
AC 2012-5050: EDUCATING GLOBALLY COMPETENT ENGINEERS IN LONDON, UNITED KINGDOM

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Educating Globally Competent Engineers in London, United Kingdom

Abstract

This paper describes the background, implementation, assessment, and future plans of the LONDON: ENG 331 program hosted by the College of Engineering (COE) and the College of Humanities & Social Sciences (CHASS) at North Carolina State University (NCSU). The motivation for initiating the program was to structure an international experience for engineering students, which differentiates them further to become the success that they want to be. The goal of LONDON: ENG 331 is to help prepare students to become more globally competent engineers through international coursework and experiences.

While many aspects of the LONDON: ENG 331 program have important implications for international programs, one aspect of LONDON: ENG 331 that may be of most interest to other institutions is that the program is customizable for engineering students across multiple majors because of company site visits and the Tourist With a Purpose (TWP) program.

Introduction

Historically, international study has been one of the primary means by which students, at institutions of higher education, have gained first-hand knowledge of other cultures and languages. Among the benefits are attaining a greater proficiency in a foreign language, gaining an appreciation for and understanding of other cultures, improving communication skills and the ability to live and work effectively in another culture.¹ The effects are felt long after return. Ninety-five percent of “alumni” report that their international experience had a lasting impact on their world view and a majority said that it influenced their career path. Although the number of students enrolled in international study has doubled over the past decade, only a small percent of undergraduates nation-wide take advantage of this opportunity.² At NC State University over 30% of all enrolled students are in the College of Engineering, however, a much smaller fraction of students participate in international study. Engineers are typically underrepresented in study abroad programs.

In 2010-2011, engineering students made up 11% of all participants from the university according to Study Abroad Office reports. While the success of international programs is widely documented, and indeed at NC State University there are many existing programs that have been integrated into the curriculum to further student success, many engineers believe that they face a tremendous opportunity cost, considering their constraints of limited time or resources, to have an international experience.

¹ U.S. Committee for Economic Development (2006)

² Institute for International Education (IIE)

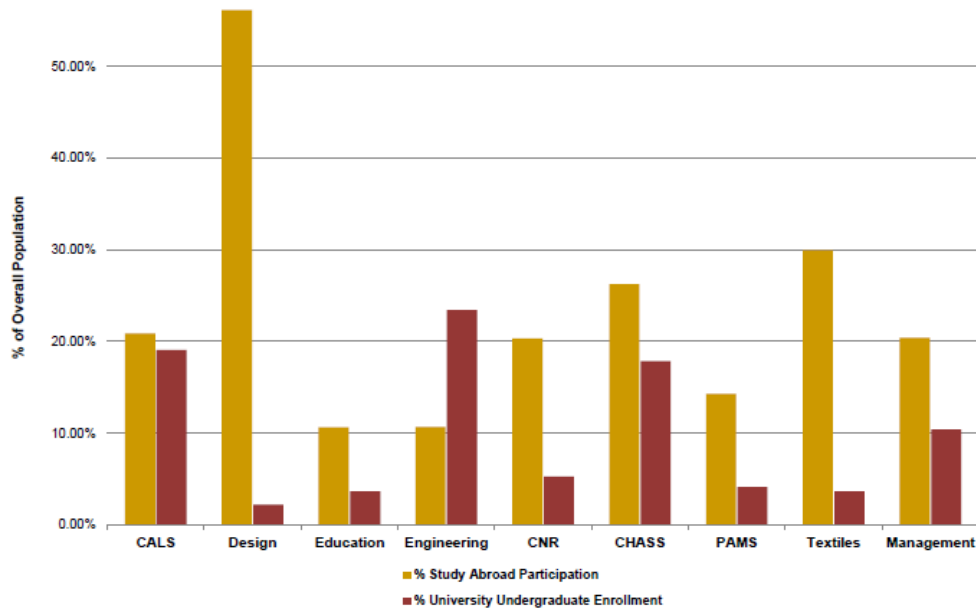


Figure 1 – Undergraduate student representation ³

The fact is, global knowledge is necessary for students to understand the world and their place in it. The global knowledge requirement at NC State University provides students the opportunity to explore the complex interrelationships among nations, to gain a deeper appreciation of other cultures and peoples, and to evaluate the impact of U.S. culture and policy on the rest of the world⁴. Creating an international version of a required course is one way to encourage more engineers to consider an international academic experience. ENG 331: Communication for Engineering and Technology is a required course for students in most of our 18 engineering majors (in addition, business majors can receive credit for this course as well). This writing intensive course covers the kinds of writing that students will do in their future workplaces with an emphasis on varied audiences and the relationship of writing to oral and visual communication. Typically, students complete ENG 331 in the classroom or in an online environment during their junior or senior year. The demand for the course is high each semester and sections fill quickly.

