# Sustainable Design & Construction: A Study Abroad Thesis Class in China

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Many universities in the U.S. have started including international education as part of their core education mission, recognizing that increasing the global competence among the next generation is a national priority and an academic responsibility (Open Doors, 2008). The McWhorter School of Building Science at Auburn University (BSCI) has been offering their students a faculty-led short-term study abroad class in Europe every summer since 2004. However, since China is becoming an important force in the world economy, BSCI has decided to expand on their European study abroad experience and develop a new class in China. Hopefully, this new destination will help prepare our students to deal with an ever changing global construction environment. A 5-week study abroad thesis in China class was created and offered to BSCI's senior undergraduate students in the summer of 2009. The faculty conducted a pre-thesis & post-thesis survey to evaluate the impact of the study abroad context on the students' learning and assess the structure of the class for possible replication in 2010. Twenty-two pre-thesis responses and twenty-four post-thesis responses were collected. This paper describes the design, development, structure, student recruitment, student selection, logistics, and outcome of the class. Suggestions for future study abroad classes in China and lessons learned are also presented.

**Key Words:** Study Abroad, Construction Management Education, International Education, China

## Introduction

More U.S. students are studying abroad than ever before. According to survey data released in the Open Doors report (2008) published annually by the Institute of International Education (IIE): "The number of Americans studying abroad increased by 8% to a total of 241,791 in the 2006/07 academic year." This increase marks a decade of unprecedented growth in the number of American students receiving academic credit for their overseas academic experience, with an increase of approximately 150%, from under 100,000 in 1996/97 to nearly a quarter of a million in 2006/07. The Open Doors report (2008) also states that many universities in the U.S. have started to include international education as part of their core education mission, recognizing that increasing the global competence among the next generation is a national priority and an academic responsibility.

Study abroad has been touted as a way to expand a student's understanding of the world (McClure, 2009). The world is increasingly interdependent; international experiences gained through participating in study abroad programs can increase students' mutual understanding, provide them with relevant career skills, equip them for 21st century professions, and prepare them to be a global citizen. Many studies have been conducted to identify the benefits that students can receive from studying abroad. Ingraham and Peterson (2004) state in their article that study abroad can:

- Facilitate students' intellectual growth
- Contribute to students' professional development
- Accelerate students' personal growth
- Develop students' skills for relating to cultural differences
- Enhance students' self-awareness and understanding of their own culture

Study abroad can also enhance students' acquisition of a foreign language, improve their knowledge of the host culture, and transform their worldviews (Lewis & Niesenbaum, 2005). Studies reveal several major factors motivating American students to participate in study abroad. The factors include the desire to search for a new

experience, to improve a professional situation, to improve a social situation, to search for liberty/pleasure, and to learn other languages (Sanchez, Fornerino, & Zhang, 2006).

American students have become increasingly interested in study abroad opportunities in China because of recent exposure during the 2008 Olympics and China becoming a world economic power. China is now the fifth-most-popular destination for US students (Open Doors, 2008). In the 2006-7 academic year, 11,064 Americans studied in China, a large increase from 1995-96, when only 1,396 Americans studied there. Being one of the world's largest construction markets and having the world's highest construction output growth rate, China is becoming a new popular destination of study abroad for construction students and faculty. The December issue of ENR (2005) states:

> Construction remains China's fourth-largest industry, representing more than 6% of the nation's gross domestic product, according to China's National Bureau of Statistics. 'China is still Number One' and is likely to remain the world's leading market for design and construction services in the general building sector, says Paul Jacob, chairman of Baltimore-based RTKL Associates.

Despite the globalization of the construction industry and rapidly increasing number of U.S. contractors seeking work overseas, study abroad programs in construction management education in the U.S. are still rare. The top three major fields of study of Americans studying abroad are the social sciences (21% of those studying abroad), business and management (19%), and humanities (13%), according to Open Doors (2008). One of the few noticeable study abroad in China programs, offered to construction students, was developed by East Carolina University (ECU) in 2008. In that summer, faculty and 17 undergraduate students in the Department of Construction Management at ECU spent three weeks in China studying China's construction industry, construction education and building tradition (Connell & Lu, 2009). Upon completion of the trip in China, students earned 6 credit-hours from this elective course.

