

## **2006-2418: UNDERGRADUATE RESEARCH IN A FOREIGN COUNTRY: A STUDENT'S EXPERIENCE**

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# Undergraduate Research in a Foreign Country: A Student's Experience

## Abstract

This paper will describe the preparation, experiences, and outcomes of an undergraduate student conducting research in a foreign country mentored by two professors, one foreign and the other from the home institution. A description of the partnership between the two institutions will be presented as well as the successes and challenges of the project and the future implications for other undergraduate students repeating the same type of program.

## Introduction

In 2002, several faculty in the Purdue School of Engineering and Technology at Indiana University - Purdue University Indianapolis (IUPUI), collaborated to offer a short study abroad multidisciplinary course in Mannheim, Germany titled, "GO GREEN - Green Organizations: Global Responsibility for Environmental and Economic Necessity." This study abroad course was designed to teach engineering and technology students three important fundamental topics; sustainability, globalization, and cultures. The course examines sustainable development in business and industry using best practices in Germany as examples. International companies visited are used as examples for analyzing and understanding the interconnectedness of globalization. Living in a different country for a short period of time is used for comparing and contrasting differences and similarities in a different culture.

The emphasis of the GO GREEN course explores the areas of sustainable design, engineering, manufacturing, technology, and leadership processes implemented and maintained in business and industry for the purpose of being environmentally and socially responsible, energy efficient, and cost effective. This course also looks at the complex interactions of costs versus environmental safety and social responsibility in decision making models sometimes called eco-efficiency models used in industries that are actively practicing sustainable development.

The GO GREEN course focuses on the sustainable practices of business and industry in Germany and the impact of those practices locally, nationally, and globally. Students are able to witness sustainable practices in industry first hand. Throughout the last four years the course has been offered, the IUPUI faculty have partnered with the following German companies and institutions, most of which, are centrally located around Mannheim, Germany; ABB, BASF, MVV Energie, DaimlerChrysler, Bodensee-Wasserversorgung (water company), Berufsakademie Mannheim, City of Freiburg, City of Landenbourg, Fraunhofer Solar Institute, Freudenberg, SolarFabrik, and Magdeburg University of Applied Science. Most of the GO GREEN industry partners were established with the assistance of faculty from the Berufsakademie Mannheim, a co-operative education university in Mannheim, Germany. The Purdue School of Engineering and Technology and IUPUI have had a long relationship and partnership with the Berufsakademie Mannheim. The GO GREEN course and the partnerships

with German businesses and industries were developed over time and have been the subject of several papers<sup>1,2</sup>

### **Undergraduate Research in Germany**

When the IUPUI faculty developed the GO GREEN course one additional proposal was introduced to allow undergraduates to conduct research projects on sustainable topics in Germany after taking the GO GREEN course. This project allowed students to take a full summer class load and be eligible for financial aid if needed. When the first GO GREEN course was offered in the summer of 2003, two students opted to conduct independent research in Germany. This was the faculty's first experience with undergraduate students conducting research in a foreign country. It was a learning experience for both the faculty and the students in that it led to some unpredicted barriers to information.

When conducting this type of program, the first step is for a student to select their faculty mentor. Students need to feel comfortable discussing their research project with the faculty mentor, so choosing the right faculty mentor is an important aspect in the process. Research shows us that undergraduate student-faculty research partnerships can positively affect student retention when UROP participants are compared with non-participants in each case there has always been a positive effect<sup>3</sup>. Undergraduate research projects encourages more students to be involved and excited about their studies. Faculty who mentor an undergraduate student must make extra time to work with the student to make the mentoring successful. Engagement in whatever form should be introduced early in the educational process so that the student can feel apart of the institutional life, role models (student or faculty) can be established, observed and imitated<sup>4</sup>. In the case of GO GREEN, students are at least sophomores before they are eligible to take the course and conduct the sustainable research.

As indicated earlier, the first two GO GREEN students who conducted independent research ran into difficulty setting up meetings with contacts in Germany prior to leaving for Europe, and therefore, some meetings were not established. One student did not conduct preliminary research on his topic area prior to arriving in Germany and therefore he had no information on his topic prior to arriving in Germany. Students should have some prior research on their subject prior to arriving in Germany.

