AC 2011-1475: INTERNATIONAL EXPERIENCES OF A US UNDERGRADUATE STUDENT IN EXCHANGE PROGRAMS IN FRANCE AND BRAZIL

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International Experiences of a US Undergraduate Student in Exchange Programs in France and Brazil

Abstract

This paper documents one year-long study abroad experiences, each in France and Brazil, of a civil engineering undergraduate at Virginia Tech. This student (the lead author) spent his sophomore year in an engineering school in France with instruction in French and senior year at the Federal University of Rio de Janeiro, Brazil with a medium of instruction in Portuguese. The rest of his engineering program was completed/is ongoing at Virginia Tech. In France, twenty-two school credits were earned in engineering and history/culture/language classes. In Brazil, 23 transfer credits were obtained, including an online class from Virginia Tech. Therefore, this student earned nearly 33% of his academic credits for his B.S. degree outside United States. Study in Brazil is funded under a project with funding from the Funds for Improvement of Post-Secondary Education (FIPSE) program of the U.S. Department of Education. These study abroad programs allowed the student to study subjects such as the Eurocodes for structures, European green building systems, and environmental engineering projects in Brazil. In addition, the student learned French and Portuguese and became familiar with the cultures/countries of many other exchange students from Europe, Asia, and South America. Lastly, the authors discuss an innovative experiment conducted in fall '10 semester in which the lead author shared his study abroad experiences in a live presentation from Brazil with engineering freshmen at Virginia Tech using TabletPC/DyKnow technologies.

Introduction

Virginia Tech designed and implemented an international faculty development program (IFDP) in 2005 to train faculty to internationalize university's curricula. Second author represented the College of Engineering on the first cohort of IFDP which included 13 faculty from various colleges and co-authored cohort's report that included various recommendations to internationalize curricula [1]. Second author initiated various activities, beginning in 2005, targeted at internationalizing the freshman engineering program (also called General Engineering (GE)). A major grant under the Department-Level Reform (DLR) program of the National Science Foundation facilitated implementation of various international activities into freshman engineering program, particularly into a first semester engineering course "Engineering Exploration EngE1024" [2]. This 2-credit course is required of all engineering freshmen and is offered by the Department of Engineering Education (EngE). The course includes a lecture and hands-on activities that are targeted at promoting global awareness. Instructors discuss international education related issues raised in national publications like *The Engineer of 2020*, *Educating the Engineers of 2020* by the National Academy of Engineering (NAE) [3] [4]. Some

examples of hands-on activities with international flavor include: i) a world map activity [2] and ii) a 8-week long sustainable energy design project (SEDP) [5]. A 20-min study abroad presentation by an upper class person with experience in studying abroad was included in EngE1024 beginning in spring 2005 and this practice continues at the time of this writing. Since then more than 40 upper class persons with study abroad experiences in various countries including Australia, India, China, Ireland, Italy, South Africa, France, Spain, Russia, Brazil, United Kingdom, etc. have shared their experinces with engineering freshmen in this course.

The lead author took EngE1024 in fall of 2006 with the second author as his instructor. He went to France for a 1-year study abroad program right after his freshman year at Virginia Tech. In his senior year, the lead author studied for a year in Brazil. Table 1 summarizes study abroad experiences of the lead author in France and Brazil. In addition, the lead author visited India in the summer of 2009 under the guidance of 2nd author [6].

This paper analyzes study abroad experiences of the lead author. He has been invited back by the 2nd author to make presentations to freshmen to share his study abroad experinces. The authors did an innovative study abroad presentation in the fall of 2010 in 2nd author's EngE1024 class which included a live presentation from Brazil with the help of educational technologies. This is discussed at the end.

Table 1. Summary of courses taken by the lead author in France and Brazil.

Institution	**INSA-Lyon, France**	**UFRJ, Brazil**
Period of study	2007/2008 academic year	Spring/Fall 2010
Class	Sophomore	Senior

Courses taken	Intro. to Geotechnical Engineering AutoCAD for Civil Engineering French Oral Proficiency Architecture and Urbanism Workshop design project (green building design) French Literature/History History of the European Union Calculus Physics Designing Concrete Structures Hydrodynamics	Fluid mechanics Urban transportation systems Intro. To Railway engineering Intelligent transportation systems Brazilian Economy Humanities (the role of the university) Foundations Civil engineering materials Technical Writing (online class from home institution) Portuguese for foreigners Soil mechanics Electrical circuits analysis
Language of instruction	French	Portuguese
Total transfer credits to home institution	22	23
Total number of transfer courses	7	7
Other relevant information	Engineering school 5000 students.	Federal University > 20000 students