## Design and Development of the Study Abroad Thesis Class

### *Faculty*

The design and development of this study abroad thesis in China class was started in the spring of 2008 and involved four faculty members in the McWhorter School of Building Science at Auburn University (BSCI). The overall objective of this class is *to expose students to companies, projects, practices, and construction management professionals that they would never be exposed to otherwise*. All four faculty members leading the class were familiar with traveling in China to various degrees: one of them is originally from China, one is the Architect that designed the campus for SIAS University in China and has been traveling between the U.S. and China for the past ten years. The other two faculty members took a 10-day reconnaissance trip in November 2008 to the cities that were on the class itinerary.

### *Length of Class*

There has been a trend toward shorter durations to study abroad programs. "The largest growth in study abroad in the last 10 to 15 years has been in shorter programs." addressed by Dessoff (2006). Short-term programs often during summer breaks —from a single semester down to as little as a week or two—have emerged in recent years as an attractive alternative for many students who do not want to spend a long period abroad or are unable to do it for financial or other reasons. In addition to costing less than longer term programs, shorter study abroad experiences also relieve concerns on issues such as culture differences, financial problems, language barrier, family commitments, etc., in particular for those who have never traveled abroad before.

With all the benefits above of the short-term programs, and based on the success of their previous study abroad classes, BSCI's faculty designed a five-week trip for their first study abroad class to the Far East in the summer semester. This class consisted of three separate courses, a two-credit study abroad preparation class in the spring

semester of 2009, a four-credit special thesis class, and a two-credit temporary structures (concrete formwork and scaffold design) class on the trip in China during the summer of 2009.

## *Special Undergraduate Thesis*

Unlike the conventional BSCI undergraduate thesis, participants in this research-based special thesis study abroad class conducted scholarly work equal to or in excess of the traditional BSCI thesis. The theme of the special thesis allowed each student to select a construction-related topic, and then conduct an independent compare & contrast case study in order to research the familiarities and differences in regard to the topic in the U.S. vs. China. The individual student thesis involved analyzing, synthesizing, and reporting on data/information collected around the specific topic in both countries. The procedure for students to complete their research included two stages: 1) students finished their literature review and the U.S. research in the spring semester before leaving for China, and 2) students collected China research data, finalized the research paper and presented their findings to the faculty on the trip in China.

The students were allowed to develop their own specific thesis topic from the three major research categories shown in Table 1. The final topics selected by the students for their study abroad thesis are also listed in Table 1.

Table 1

***Special capstone thesis topics selected by students***

| Research Category | Research Topic |
|---|---|
| Construction Business Practices: | Logistics: labor, material, quality control<br>Construction craft labor in cast-in-place concrete work<br>Construction safety – fall protection<br>Construction labor productivity factors<br>Equip/sitework/safety/business practices |
| Sustainability / Alternative Energy / Pollution: | Adaptive reuse of waste concrete<br>Sustainable design<br>Wind & solar power<br>Water and air pollution<br>HVAC design: central vs. split system<br>Adaptive reuse of buildings<br>CMU & granite in construction<br>Eco-city |
| Construction Materials, Methods, Equipment: | Heavy Equipment: Cat d7e - diesel / electric traction<br>Construction material supply chain management - concrete<br>Concrete mix and testing<br>Bamboo scaffolding<br>Sustainable materials & methods |

## *Student Recruitment and Motivations*

The students targeted in this class were senior BSCI students who would be working on their undergraduate thesis in spring, summer, or fall semesters of 2009 based on their initial plan of study. Several techniques were made to recruit students, including:

- Presentations introducing this new study abroad program to the targeted classes in the curriculum in August 2008
- Information and application forms posted on the school's website
- Email announcement sent to the targeted classes

To apply for this program, students had to have the following qualifications:

- Meet certain academic study abroad requirements (GPA > 2.5)
- Turn in a complete application along with an approved proposed plan of study
- Submit a 300-word essay on their reasons for wanting to participate in the class and discuss possible research topics for their thesis

The original plan for this class was to accept 15 to 20 students. A total of 34 BSCI students applied. Through evaluation of their application package and a personal interview by BSCI faculty, 24 students were accepted into the class by late September 2008.

Studies reveal that there are several factors motivating U.S. students to participate in study abroad programs ranging from professional to cultural to personal. They include the desire to use the abroad experience as a stepping stone that will facilitate an international career, to master a foreign language, to experience living in the host country, to make new international friends, to find excitement and enjoyment, and to experience a final college level sojourn before moving from university life to a full-time job in the home country (Sanchez, Fornerino, & Zhang, 2006). However, based on the information provided by the students in the pre-thesis survey, the students surprisingly reported that the top motivations for participating in the study abroad class were travel opportunities and experiencing another culture. Approximately 50% of the students listed early graduation, academic goals, or conducting a research-based thesis abroad as their top motivators (see Figure 1).