### **Funding for Undergraduate Research**

At IUPUI, undergraduate students can apply for about \$2,500 in grant funding for undergraduate research. The program is called, Undergraduate Research Opportunity Program (UROP). Students applying for an undergraduate research grant must first find a faculty mentor. The application for the grant is a three page single spaced proposal narrative of the proposed project. The proposal must also include two recommendation letters, one from your mentor and one from another faculty member. Upon completion of the UROP research project, the student must submit a final report when his or her research is complete. If awarded, students must sign up for research credit with their mentor. About the time the first students in the GO GREEN program applied for their grants in 2003, the total fund for IUPUI was about \$70,000. Today, the total undergraduate research fund for IUPUI is \$100,000.

The GO GREEN faculty applied for and received an NSF grant to find German partners that could act as mentors for the undergraduate sustainable research. Two faculty made two one week trips to Germany in the fall of 2004 and the spring of 2005 that netted 4 new partners and 3 old partners, which agreed to mentor and host undergraduate students working on sustainable research. Depending on the company or university, the sustainable project would be tailored to fit the organization and students would be selected based on their interest. During the summer of 2005, faculty placed 3 students with these mentor partners. Two students went to the Magdeburg University of Applied Sciences to study hemp with a Professor of Mechanical Engineering and one student went to study the history of the Freudenberg Company and how it created a new business out of the waste from an existing business.

### **Preparation for Foreign Travel and Stay**

Students in the GO GREEN course and research students are given at least a four hour orientation for traveling abroad and German culture. When it is determined where the research student will be placed, the IUPUI faculty mentor and student will contact the German mentor and discuss housing options and other research details. IUPUI faculty have worked with most of the German partners for at least 4 years and feel comfortable leaving the students in their care. For the students taking GO GREEN, 95% of them do not speak German. Therefore, there may be apprehension and barriers to do their research due to the language differences. For all three students in 2005 research program, language differences were not an issue. The German partners are well aware of the fact that the GO GREEN students do not speak German.

One of the GO GREEN partners, the Magdeburg University of Applied Sciences agreed to be host for up to 6 students per summer for undergraduate research. Faculty at Magdeburg felt that their graduate students working on sustainable research projects could assist IUPUI undergraduate students in their research projects. In turn, the German graduate students would be able to practice their English skills while working and connecting with the IUPUI students. Magdeburg is located in old East Germany close to Berlin. While many people in old West Germany speak English, especially young to middle age Germans, this is not the case in the old East Germany. When the Soviets occupied East Germany they forced East Germans to learn Russian, therefore, not very many middle aged Germans in the old East Germany know English while the younger Germans have learned English a little later than their counterparts in the old West Germany. Given this scenario, the two IUPUI students who conducted research in Magdeburg in the summer of 2005, managed very well in the city and university with no German language skills.

One of the first tasks an undergraduate student must attend to when they are matched with their German mentor is to start a series of emails with their mentor. The emails to the mentor should include information like the student's resume and/ or background information, and or any other pertinent information that might be relevant to the research or the person. All the emails to the German mentor should also be copied to the IUPUI mentor. The student should attempt to start to research the topic (library, web, etc) prior to leaving for the foreign country. After the research topic has been selected and the host partner is selected, the student and the IUPUI faculty mentor should work on the UROP proposal.

Living arrangements will be discussed with the student and the German mentor and the IUPUI mentor. Students are responsible for making their own travel arrangements. They will most likely need to research train travel and what type of train pass to purchase before they depart from the United States. Other pre-departure concerns are obtaining passports, planning for emergency contacts, planning for medications to take with them, etc. The home faculty can assist students with some of these issues. For the GO GREEN students in Germany, there is a faculty member at the Berufsakademie Mannheim who serves as a backup emergency contact for IUPUI students in Germany when IUPUI faculty have departed. The IUPUI students have a network of contacts in Germany for emergencies.

## **The Experience**

Students that have never traveled overseas usually have more questions and concerns about travel and living arrangements. They may need more information about the differences between Europe and the United States. This clearly needs to be understood by students before they leave. It is culture shock. Students need to understand that eating, living, working, traveling (everything) will be totally different than what they are use to. Students need to be very flexible because they will be living and working in a totally different culture. Students need to act like change agents and be adaptable to their surroundings. In the case of living and working in Germany, students will find themselves walking (a lot), using mass transportation (trams, trains), eating different foods, and living in smaller places, just to name a few differences. If a student has the type of personality that does not display flexibility, then they should not apply for this type of program.