INSA-Lyon, France

The lead author studied at INSA-Lyon, an engineering school in France, during his sophomore year of engineering studies. INSA-Lyon is unique in France for its integrated preparatory school and engineering program as well as the high percentage of students (25%) from across Europe, South America, and Asia. The preparatory school, a French tradition, groups the first two years in which students take strictly science and humanities courses and forms the basis for the following three years in the departmental engineering programs. INSA-Lyon is also unusual in that the first two years of preparatory school are divided into groups of students, called *filières*, in which French students are mixed with European (Eurinsa *filière*) students, Asian (Asinsa) students, South American (Amerinsa) students, and English speaking students (SCAN) in a *filière* taught in English.

Academic Environment: The lead author was permitted to enroll in classes in the preparatory school and the 1st year (junior year) classes of the civil engineering department. In the preparatory school, calculus, physics, a European Union history class, and a speech class were taken. Classmates were from Slovakia, Germany, Romania, Poland, Italy, and Spain. The speech class was challenging for the international students since it was instructed in French. The theme

of the class was to learn both the French culture and format of speaking, as well as introduce the French students with the cultures of other students.

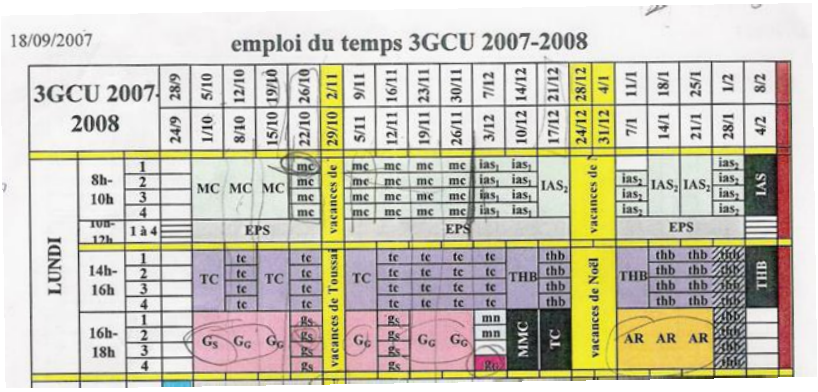

Figure 1.Fragmented class schedule showing Monday's (*Lundi*) schedule for the fall semester of the 3rd year of the department of Civil Engineering and Urbanism at INSA-Lyon

Students in the preparatory school are in class eight hours a day (8 a.m. to 6 p.m.) with two hours for lunch. Due to the rigor of the *préparatoire*, students state that once they pass the first two years, passing the next three years in the engineering departments is guaranteed. There is a strong sense of a professor - student hierarchy. A calculus teacher told the class in the first few days, "If you are not good in math, you are *null"*—meaning "worthless." Cheating and plagiarism were greatly looked down upon by the professors, and the French students took pride in their personal work. Although INSA as an institution did not have an Honor Code, the professors and students did not tolerate cheating.

A typical class consisted of a 2-hour lecture and a 2-hour recitation session which would make it a 4-credit course under the European Credit Transfer System (ECTS). The lecture would be in an auditorium with a hundred or more students while the recitation sessions would be conducted in a small classroom. The problems worked in recitation were checked by the professor during class. Little homework was assigned. Evaluation for first and second year classes consisted of three tests during the semester and a final exam. For third through fifth year classes, evaluation consisted of a final exam, laboratory work, and recitation participation. Since there were few homework assignments during the semester, the exam period was intense. Those who failed within a certain margin in their first attempt at the final exam were given the opportunity to retake the final exam two weeks later. Grades were not considered of much importance. Hiring companies would not ask for grade point averages, and merit scholarships virtually did not exist because the school charged only a nominal fee of one hundred Euros per semester for tuition for those in attendance. However, since the slots were limited in each engineering department, class rank was a deciding factor for second year students to be accepted

to their preferred engineering department. For students in their third and fourth years, competition for study abroad slots depended on their class rank as well.

France uses a 20-point grading scale with a passing grade of 10, and the letter grades of *A*, *B*, *C*, *D*, *E*, *Fx*, and *F*. French students explained the 20 point grade scale as follows: 18 was perfect, no one received above that in post-secondary education unless he or she was better than the professor; 16 was excellent; 14 was a good grade; even with a 12 students would still sigh with relief; 10 was a pass; and 8 to 10 meant that a student's fate would be subjected to a jury of teachers to determine if he/she will pass, fail, or retake the year. *A* through *E* on the letter scale were passing grades. The *Fx* meant that the final exam could be retaken. The *F* was a fail.