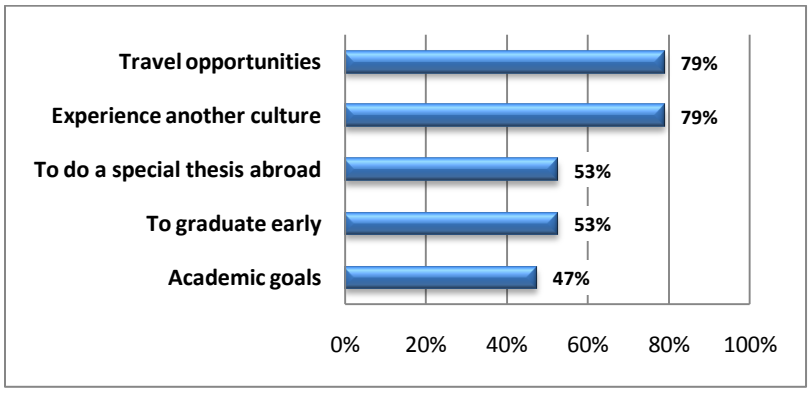


*Figure 1: Top five motivations identified by BSCI students to participate in the Study Abroad class.*

In regards to the motivator *to graduate early*, most of the students met their goal. Based on information provided by the students from the post-thesis survey, upon completion of the study abroad class: (1) 68% would be able to accelerate their graduation by at-least one semester, (2) 23% would graduate on time, and (3) only 9% would have to postpone their gradation past their initial plan of study.

Another surprise to the faculty was encountered regarding the students *free-travel* after the class was over. Since it is a long journey from the U.S. to China and none of the students had been to the Far East before, faculty encouraged students to travel to the other parts of the region when the class was over in Beijing. However, based on the findings from the pre-thesis survey, only 9 students planned to continue on their trip overseas, the rest of the group went back to the U.S. immediately. In fact, of the 9 students who lengthened their trips, 4 of them stayed in China for only a few more days, one traveled to Southeast Asia for a month, and the rest went to Europe for two weeks. When asked why they did not want to take advantage of the free-travel opportunity, the most common responses were "trip is long enough, time to go home", "cost", and "other commitments with school or work".

## *Logistics and Program Itinerary*

Because of the reconnaissance trip in the fall of 2008, faculty members were able to organize the entire trip and arrange all the activities by themselves vs. a third-party travel agency. This provided significant flexibility and considerable cost savings for the class. Most of the logistical issues were taken care of before the class took off to

China. They included Chinese visa application, students' international travel emergency medical insurance (MEDEX), accommodation, transportation, and construction site visits. Unlike most other programs, this class allowed students to arrange their own flights to and from the U.S. and China as long as they could meet the class in a given hotel in Shanghai at 6:00PM on May 20th, 2009 which was the official start date of the class.

The program itinerary in China was carefully planned to meet the overall objectives of the students' research along with considerations of feasibility, and availability of local contacts, travel, and cost. The 5-week trip in China consisted of 4 weeks of traveling (Shanghai, Xi'an, and Beijing) and 1 week in residence at SIAS University (Zhengzhou, Henan Province). See Table 2 for the complete program itinerary. The theme used to design the itinerary had three stages:

1. Have most of the construction-related site visits (in Shanghai) in the early stage (the first 2 weeks) in order to let students' collect adequate data for their research.

2. Provide students an in-residence place (SIAS University dorms) with access to the Internet and library/classroom to let them concentrate on the synthesis and writing of their research (in the 3rd week). The temporary structures class was also taught at SIAS.

3. Have most of the cultural/social events and historical/finished building project visits in the last stage (the last 2 weeks) along with students' thesis presentations/defenses.

