ability to use the techniques skills and modern engineering tools necessary for engineering practice.

In order to facilitate the quantitative assessment of the China trip projects, the SECS external evaluation of program form used to assess undergraduate projects was provided to the external evaluators [14]. Figure 1 below shows the average evaluation score of each aspect of this project. As a guide to assigning ratings, 70% or above is considered to be an acceptable level of accomplishment. As can be seen from the figure, every category had a rating that was higher than the satisfactory level of 70% and more than half of the outcomes achieved a rating of 90% or higher, indicating that the projects and student experience were successful in meeting the required program outcomes.

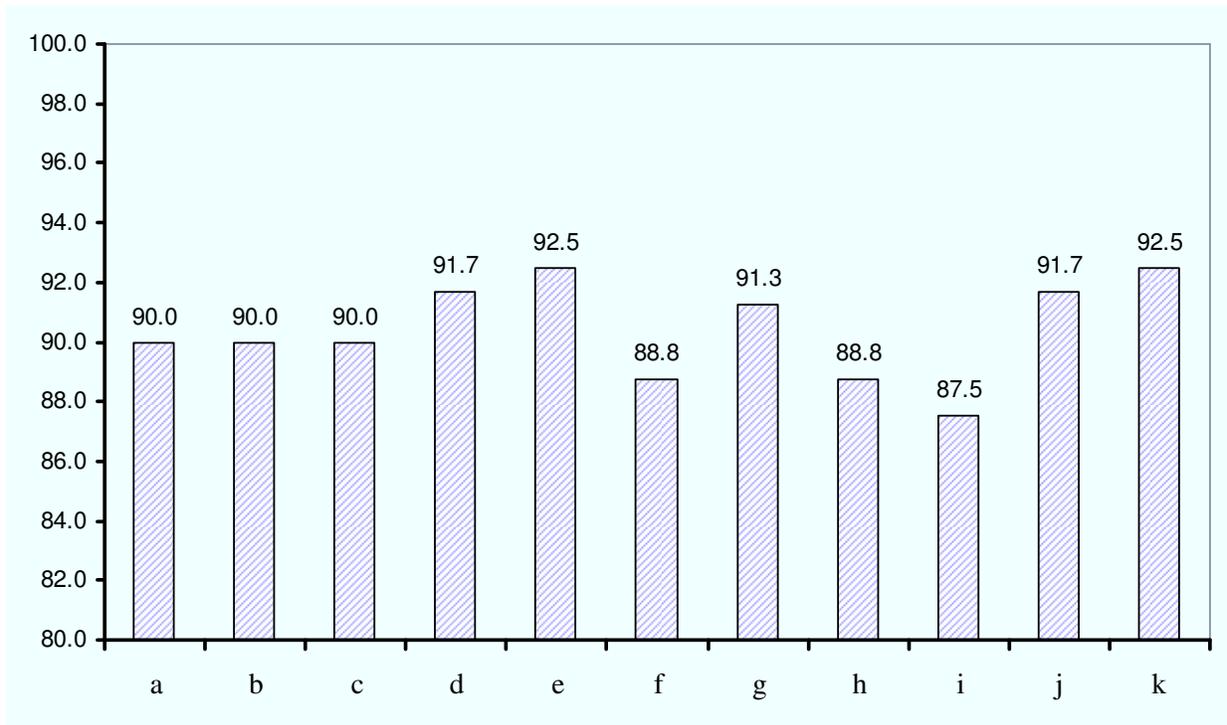


Figure 1: Average project evaluation scores

The BJTU students participating in this program were all undergraduates. Our plan in future is to have BJTU graduate students involved as well. By teaming one OU undergraduate or graduate student with a BJTU graduate student, the OU student may also get to learn how to conduct research and may have access to research labs, which might lead to additional long term research collaboration between two schools.

## Conclusions

This China trip program provides an excellent opportunity for our OU students to learn immerse themselves in Chinese culture and work with Chinese engineering students. It lays a solid foundation for them to become a global engineer in the near future. Three weeks are about the right time for students to stay in China. During these three weeks, our students faced a complete new living and working environment, worked with Chinese students with different way of thinking, overcame the language and cultural barriers, and eventually finished their projects. It requires a group of dedicated faculty who are willing to work hard over the summer without pay. Despite a few complaints about the train ride to Shanghai, we all felt that it was otherwise a successful program. Comments such as the ones listed below make it all worth it.

“Overall, I would give the trip an A for the experience, a B- for the organization of the activities and language portion, and an A for the project. I strongly recommend that this program continue to grow and more students participate in it each year.”

“Overall I think the trip was excellent. I had a great experience that I will never forget and I know that this trip has definitely had a huge impact on my perspectives about other people and the world.”