All students at INSA-Lyon were required to complete two internships, one after the first year which was an unpaid, non-professional "factory hand" internship, and a second professional internship after the fourth year. The first year French students were tasked with finding their rising sophomore internship in the part of the world according to their *filière*. For example, students in AmerINSA found summer internships in South America. AsINSA (Asian/French *filière)* students searched for internships in countries like China, Singapore, and Vietnam. EurINSA students looked for internship opportunities in Europe, and the students from the all-French *filière classique* searched in France. It was usual for seniors to share their contacts with the first year students, and classmates from those countries also helped their French peers.

Social and Cultural Interactions: There were approximately 150 exchange students in the 5000+ engineering student body at INSA-Lyon. The majority came from Brazil, about sixty students. Other countries represented were Germany, Mexico, England, Argentina, US, Ireland, Singapore, Finland, Sweden, Czech Republic, Colombia, and Venezuela. A good number of students came from Europe under the Erasmus student exchange program of the European Union. European students received a monthly subsidy for studying in another country for six months or a year. Many French students (approximately 50 %) participated in this program in their fourth year. French students considered an academic exchange as a crucial experience for their resumes. European companies favored students with experience abroad and multiple language skills. The students who remained at INSA during the five years did research work or an internship as a replacement for an exchange experience. With the large number of students

studying abroad, spaces were limited and competitive. Academic advisors matched students with countries based on class ranking and student preferences.

Campus Life: INSA-Lyon was proud of its tradition of integrating sports and music in the engineering curriculum. The preparatory *filière* "sport-études" combined competitive sports with engineering classes. All students were required to participate in a sport for two hours per week. The preparatory *filière* "musique-études" combined music studies with the first two years of preparatory school. An orchestra and several bands were included among the student-run clubs. However, the engineering school itself sponsored few of these activities. For example, to swim at the school gymnasium required a subscription. But student-funded clubs abounded, including tennis, sailing, skiing, and rock-climbing to name a few. Other clubs included a bicycle workshop, a ski rental outlet, rocketry club, and parasailing. Students' responsibility for organizing extracurricular campus activities was also apparent in the student-run bars and printing/supply shops on campus. Students organized a massive traditional yearly celebration "Les 24 heures de l'INSA" of 24 hours non-stop music, relay races, and festivities as well.

***France from a student's perspective*:** Being a student in France had the advantage of being able to explore Europe inexpensively. Train fares were discounted up to 50% for students. Holidays were spent traveling with friends, staying at their houses or in hostels, or camping. Student ski rentals, for example, including lift tickets and transportation in a bus to the ski slopes would cost 30 Euros for a day.

Figure 2. Sailing on the Mediterranean with exchange students (lead author in the middle).

One weekend, the students of the Yachting Club "Big Boys" rented sailboats on the Mediterranean with eight people per sailboat. This three day trip, including food and transportation cost 80 Euros per student. The cost of two semesters in France was equivalent to what a tourist would pay for a few weeks of travel.

Language Training: Because of INSA's tradition of recruiting 25% foreign students, the school had developed an efficient method of teaching French to foreigners. The first year students

coming to INSA learned French rapidly, impelled by the need to communicate with each other. Exchange students were more lax since they were only in France for six months or a year, but within a couple months, most were communicating in French with other exchange students. Although the exchange students were able to communicate with each other, taking classes in another language and adjusting to a different learning system was difficult. It was common for exchange students to fail several classes.

Universidade Federal do Rio de Janeiro (UFRJ), Brazil

In his senior year, the lead author took civil engineering classes at the Universidade Federal do Rio de Janeiro (UFRJ) in Brazil through a project sponsored by the Funds for Improvement of Post-Secondary Education (FIPSE) program of the U.S. Department of Education. The second author directs this project at Virginia Tech. Exchange students from other countries including France, USA, Germany, Czech Republic, and other South American countries were studying at UFRJ.

***Academic Environment*:** The engineering program at the Universidade Federal do Rio de Janeiro (UFRJ) is designed as a five-year degree program. UFRJ is a public university which means tuition is free for students who pass the entrance exam. The entrance exam, known as the *vestibular*, is currently separate for each university although there has been discussions on developing a national *vestibular* which will facilitate students' applications to multiple universities.

