

# **Summer Research Experience in Venezuela: From a Student and Faculty Member's Point of View**

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## **Abstract**

This paper and presentation will chronicle the experiences of an undergraduate student participating in an NSF funded international summer research experience for industrial engineering students at the Universidad Nacional Del Táchira in Venezuela (The Experimental National University of Táchira State). The authors along with students from University of Nebraska-Lincoln and Virginia Tech University conducted research relevant to industrial engineering, gained intensive language training and stepped out of the familiar to encounter different and diverse people, cultures, and lands which broadened their world view.

We will discuss how this experience prepares the next generation of engineers by exposing them to different cultures prior to entering the workforce and improves the undergraduate experience. The outcomes of the experience were: 1) to improve students' knowledge of, as well as a demonstrate proficiency in, culturally competent research skills relevant to their major field of study under the mentorship of a faculty member; 2) to increase students' level of comfort when working with people from different cultures through exposure to the technological, economic, and socio-political aspects of Venezuelan society; and 3) to increase students' awareness of cultural differences by considering their own culture from another's perspective and thereby develop a global view of research.

## **Introduction**

Research has shown that research experiences play a critical role in introducing undergraduates to the culture of graduate school and research [1]. Research experiences expose undergraduate students to the creativity of the research process and enable them to apply formal course knowledge. Additionally, undergraduate research experiences encourage students to pursue graduate education and have been considered effective in attracting and retaining students in a variety of science and engineering careers. According to Dr. James McCullough, former Director of Program Evaluation for the National Science Foundation, undergraduate research programs are "highly effective in helping students who are uncertain about going to graduate school to clarify their intent to pursue those goals ... and in bolstering the certainty of those students who have already decided to pursue those goals" [2].

Undergraduate research experience assists students in attaining a higher level of competence in the science, mathematics, engineering, and technology areas; understanding the methods and process of research; making informed judgments about technical matters; and communicating and working in teams to solve complex problems [3]. These experiences typically offer research and research enrichment skills, seminars, mentoring, interactive

activities, high-performance computing hardware and software workshops and support, among other things. Undergraduate research experiences also promote interaction among students and among students and professors. Professor-student interaction increases the persistence of students [4, 5] especially if students begin their research work early in their career.

The global economy demands that engineers are able to successfully understand and navigate within different cultures. Culture shapes the way we perceive the world. Differences in culture are more than just differences in language, food, clothing, and art. They reflect the diverse and changing landscape of an increasingly connected technological world. These differences also influence our perceptions which are radically different from one culture to the next.

A survey conducted in July 1996 found that Spanish is the second most useful language, in the context of the business world. Sixty-three percent of the 150 executives polled chose Spanish as the most valuable second language [6]. According to the U.S. Census Bureau, Hispanics now comprise 12.5% of the nation's total population, and this segment of the population is growing at unprecedented rates. Consequently, a significant segment of the American workforce speaks Spanish as a first language. Unfortunately, many co-workers, supervisors and managers do not, creating problematic work environments where even basic communication is difficult.

Management practices suitable for the current American workforce are not necessarily suitable for a Hispanic workforce—not only because of the language barrier, but also because of cultural differences in environments where managers have been slow to update their management styles [7].

Given the importance of both an undergraduate research experience and exposure to other cultures, an international summer research experience was conceived at the University of Nebraska-Lincoln. The objective of the program was to prepare future engineers for the changing workforce by exposing undergraduate students to the Spanish language and Venezuelan culture while immersing them in an environment where they could also effect engineering innovation.

The specific desired outcomes of the program were to: 1) improve students' knowledge of, as well as demonstrate proficiency in, culturally competent research skills relevant to their major field of study under the mentorship of a faculty member; 2) increase students' level of comfort when working with people from different cultures through exposure to the technological, economic, and socio-political aspects of Venezuelan society; and 3) increase students' awareness of cultural differences by considering their own culture from another's perspective and thereby developing a global view of research.