In the LONDON: ENG 331 version of the course, students complete the same rigorous requirements as the campus or online version of ENG 331 while also experiencing living abroad, observing international workplaces, and performing research about international workplace communication. In addition to readings and lectures, students use the resources of London as an extended classroom. Following the existing ENG 331 curriculum and emphasizing the internationalization of students' current and future workplaces, students complete the typical assignments for ENG 331: business memo/email, proposal, progress report, instructions, resume and letter, presentation, and website or project. All these assignments are directly related to their observations and interactions in London and the site visits at engineering / technology workplaces.

³ <http://www.ncsu.edu/>

⁴ <http://oucc.ncsu.edu/gep-gk>

Specifically, the objectives of the LONDON: ENG 331 program are to:

- Expose students to international communication and explore similarities and differences in workplace communication
- Provide opportunities to tour and observe international workplaces
- Provide opportunities to conduct original research by interviewing employees to be used in the *Communication in the Workplace* report published by the Professional Writing Program (PWP) and used by faculty and students
- Encourage students to explore London viewed through the perspective of their own field of study in the Tourist With a Purpose (TWP) Program
- Allow students and faculty in the PWP who are unable to participate in study abroad opportunities access to the class blog to enhance learning about international communication.

The planning for LONDON: ENG 331 began in the fall of 2009. During the summer of 2011, engineering students participated in the first offering of LONDON: ENG 331. It turned out that, three of the eight participants were female. Typically, more females tend to participate in study abroad. According to the Study Abroad Office's most recent reports, females made up 66% of the participants in study abroad programs (62% in 2009-2010).

	NC State University	College of Engineering	Study Abroad (NCSU)	Study Abroad (COE)
Male	12,265	4,612	313	70
Female	9,613	864	592	40

Figure 2 – Spring 2011 Undergraduate Enrollment compared to 2010-11 Study Abroad participation

During the 1995-96 academic year, the United Kingdom was *the* key international opportunity. Today, the United Kingdom is just one of the many key international opportunities:⁵

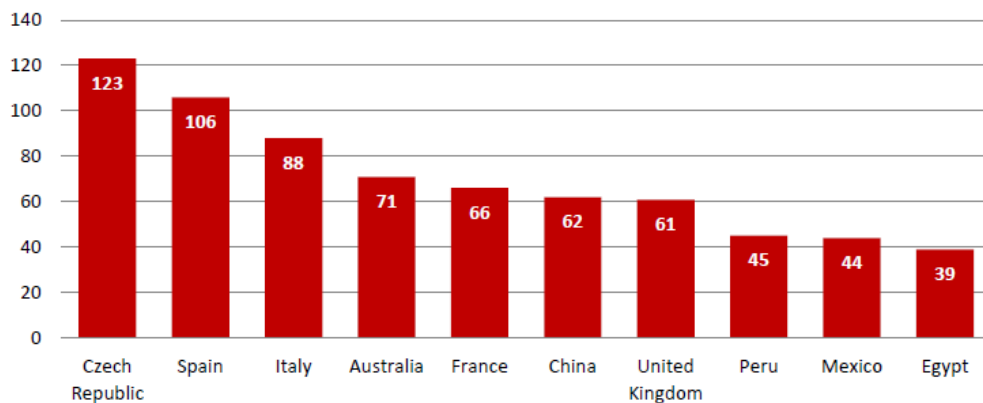


Figure 3 – Ten most popular study abroad programs at NC State University in 2011

⁵ <http://studyabroad.ncsu.edu/>

At NC State University, international study is increasingly integrated into the curriculum. It is essential for a students' international experience to be integrated into their plan of study⁶ whereby differentiating themselves from the more than 1,100 that will graduate from just this College of Engineering, not to mention the 70,000+ plus graduating with an engineering degree nationwide and the over 3/4 million engineering graduates worldwide – just in one year alone.