“best trip I've ever been on!”

“it really changed my outlook on many things and was a very valuable experience.”

Additionally, as a result of this trip, a student exchange agreement has been signed between Oakland University and Beijing Jiaotong University. As a result, a group of 4 BJTU students came to OU as exchange students in Fall 2008 and Winter 2009. Additionally, three faculty members from BJTU will join Oakland University in winter 2009 and fall 2009 to develop a joint research with faculty members in the School of Engineering and Computer Science at Oakland University. We expect that with the healthy growth of this program, more and more engineering students will get to benefit from this experience.

## Acknowledgements

The authors gratefully acknowledge the support of the Chrysler Foundation and Oakland University's Office of the Provost and Vice president for Academic Affairs. They also acknowledge the support of the office of International Students and Scholars at Beijing Jiaotong University, China.

## References

- 1) Meyer, J. W., “Globalization: Sources and Effects on National States and Societies”, *International Sociology*, Vol. 15, No. 2, 233-248, 2000.

- 2) "Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future", National Academy Sciences, ISBN-10: 0-309-10039-9, 2007.
- 3) Earley, P. C., "Social Loafing and Collectivism: A Comparison of the United States and the People's Republic of China", *Administrative Science Quarterly*, Vol. 34, 1989.
- 4) Purdie, N., "Student conceptions of learning and their use of self-regulated learning strategies: A cross-cultural comparison", *Journal of Educational Psychology*, 88(1), pp. 87-100, Mar 1996.
- 5) Delpit, L. D., "Other People's Children: Cultural Conflict in the Classroom", New York: New Press, 1995.
- 6) Demmert, W. J., Jr. and Towner, J. C., "A Review of the Research Literature on the Influences of Culturally Based Education on the Academic Performances of Native American Students", Portland OR: Northwest Regional Educational Laboratory, 2003.
- 7) Cheng, K., "Can education values be borrowed?", *Looking into cultural differences*, Vol. 73, No. 2, Pages 11-30, 1998.
- 8) Zha, P., Walczyk, J. J., Griffith-Ross, D. A., Tobacyk, J. J., Walczyk, D. F., "The Impact of Culture and Individualism–Collectivism on the Creative Potential and Achievement of American and Chinese Adults", *Creativity Research Journal* 18:3, 355-366, Online publication date: 1-Jul-2006.
- 9) Kim, K. H., "Learning From Each Other: Creativity in East Asian and American Education", *Creativity Research Journal* 17:4, 337-347, 2005.
- 10) Boscardin, M. L., "What is Special about Special Education Administration? Considerations for School Leadership", *Exceptionality* 15:3, 189-200, Online publication date: 1-Jul-2007.
- 11) Bathory, Z., Vari, P., Tamir, P., Miyake, M., Im, I.-J., Yeoh, O. C., et al., "Profiles of educational systems of countries participating in practical skills testing", *Studies in Educational Evaluation*, 18, 301–318, 1992.
- 12) [www.bjtu.edu.cn](http://www.bjtu.edu.cn)
- 13) <http://www.inext.com/inextweb/guestpages/features/basic.html>
- 14) <http://www2.oakland.edu/secs/assessment/assmtformgenUGrad.asp>