### **Research Program**

During the summer of 2005, industrial engineering students from the University of Nebraska-Lincoln, Virginia Tech University and the University of Arkansas traveled to San Cristóbal Venezuela to conduct research and cultural exchange at the Universidad Nacional Del Táchira in Venezuela (The Experimental National University of Táchira State, UNET). Students were paired with a faculty member from the Industrial Engineering (IE) Department at UNET for a period of 8 weeks. Faculty at UNET are involved with businesses in Táchira State in the service, manufacturing and educational sectors researching organizational structures; strategic planning techniques; training and development; entrepreneurship; and material and

manufacturing processes. Students conducted research on a topic related to industrial engineering. The research projects were narrow enough for completion during the allocated time, yet broad enough to present a variety of research challenges. The basic activities of the summer research experience were: 1) on-site orientation; 2) reflective journals; 3) Spanish language instruction; 4) research methods seminar; 5) field research project; 5) oral and written presentations; and 6) assessment and evaluation. Time at the end of the program was planned for the synthesis of the students' findings and for writing, followed by the oral presentation and discussion of results in a group setting. The remainder of this article shares the experiences of one of the undergraduate students and how this experience has impacted his future decisions to pursue a graduate degree.

### **Student's Perspective on Experience**

The summer was my first research experience overseas, speaking in a different language and working in a different culture. As such, I learned a new set of research and interpersonal skills while refining previously acquired skills. Also, more importantly, this summer's experiences developed in me a desire to attend graduate school, where previously I had sworn I was sick of school and had no desire to do so. This summer's experiences helped me to realize that not only did I possess the necessary skills to be successful in graduate school, but also, I learned the importance of further education in today's work force. In the following portion of the paper, I hope to provide a sense of what it is like to be a student researching in a foreign country, to share the events that particularly affected and encouraged my desire to attend graduate school, and to demonstrate a new and broadened understanding of the field of Industrial Engineering.

My research experience involved working eight weeks working under Dr. Elizabeth Castillo, who specializes in the fields of entrepreneurship, new businesses formation, and small and medium enterprise (SME) growth. My research included literature reviews and idea generation in the following topics: Skills and abilities necessary for entrepreneurial success, the relationship between entrepreneurs and new business formation, how governments and researchers can create a fertile environment for the creation of new businesses, and ways to help entrepreneurs to become more successful in the creation of new businesses.

I worked in an office this summer where no one spoke English so I didn't always understand what my fellow researchers were telling me at first. However, through patience we were always able to communicate...it might just take a little bit longer than if we had all spoken the same language.

At the start of the summer, I was very intimidated by the thought of working with in an office where no one spoke English. At the start of the summer, I was very intimidated by the thought of graduate school too. However, as I the summer progressed and I successfully integrated into life and work in a strange office and language using the limited resources available, I came to realize that graduate school would be very similar. It would be very difficult at the start, and I may spend more time than I'm used to in my professors' offices coming to understand exactly what they expect of me, but if I can successfully learn to do research in a foreign country, how much harder can graduate school really be.

Motivated by this thought, I began to search for graduate schools that interested me. The more I looked, the more excited I became. I found programs with curriculum that interested me and places that used to frighten me because of their distance from home and the familiar now

began to look more inviting. More importantly though, I wasn't the only one, the other students from the program also began to look more seriously at graduate school. I believe by the end of the program we had all decided to attend graduate school.

Another aspect of the program that fueled my desire to attend graduate school, was working everyday with graduate students in my office. I found these to be normal students, with families and lives outside of school, whom were still able to successfully pursue their advanced degrees. Students I could identify with and who encouraged my new interests in graduate education. Hearing about their course work and projects, I became excited and desired to gain similar experiences, and the best way to do so would be through graduate school.

From this experience I also came to realize that research skills are an invaluable part of not just a graduate education, but everyday life also. For example, no one would purchase a new car without first researching such things as government crash test ratings, independent reviews from such experts as Consumer Reports, and even review forums on the internet from everyday people who possess experience with the product. This summer, I learned the same is true of researching. You have to ensure that the sources you use are creditable either through expert status or through a peer review process. You cannot just search the internet and use anything you find.