Although the duration of the engineering degree is five years, engineering students at UFRJ spent an average of 7 years to complete their degree. The extra time is needed for classes which may need to be retaken and internships. It is common for students to repeat classes. As in France, student's grades affect their ability to enter the engineering department of preference. Almost all Brazilian students at UFRJ's *Escola Politécnica* (engineering school) lived in Rio de Janeiro with their families. The majority of students also worked part time on internships at least for a semester or year during the course of their studies. The students were obliged to work part time in order to be marketable upon graduation. However, UFRJ professors encouraged students to focus more on their studies than working in order to increase the graduation rate.

A certain level of proficiency in English was required for graduates of the UFRJ *Escola Politecnica*, and professors and students often spoke English with exchange students to answer questions. After English, French was the most widely studied language among the Brazilian engineering students.

While in Brazil, the lead author completed transportation classes, fluid mechanics, electrical circuits, humanities, and the Brazilian economy. In the humanities course, the students read two books on personal learning and the changing role of the university. The class was assigned to write chapter summaries of two books. For the final course presentation, groups of four students were assigned to research a university laboratory and they were tasked to examine the activities in the lab in meeting university's goals in research, education, and extension.

The transportation engineering classes were fairly small (only five students). The largest classes held sixty to one hundred students. Copying notes from the chalkboard was a standard practice in classrooms, and professors assigned reading and problems from textbooks which could be copied on campus or downloaded. The classes were typically four credits which meant two hours of instruction twice a week. Many professors started classes fifteen minutes late and accepted tardy students with just a joke. Others stipulated that students arrive on time.

One of the interesting and surprising moments in lead author's memory was when the professor would ask the students for setting test dates. Students joked that at UFRJ the students are united against the professors. It usually took a few minutes for the students to verbally determine the best dates. Cheating is prevented but each professor determined how strictly he/she enforced rules. During difficult tests, the students would unite at the end of the hour to bargain for more time. Talking during regular class-time was also permitted to a degree. However, rules varied greatly between professors. Courses usually included two to three tests and a final exam. If a student performed well on the tests, he/she was not required to take the final. The grading was based on a 10-point scale. Seven was a pass, and professors assigned decimals such as 9.6 to grades. The professors put course materials and grades on course websites for some classes. Test grades were posted on bulletin boards.

***Social and Cultural Interactions*:** Outside of school, it was easy to spend time with Brazilian students since they spoke English and the foreign students knew conversational Portuguese. A group of Brazilian students was dedicated to orienting exchange students, and several Brazilian

students planned social events throughout the semester such as a BBQ and a hike. Since there was very little on-campus housing and most of the students' families lived in Rio de Janeiro, student activities after hours took place in the city itself. The beaches in the South zone were popular places to run, surf, or hang out with other students. Students attended cultural activities within the city.

***Language Training*:** Before beginning studies at UFRJ, the lead author received two and a half weeks of 6 hours daily Portuguese training with a class of Japanese, American, and French students. The introduction to Portuguese and previous training in Spanish and French helped the lead author in adjusting to the new language. A twice weekly Portuguese class was also taken throughout the first semester in Brazil.

Academic and Financial Impacts of Study Abroad

Perhaps the most difficult part of the study abroad process was transferring credit to the home institution. After returning from France, a year had passed before transfer credit appeared on the transcript. Much time and effort was spent ferrying documents and sending emails between professors, departments, and the registrar's office. Administrators and faculty spent a good amount of time approving each course and entering it into the university course transfer database. The lead author delayed his graduation by one year largely because of the extra time needed to finish classes. Classes in which he was most successful were those within his interest area and those in which he was already familiar with the subject material. It was typical among the exchange students to experience difficulties finding the classes they needed. The lead author recommends finishing physics, statics, and calculus before studying abroad, although taking calculus and physics classes abroad could be a valuable experience. Readily available study abroad scholarships offset additional costs of traveling and living, and some costs were actually less in comparison with costs at the home institution. For example, not buying textbooks saved $500 per semester. The French government subsidized housing for students who stayed at least two semesters. The lead author does not regret spending an extra year in graduation since it provided time to branch out, but had he been an out-of-state student, it would have been impossible. Also, he feels that the minimum length of stay for an immersive experience in a foreign country is 6 to 10 months. It takes at least a month in order to feel comfortable in a place. Longer stays are far more cost effective than short ones if a student is keen on experiencing a

different culture. The critical success factors include the class offerings of an institution, and at least some previous training in the language of instruction.