Figure 4 – Curriculum Integration for Engineering Students

Implementation

During the five week program, students split time between classroom lectures/activities, cultural events, personal travel, company site visits, and the Tourist With a Purpose (TWP) program. Classroom meetings were held three days a week for 2 ½ hours. During classroom time, students participated in lectures, completed group activities, drafted documents, performed peer review, and collaborated on their final project. A number of cultural excursions provided breadth of knowledge. While classroom and cultural activities were important, the site visits and the TWP program were by far the most enriching and valuable aspects of LONDON: ENG 331.

One day a week, students participated in site visits at engineering companies in London. The visits included a tour of the facilities, a professional presentation about the company, and a question and answer session about workplace communication.

⁶ Reed-Rhoads , T. (2007)

	Arrival	Week 1	Week 2	Week 3	Week 4	Week 5
Monday		Class; Reading Day	TWP; Pygmalion	TWP	TWP	TWP; Fuller's Brewery
Tuesday		Class; Science Museum	Class	Class; Site Visit	Class	Site Visit
Wednesday		Class; Westminster Abbey	Class; Site Visit	Class; Phantom of the Opera	Class; St. Martin's in the Fields Brass Rubbing	Class
Thursday		Class	Class	Class; London Eye	Class; Site Visit	Final Presentations; Process Experience
Friday	Arrive in London Orientation	TWP	TWP; Greenwich	TWP	TWP	Leave London
Saturday	Market Day	Excursion to Bath/Stonehenge	Travel Weekend	South Bank	Final Project	
Sunday	London Tour	British 10K	Travel Weekend	Free Day	Final Project	

Figure 5 – Example Schedule

Every five years, students in the Professional Writing Program (PWP) program interview professionals about their workplace communication. Although not all the survey and interview questions were used for the site visits, the following 9 questions ⁷ were used as the starting point for the question and answer sessions:

1. *Are oral and written communication a part of your performance appraisal?*
2. *What percentage of your work week do you spend writing (planning, drafting, revising)?*
3. *What percentage of your time is spent working with others to plan and write documents?*
4. *What percentage of your writing time is spent composing the following: Email, Chat, IM, Text, blogs, wikis, short internal documents, short external document, long/formal documents?*
5. *What type of documents do you write?*
6. *What percentage of your time communicating on the job is with people from other countries?*
7. *How did you learn to do the writing you have to do in your work – on the job, workplace training, college course, etc.?*
8. *In what ways has technology changed the way you communicate at work, especially over the past five years?*
9. *Please describe any examples of the consequences of effective or ineffective writing within your organization.*

⁷ Questions were adapted from the PWP's Communication in the Workplace (CIW) report: <http://courses.ncsu.edu/eng331/common/resources/ciw2007/index.html>

Students took turns asking the questions and recording the interviewee's answers. This informal public speaking is the kind of speaking expected on a daily basis in the workplace. The question and answer session also mimicked a workplace meeting. The survey questions were a starting point for the conversations about workplace communication and other topics like ethics in engineering, working with others in different countries, tensions between departments, collaboration, and changes in technology and tools.

The four companies visited were: Keane, Ramboll, AKT II, and the 2012 London Olympics. At each site visit, students saw different corporate environments, expectations, management styles, and workplace cultures.

- ✓ Keane, an IT services firm, is the most formal workplace visited. Students spoke with the very personable executive vice president and the vice president of Human Resources.
- ✓ Ramboll, an engineering and design consultancy company, was popular with the students because of its open floor plan and collaborative workplace. Students spoke with a young engineer and could easily imagine being in her position after graduation. In addition to the tour and question and answer session, the Ramboll engineer led the students through some critical thinking case studies.
- ✓ AKT II, another engineering design company, emphasized their spiral organization structure and design-led engineering practices. The AKT II employees shared many of their designs and major projects from idea to completion.
- ✓ The Olympic Park is an example of extraordinary efforts in sustainability. Students were impressed with the scale of the project and the amount of materials that were recycled, reclaimed, or will be reused in other venues. Certainly, when watching the games in the summer of 2012, the tour will be in the front of their minds!⁸