While I was gaining this new desire to acquire a graduate education I was also being exposed to many new and interesting aspects of the field of industrial engineering. Not only from my research projects, which included research in the fields of entrepreneurship, entrepreneurial training, small and medium enterprise growth and development, and start-up businesses, but also from the work of the other graduate students in my office and the other students in the program with me. I was able to go on trips with graduate students from my office as they worked on their projects and I was able to experience different aspects of industrial engineering in action such as plant design, time studies, operations research, and more.

After my experiences this summer, I am now excited about and preparing for graduate school. I have more tools and experience to aid me in dealing with students from other backgrounds and cultures. I have an increased understanding of the field of Industrial Engineering, and what it means to be an Industrial Engineer. I believe this summer experience is as valuable as any experience I have had at my university and has further prepared me to be successful in my post undergraduate career.

Finally, this summer's experience helped me to decide that I want to attend graduate school. I found a fun and exciting side to research. Through much practice, my skills have become sharp, and I use them with greater ease than I would have ever though possible in the past. This summer showed me that I could survive in a graduate program. That I do have what it takes to do research and to survive "the next level." Now for the first time in my college career, the thought of going to graduate school excites me.

### **Faculty Member's Perspective on Experience**

Though the formal evaluation process has not been completed a preliminary review of the evaluation forms support the conclusion that Summer Research Experience in Venezuela successfully met the previously stated outcomes. The first stated outcome was, to improve students' knowledge of, as well as a demonstrate proficiency in, culturally competent research skills relevant to their major field of study under the mentorship of a faculty member. All students strongly agreed with the statement, "this program helped me to increase my knowledge

in a specific research field” and they split responses between strongly agree and agree on the statement “this program helped me to improve my research skills.” Furthermore, the students were asked questions about the value of scientific research and how this experience impacted their future decisions to attend graduate school and their overall academic career. Most of the students were very satisfied with how this experience had impacted these areas.

In an open ended question students were asked how has their participation in this experience affected their future career plans. Each of them indicated that this program/experience has definitely reemphasized the importance of going to graduate school and several went on to say that it also helped them narrow the specific areas of industrial engineering they might want to pursue.

As to the remaining two outcomes, 2) increase students’ level of comfort when working with people from different cultures through exposure to the technological, economic, and socio-political aspects of Venezuelan society; and 3) increase students’ awareness of cultural differences by considering their own culture from another’s perspective and thereby develop a global view of research, their reflective journals and evaluations also indicate that these objectives were met. I found the students to be comfortable working with others from a different culture and they seem to have gained an awareness of cultural differences through their travels around the country and their interactions with other students, faculty and administrators. More detailed information regarding the impact of the culture will be available upon finishing the analysis of the evaluations.

The most difficult part of the entire experience was the quality of research and/or laboratory facilities. The students found that the library, computer facilities and research facilities available to them was different than what is available in the United States. As a matter of fact the internet at the university was down the last four weeks of the program and the databases available for literature searches was not comparable to what is available in the states. I think this helped students to understand the importance facilities plan in graduate education and they will seek institutions for graduate education with ample facilities.

### **Summary**

The University of Nebraska-Lincoln has successfully implemented an international summer research program. The evaluations from all participants indicate this group of students benefited greatly from their research experience. These students are more likely to attend graduate school and finished the summer with a sense of excitement about graduate education and careers in academia. Throughout the program, the faculty coordinator, spent time talking with the students about career choices after completing the Ph.D., the graduate school process, research ethics and other relevant topics that appear to have had an impact on them. This program created a thoroughly positive experience for the student participants, faculty advisors and student hosts. It is the first step in more undergraduate U.S. students going to graduate school and to more students from Venezuela considering coming to the University of Nebraska-Lincoln to pursue graduate degrees

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### **Biography Information**

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