Professional and Personal Impacts of Study Abroad

The lead author feels that the study abroad experiences discussed in this paper have broaden his vision about engineering education. For example, when he saw French classmates seeking internships in other countries he was inspired to do the same. In addition, it helped him build an international network of friends. For example, his friend from India whom he met in France picked him up at the airport when he visited India in the summer of 2009. After he returned from France, he interned with a company on bridge design project in Montreal in which design drawings were in English and French. He is currently seeking to return to Brazil to work with transportation projects in Rio de Janeiro leading up to the 2016 Olympics. Also, the lead author interviewed for an internship with a transportation engineering company in Brazil.

Study Abroad Presentation from Brazil Using Education Technologies

Figure 4. Study abroad presentation to Engineering Exploration class. Lead author on screen via skype and webcam.

The second author has done innovative experiments to motivate his freshman students to consider study abroad programs [2]. He requested the lead author to present his study abroad experiences in Brazil to his Engineering Exploration class in fall 2010 by conducting a live presentation from Rio de Janeiro. They used TabletPC/Dyknow/Skype/Webcam technologies for setting up this presentation (see Fig. 4). After a 10-min slide presentation from Rio by the lead author, students were asked to record their questions on lead author's presentation by writing on a blank DyKnow slide using their tablets. The second author retrieved their questions (see examples in Table 2) using TabletPC/DyKnow technologies and requested the first author, who was participating from Rio, to answer these questions. Overall, it was a successful experiment and demonstrated the potential of modern education technologies to promote study abroad opportunities. In an exit survey in EngE1024 (see Table 3), 17% of the students noted that the study abroad presentations motivated them to consider study abroad and over 75% of the students found them useful. It may be noted

that about 100 students participated in the study abroad experiment discussed above. The data presented in Table 3 is for the entire EngE1024 class in fall '10.

Table 2. Questions from students during study abroad presentation from Rio de Janeiro, Brazil.

Are your classes taught in English?
Which track of CEE are you on? Why did you choose to study in Brazil?
Which language was hardest to learn?
In the places you have been, how easy has it been for you adapt to local culture?
How hard was it for you to get used to different cultures (i.e., language, food, people, etc.)?
How study abroad negatively affected your graduation from Tech?
Which study abroad experience did you like the most?
Do you get breaks like you would here? (fall/spring break)
How did you get involved in study abroad?
Do you think the classes you are taking are up to this U.S. university's standards?
What is the most difficult aspect of studying abroad?
What has been your favorite experience?
How did (second author's) class prepare you for these study abroad opportunities?
When is the best time to participate in study abroad experience? Freshman, sophomore, junior?
Do you plan to live in a different country after you graduate?
What are the difficulties in working with people from different cultures?
Did you actually learn a lot of Portuguese in just 3 weeks? Were you prepared for class?
Were any of the classes you took taught in a foreign language?
How did you choose which place to study abroad?

Table 3. Exit survey of freshmen engineering students (N=610).

Please recall a guest presenter discussed his/her study/work abroad experiences with you in your lecture class. I found this presentation:	
Very useful and it motivated me to consider study abroad options in future	(17%)
Useful but it's too early to make plans for studying abroad	(34%)
Useful but I'm not interested in studying abroad	(28%)
Not useful	(11%)
None of the above	(8%)
no answer	(3%)

Conclusion

Participation in study abroad programs in the case of the lead author significantly broadened his cultural knowledge and contributed to his personal and professional goals. He is currently examining various opportunities to pursue graduate studies in Germany. The financial

impact of study abroad was minimal with the help of readily available study abroad scholarships, FIPSE project grant, and reduced costs such as subsidized student housing in France. Although a study abroad experience may delay graduation or will result in higher course loads to compensate for unavailable classes during semesters abroad but the lead author feels that studying at a foreign educational institution with foreign students is an excellent way to assimilate a foreign culture and language, and longer stays have higher returns than short stays on language learning, friendships, and enjoyment of a place. Second author serves on College of Engineering's International Programs committee and has participated in several initiatives targeted at internationalizing the curricula. The FIPSE project discussed in this paper is the first project of this kind in the CoE and an international engineering certificate for engineering undergraduates is a possible outcome of this project. International experiences should begin in the freshman program and should be woven throughout the curriculum. Theoretical models like Jerome Bruner's spiral curriculum approach should be considered for weaving global experiences throughout the curriculum [7][8].

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