For one student's experience this past summer, the living conditions were comfortable and agreeable with a few small problems. The German university provided a very nice, clean apartment for a reasonable price. It cost 13.00 Euros per day or \$15.60 a day for a one bedroom apartment and 19.50 Euros per day or \$23.40 a day for a two bedroom apartment plus a cleaning fee. Assisted by the German university contact person, a short-term lease agreement written in German was signed by the student. Located on the ground floor of a student dorm building, the German apartments were fully furnished, including stove, mini-refrigerator, microwave, dishes, linens, TV, radio, sleeper sofa, desk and other miscellaneous items. The building was equipped with intercom and key-only access, giving a sense of security. Within the building was a 'partial' laundry facility for occupants. Partial in that it included washers, but no dryers, only drying rooms. At times, this was a challenge since the drying rooms were almost always full, leaving the only other option of draping wet clothes throughout the apartment for days until the clothes dry. Another challenge was adjusting to a refrigerator that did not have a freezer (this is common in Europe), which meant no ice! But the biggest challenge was an unforeseen heat wave within the building. Due to construction in the area, the heating system for the buildings had to be turned on. With temperatures outside hovering around 95° F and temperatures inside over 95° F, it was quite warm! Many of the German students in the buildings would congregate and party outside well into the morning hours to escape the heat. Fortunately, this lasted only ten days! This is why students need to be flexible.

Depending on the length of stay in Germany, the best value may be to purchase a one month tram pass. This pass allowed unlimited access to all public transportation throughout the city. The apartments were located across the street from the local tram line, making it very easy and convenient to get to the university and other areas of the city. The downtown area of Magdeburg, which included many stores and restaurants, as well as grocery stores, was just a short tram ride away from the apartment. Additionally, a used bicycle was purchased from another student; this allowed further exploration of the surrounding area and city.

### **Research Working Conditions**

With the exception of minor glitches, the working conditions set up for the student's visit was ideal. Students were given a separate secure office in which to operate, allowing them to have the flexibility to come and go. The university set up computers for their use. Unfortunately due to an earlier vandalism and theft at the school, the replacement computers were not equipped with the latest software and hardware options. This limited the amount of information the student's could gather as there were no CD burners, USB drives or printers available for use. All research information gathered was recorded the old-fashioned way – by hand.

By far, the best part of the experience was the time spent with the German faculty mentor, Dr. Peter Gerth, who shared his knowledge and expertise with the IUPUI students, as well as giving them access to his professional database for additional information. Despite his busy schedule, Dr. Gerth consistently met with the students, enthusiastically answering all of the student's questions and giving them guidance in the research. In addition to the meetings, Dr. Gerth arranged for the students to take several field trips to nearby destinations to further our experience.

Despite the language differences, it is surprisingly easy to navigate your way through Germany, without knowledge of the German language since so many Germans are bilingual. In addition, we have found that the German people are very friendly and hospitable. Although a German dictionary often comes in handy, most information is readily available in both English and/or universal signage. It is even very easy to drive in Germany because if you know the rules, everyone there follows them. There are more similarities between our countries than differences. It may take a while for you to recognize some of the things that are the same. One area in particular is the abundance of banking facilities and compatible ATM's, thus eliminating the need for traveler's checks or carrying large amounts of cash. If you talk to the German people, you will find that they have some of the same concerns we do. The shopping experience in Germany is different from that in the U.S. in that we are use to buying everything in one trip. Because most people rely on public transportation to get around, one lesson you quickly learn is to buy only what you can carry.

### **Conclusion**

Although there seemed to be a few glitches along the way, the positive experiences far outweigh any negative experiences encountered during this research project. Being flexible and not easily fazed helped in dealing with the unusual and unavoidable challenges and getting the most from this once in a lifetime experience. The ability to be able to interact and work with people from another country was a unique experience. This experience is very valuable to me as a person and

for my future dealings or connections with any international people. Working in a different cultural setting will be valuable to me for the rest of my life.

I was fortunate to have worked with people who made my experience enjoyable. The faculty, research assistants, and graduate students at the Magdeburg University of Applied Sciences were wonderful people to work with from a student's point of view. Many more students will be able to have this experience if they dare to try. Many students do not understand how valuable it is to see the world from a different point of view or to view your own world with different eyes. Traveling abroad and experiencing a new culture for the first time does put a different perspective on your outlook on life.

The cooperation between the two universities, Magdeburg University of Applied Sciences and IUPUI, is quite good. The interactions between the two institutions and faculty have increased since the summer of 2005. Many more IUPUI students will have the opportunity to take a new experience and make it work to their advantage.

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