Students prepared a collaborative report about their communication in the workplace findings from the site visits as their final project for the course. They compared their findings to the most recently published version of the Communication in the Workplace (CIW) report created by the PWP. In their final report, the students emphasized what they learned about communicating with workers in other countries, respecting cultural awareness and expectations, adapting communication styles for different audiences, being concise, explaining concepts in non-technical terms, and collaborating. Students were especially interested in the value of communication skills for engineers and how the changes in technology are improving (or sometimes complicating) workplace communication. Below are a few excerpts from the students' report:

⁸ For more details about each site visit, please visit london-eng331.blogspot.com.

Communication Skills

- “The representatives from each company repeatedly told us how important it is to be able to communicate and write in the workplace. The answer to almost every question we asked always concluded with *you must be able to write and communicate properly with others if you want to keep your job.*”
- “Our findings also reflected the previous CIW report indicating that oral and written communication were part of the employees’ job performance appraisals. The communication process was also considered to be an integral part of every activity in the workplace, as found in the last CIW report.”
- “Each representative could not stress enough how important communication is in the workplace and how being able to communicate properly is one of the most valuable assets an engineer can have.”

Technology in the Workplace

- “When it comes to technology, new technological advances, especially in social networking, have made an impact on how information flows in an office setting. This is a new development since the last published CIW report. Email has also retained the importance it had five years ago.”
- “Aside from the specific differences in each company’s technological changes, both companies reported that technology has reduced the amount of face-to-face conversation and exponentially increased the amount of emails sent per day. Technology changes the way a company runs, and will continue to alter the communication within corporations.”

International Communication

- “Communication with other countries was also an important part of the companies we visited. London is an international city with over two hundred nationalities living and working inside the city. Without even leaving London, companies need to be culturally aware and adapt their communication style to accommodate all their employees and clients.”
- “Our findings at our site visits coincided with our studies in ENG 331. Skills like document design, being concise, and being able to explain your work in non-technical terms when necessary were emphasized by both companies, echoing the teachings of our ENG 331 class.”

Clearly, the site visits provided rich experiences in exposing students to international workplaces and reinforcing the concepts covered in lectures, readings, and classroom activities. Despite the benefits of the site visits, a caveat is needed when planning future site visits. Scheduling the site visits was problematic especially during the summer months. Multiple company contacts rescheduled and then ultimately cancelled. The take away for the instructor is to over-schedule even more site visits. Originally, the Olympic Park tour was not intended to be considered a “site visit,” but our guide graciously answered the communication in the workplace questions and spoke with the students about communication on such a large project.

The site visits reinforced content from class lectures, gave students a glimpse of professional life, and provided data for the PWP’s ongoing research study. Additionally, students commented on

the benefit of seeing different workplaces—from formal offices and cubicles (Keane), to open rooms with collaborative spaces and tables (Ramboll and AKT II), to mobile projects (Olympic Park). These experiences can help students determine the kind of environment that is most suitable to their strengths and interests. In their future job searches, the site visits can provide interesting conversations for interviews to help them stand out from other candidates.

Tourist With a Purpose (TWP)

Because of the differences in each major, the challenge for LONDON: ENG 331 was to be meaningful and customizable. The Tourist With a Purpose (TWP) program allowed the students to adapt the program to their interests and fields of study. As a result students were able to take ownership of this aspect of their international experience. London offers intriguing opportunities for engineering students in many different fields: architecture, aviation, breweries, cholera epidemic, construction, environment, flood control, gardens, government, HVAC, instructions, industrial revolution, London fire, mechanical, medical history, military, museums, nuclear power, Olympics 2012, parks, plague, public health, recycling, sewer, signage, sustainability, textiles, theatre, transportation, urban planning, war, and water.

During the first week of classes, students planned their TWP activities for the entire course. Each week, students completed at least three activities based on their major, passions, or future workplace interests. After completing a TWP activity, students wrote a reflection appropriate for an audience of fellow engineering students about what they learned and how it related to their major. The instructor selected TWP postings to publish to the class blog⁹ that was shared with PWP instructors, friends, and family. The blog was also highlighted on the Study Abroad Office website and tweeted by the Office of Information Technology so that members (students, faculty, and staff) of the University were also connected to these students.