Table 2

***Program Itinerary in China***

| Date | Days | City | Activity | Lodging |
|---|---|---|---|---|
| 5/19/2009 | - | Atlanta, GA to Shanghai | Travel from the U.S. to Shanghai, China | |
| 5/20/2009 | 1 | Shanghai | Class Starts | |
| 5/21/2009 to 6/2/2009 | 13 | Shanghai | Construction Site Visits, Cultural Events, Working on Thesis | SJTU Faculty Club |
| 6/2/2009 | - | Shanghai to Zhengzhou | Travel by High-Speed Train: Shanghai to Zhengzhou (SIAS Univ.) | |
| 6/3/2009 to 6/9/2009 | 7 | SIAS University | Working on Thesis, Construction Visits, Cultural Events | SIAS Student Dorms |
| 6/10/2009 | 1 | Zhengzhou to Xi'an | Travel by Charter Bus: Zhengzhou (SIAS Univ.) to Xi'an | |
| 6/11/2009 to 6/16/2009 | 6 | Xi'an | Working on Thesis, Construction Visits, Outdoor Activities, Tera-cotta Warriors Site Visit, City Wall, Cultural Events | Hotel in Xi'an |
| 6/16/2009 | - | Xi'an to Beijing | Travel by Train: Xi'an to Beijing: | |
| 6/17/2009 to 6/23/2009 | 7 | Beijing | Great Wall, Olympic Venues, Tiananmen Square/Forbidden City, Summer Palace, Temple of Heaven, Cultural Events | Hotel in Beijing |
| 6/24/2009 | - | Beijing to Atlanta, GA | Class Ends: Students Return to Atlanta, GA or Free Travel | |
| Total Number of Days | 35 | | | |

During the stay in Shanghai, the class had six group visits to various types of on-going construction projects in the urban area. See Table 3 for more details about the construction projects visited in Shanghai. In addition to these group site visits, some students took free-time to conduct individual site visits for their specific research topics. Furthermore, the faculty arranged a two-hour seminar on construction management and safety issues in Shanghai. The speaker invited for this seminar is an expert who was a former executive of the Shanghai Construction Management Bureau before retirement.

Table 3

***Undergoing Construction Projects Visited by the Class in Shanghai***

| Category | Project Type | Project Name | Construction Area |
|---|---|---|---|
| Commercial | office & biology lab | SJTU Biology Building and Lab | 18,581 $m^2$ or 200,000 $ft^2$ |
| | exhibition hall | Chinese Pavilion at the World Expo | 160,000 $m^2$ or 1,720,000 $ft^2$ |
| | office and condominium | Office Building at Minhang District | 96,000 $m^2$ or 1,033,000 $ft^2$ |
| Infrastructural | underground tunnel | So. Xizang Rd. Tunnel | Total length: 2.6 km or 1.66 mil |
| | subway | Line 3 Lupu Bridge Subway Station | 2,600 $m^2$ or 28,000$ft^2$ |
| Residential | development | 35-A Residential Development | 31,000 $m^2$ or 334,000 $ft^2$ |

The variety of the destinations and events arranged by the faculty provided students numerous opportunities to interact with Chinese college students, construction professionals, and citizens in order to gain an understanding of Chinese culture and history. Table 4 lists the major historical/cultural sites and events experienced by the students.

Table 4

***Major Group Historical/ Cultural Site Visits and Events in China***

| Location | Type | Site/Activity |
|---|---|---|
| Shanghai | Site visit | Maglev Train, SJTU, The Bund, Pudong District, Shanghai Technology Museum, Yu Garden, Qibao Ancient Village, Shanghai Circus World, West Lake (Hangzhou) |
| Shanghai | Cultural Experience | Huangpu river cruise, Social with SJTU students, Shanghai acrobat show, express train |
| SIAS/Henan Province | Site visit | Longmen Grottoes, Shaolin Temple, SIAS University, construction sites on SIAS campus |
| SIAS/Henan Province | Cultural Experience | Shaolin musical show, Shaolin marshal art demonstration |
| Xi'an | Site visit | Terra-cotta Warriors site, ancient city wall, historical city center, historical Gao Jia House, Shaanxi Provincial Museum |
| Xi'an | Cultural Experience | Tang Dynasty Palace dance performance, Muslim street |
| Beijing | Site visit | The Great Wall, China National Stadium (the Bird's Nest), China National Aquatic Center (the Water Cube), Summer Palace, the Forbidden City, Tian'anmen Square |
| Beijing | Cultural Experience | Wangfujing street, Peking duck dinner |

## Program Outcome and Assessment

One of the major goals of study abroad is to expand students' academic, professional, and personal views of the world *from regional to global*. The impact and outcome of this study abroad in China class were reflected on the students' answers to the related questions in the post-thesis survey. Table 5 shows some of these questions and their results. All students agreed that this trip helped them develop a better understanding of China and increased their appreciation of and sensitivity to other cultures. Most students indicated that through the trip they developed a better understanding of their home country and its culture, became more aware of international issues, and improved their ability to adapt to a different situation. However, the results also showed that the trip did not make a significant impact on the students' (1) values or (2) personal and professional goals. Only six students believed that their career choices changed from domestic to international construction after the trip. However, all but two students agreed that participating in this study abroad special thesis instead of completing the conventional undergraduate thesis project in the U.S. would make a positive impact for them to find a job.