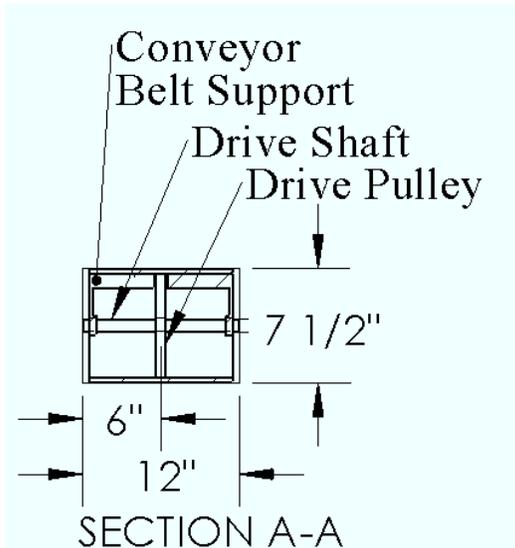
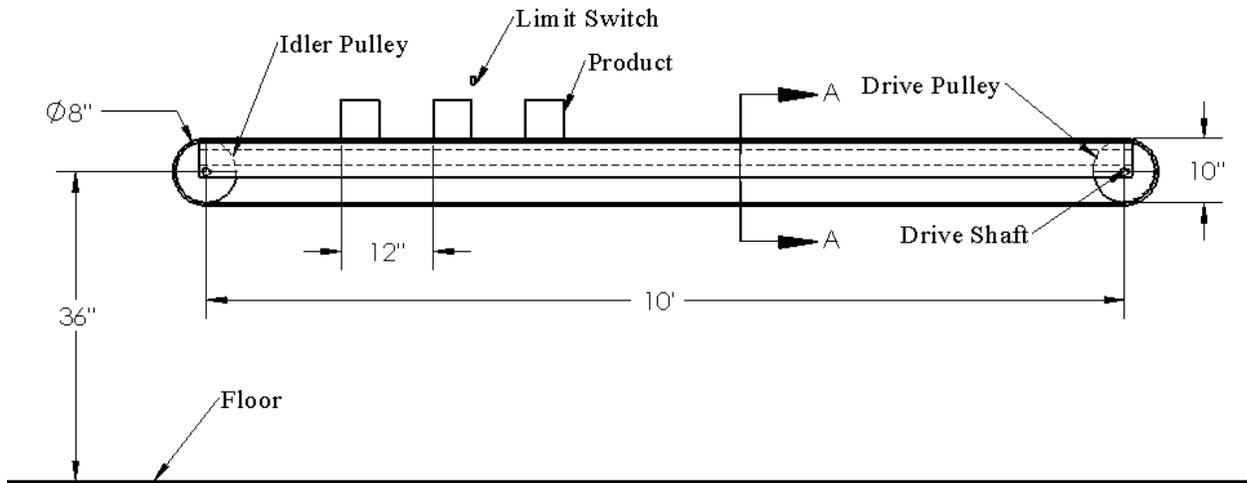
## **Appendix 1: Project Assignment**

### **Design Project China Exchange Program Spring 2008**

On an assembly line it has been determined if a product has been incorrectly assembled its overall height will be larger than those products which have been correctly assembled. It has been decided that these flawed products will be detected using a limit switch and removed from the assembly line. A section of the assembly line is shown in Figure 1. Each product is 6 inches by 12 inches and weighs 50 pounds. The product is orientated on the conveyor so that the 12 inch dimension lies along the length of the conveyer. The spacing between products along the length at the conveyor is 12 inches.

Your task is to work as part of a team of engineers to design a system to remove the incorrectly assembled products from the conveyor. This system should be powered with an electric motor

(1800 rpm – ac) which will be located beneath the conveyor. In addition, this motor should also drive the conveyor drive shaft. Your company initially expects to produce five prototypes of these systems. The final designs will be presented orally to the class beginning on the due date given on the class schedule.



Required belt speed = 24 in/sec  
 Maximum product weight = 500 pounds  
 Assume initial belt tension is negligible  
 C.O.F. between belt and the conveyor belt = 0.15  
 C.O.F. between product and belt = 0.100

**Figure 1 - Conveyor**

Minimum Requirements:

1. Make a neat, detailed sketch or drawing of your entire design and a neat, detailed sketch or drawing of each part that you design.

2. Make a list of all purchase parts used including manufacturer and part number. Show that these parts have sufficient load carrying capacity. List all component and purchase part cost.
3. The customer specifies that all equipment must be mechanically driven. No pneumatic or hydraulic equipment can be used. The customer has further specified that the ejection paddle must eject the product smoothly. The customer has specified that this must be done by having the paddle move along with the conveyor at a speed of 24 inches/ sec at the same time as it moves across the conveyor to eject the product.
4. Perform stress and/or deflection analysis of critical components.
5. Provide justification that your design is optimal. In other words, consider various approaches/designs and explain why the approach you select has functional and economic advantages over other designs.
6. Describe how your components will be manufactured. Explain why the processes you select will be optimal.
7. Give some consideration to assembly. Can the system be assembled and disassembled easily?
8. Compare different materials and manufacturing processes and specify materials and processes which meet all design specifications and provide minimum cost.
9. Provide a list of manufacturing steps for each component you design and calculate the time and cost for each step.
10. Calculate the total cost of your complete design. Use a labor rate of \$10.00 per hour, and overhead rate of 30% and use a project of 10%.
11. The system you design should be attached to the conveyor side plates shown on Figure 1.
12. If the customer decides to go into full production, they will purchase 10,000 ejection systems per year. Describe how this would affect the selection of manufacturing processes for your components.
13. Students will work in teams of U.S. and Chinese students to complete as many of the above tasks as possible. At a minimum, items 1.), 2.), 4.) and 5.) Should be completed in China. The project teams will give oral presentations on their projects on May 19, 2008.

#### Grading For U.S. Students

Project Presentation in China	30%
Oral presentation at OU upon return	5%

Tests on Chinese language and culture in China	15%
Final oral presentations and written Report (at end of summer)	50%