Students selected a wide range of activities for TWP including: Tower of London, Fuller's brewery, Science museum, British museum, Oxford, Greenwich, Westminster Abbey, Little Venice, Recycling in London, Madrid, Paris, Rome, Germany, Stonehenge, Bath, Kensington Palace, Croydon, and plazas and parks. The TWP program encouraged students to do activities or visit places that they may not have considered when first arriving in London. Students teamed up to visit some locations together, commented on classmates' reflections, and were accountable for completing all activities and creating a progress report.

Assessment

At the end of the program, students participated in an open discussion about what went well, what they would change, and suggestions. Because of the small size and the closeness of the class, this meeting generated specific ideas for the future (including more meetings prior to departure, different arrival information, and tweaks to the schedule). All suggestions will be incorporated into future versions of LONDON: ENG 331.

⁹ <http://london-eng331.blogspot.com/>

In addition to the face-to-face discussion, students were required to complete anonymous program and course evaluations. These evaluations were shared with the instructor after final grades were posted. The response was very positive as evidenced by the comments below:

Site Visits

- “They were excellent and key to the program. They gave a great perspective to the material we were being taught.”
- Trips were “well integrated.”
- “Informative”
- “The site visits were perfect.”
- “We could relate it (site visit) to the course.”

Best aspect of the experience

- “...learning the feel of professionalism: from being independent to visiting large companies and holding meetings. It was a great experience to meet new people and live in the city.”
- “...the fact that you learn the lecture material and you see it being used on the different site visits.”
- “LONDON: ENG 331 study abroad was the greatest summer experience I have ever had. I would recommend the trip to any engineer.”

From the instructor’s standpoint, the program was an undeniable success. The students were excellent representatives of the University and the U.S. They studied, participated fully in site visits and TWP, and responsibly explored London and beyond. Living in London and teaching these students ranks as the top professional experience for the instructor of LONDON: ENG 331.

Future Plans

Starting a new study abroad program requires extensive planning, recruiting, patience, and luck! Thanks to the success of the first offering of LONDON: ENG 331, future plans for the program are already coming together. Although we won’t be offering LONDON: ENG 331 during the summer of 2012 because of the Olympic games, plans are underway for summer 2013. Recruitment efforts, partnering with other instructors, and considering different locations are all possible in the future.

Past students are excellent for recruiting future students. Students participated in NCSU’s Study Abroad Symposium and shared their experiences and answered questions. The students have given presentations to student groups about LONDON: ENG 331. In addition, recruitment materials can now include pictures of students in the apartment accommodations, the classroom, on excursions, and during site visits. Also, the class blog, available to the public, highlights the program.

Currently, the LONDON: ENG 331 instructor is working with an instructor in the College of Engineering to create a two-course program for future summer programs. Students would complete one engineering course and then the LONDON: ENG 331 course. This would make

access to financial aid easier and it will allow students to complete two courses while overseas in the summer.

Although London is an ideal city for an international experience for many reasons such as ease of travel, no foreign language proficiency requirement, outstanding public transportation, relative safety, and a wealth of historical and cultural sites, future plans for the program could include other cities (e.g., PRAGUE: ENG 331 or SYDNEY: ENG 331...). The program will continue to adapt and grow to meet the needs of our engineering students.

Combining classroom experiences, site visits, and cultural activities can help prepare students for the global workplace. These students will be able to discuss their experiences in job interviews and will be better prepared to live and work in areas outside the United States. Being aware of international workplace similarities and differences will help us produce globally competent engineers.

Conclusion

Students must develop global competence and be able to function as global citizens. All engineering students should “have the broad education to understand the impact of engineering solutions in a global and societal context.”¹⁰ To do so, students must increase their international knowledge and skills through, for example, international study and experiences. The United States, to remain a leader, must continue to emphasize internationalization in higher education. Our counterparts around the world are certainly doing so – often times at a faster rate. If this continues, we will lose our competitive edge in the international marketplace. Therefore, it is vital that we embrace this global economy and reinforce the experiencing of other societies and cultures as both valuable and necessary to remain competitive.¹¹ Investing in international education is the key to educating globally competent engineers.

¹⁰ ABET, Inc.

¹¹ Continental AG (2006)

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