Table 5

***Impact on Students of the Study Abroad Thesis in China Class***

| | Very Much Agree | Somewhat Agree | Neutral | Little or Not Agree | No Opinion |
|---|---|---|---|---|---|
| Developed a better understanding of the country in which you studied (China) | 96% | 4% | - | - | - |
| Developed a better understanding of your home country/culture (the U.S.) | 46% | 33% | 17% | 4% | - |
| Became more aware of international issues | 54% | 38% | 8% | - | - |
| Increased your understanding of and sensitivity to other cultures | 58% | 42% | - | - | - |
| Improved your ability to adapt to a different situation | 71% | 13% | 17% | - | - |
| Altered your values | 29% | 17% | 8% | 42% | 4% |
| Reassessed your personal and professional goals | 17% | 21% | 21% | 38% | 4% |

When asked about their perception of the *overall quality of the class*, the students' answers were extremely encouraging (see Figure 2). All students stated that they would recommend this class to a friend.

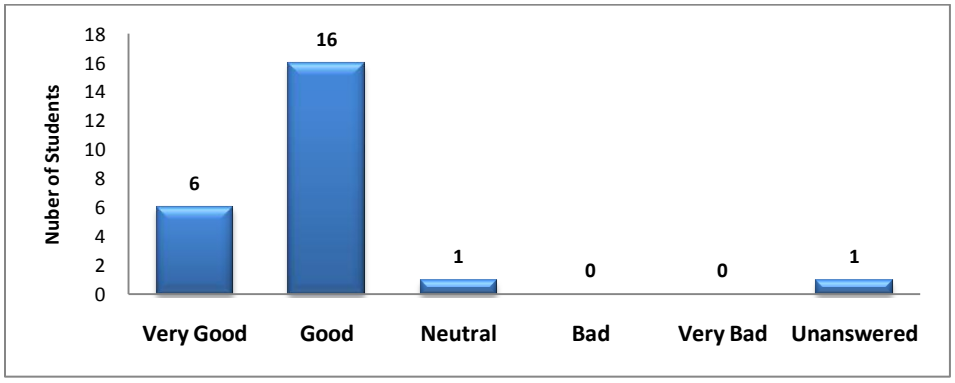


*Figure 2: Participating students' evaluation of the overall quality of the Study Abroad Thesis in China class.*

## Summary and Suggestions for Future Study Abroad Classes

Today, more so than ever before, it is absolutely critical that students study and experience business in an international context (Open Doors, 2008). More and more universities in the U.S. have started including international education as part of their core education mission, recognizing that increasing the global competence among the next generation is a national priority and an academic responsibility (Open Doors, 2008). In the summer of 2009, 24 senior undergraduate students and 4 faculty members of the McWhorter School of Building Science at Auburn University participated in a 5-week study abroad thesis class in China. In fact, this 4-credit class was only one part of the special thesis study abroad in China program, which also included a 2-credit study abroad preparation class taken by participating students in spring 2009, and a two-credit temporary structures class taught on the trip in China. Unlike the regular BSCI's undergraduate capstone thesis, the theme of this special thesis was research-based, which required each student to conduct an independent research to study and compare issues on a specific construction-related topic in the U.S. and China. The objectives of this program included:

- Exposure students to different construction methods, materials and equipment

- Exposure students to issues relating to construction craft labor in other countries
- Help students obtain understanding of globalization
- Allow students to experience different cultures, currencies, transportation systems and languages
- Provide opportunities to view monumental and historical architecture
- Appreciate world-class performing arts, and fine arts

Since this was BSCI's first study abroad class to China, there were also some lessons learned. For instance, it has been hard for many students enrolled in the class to conduct high-quality scholarly research without a solid academic background from a research methods class. Also, the 2-credit Study Abroad Prep class was added to an already full class schedule the semester prior to leaving for China. Once in China, the intense travel schedule and limited accommodations for writing and studying made it difficult mentally and physically for the students to concentrate on their research work. To avoid this type of problems in future study abroad programs, faculty may consider implementing a more flexible program timeline, such as, after the trip is over in the destination country, they would allow students to come back home to finalize their research within a certain period of time before the defense of their thesis.

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