COMMUNICATION AND CULTURAL IMPLICATIONS OF SHORT-TERM STUDY-ABROAD EXPERIENCES ON ENGINEERING STUDENTS

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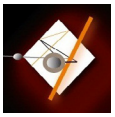
Study abroad is an important international learning component to add to students' university experience. As programs of study become more rigorous and detailed, it is difficult for students to incorporate study abroad into their schedules, especially those in engineering programs. Short-term study abroad provides engineering students with an opportunity to view engineering on a global scale and to gain cultural awareness. This research study examines the cultural adjustment, communication issues, and experiential learning of a group of engineering students who studied abroad in Germany during their winter break.

Keywords. Cultural adjustment, Engineering students, Experiential learning, Short-term study abroad.



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For years, students attending institutions of higher education have studied abroad. During the 2010–2011 academic year, approximately 273,000 American students studied overseas (Institute of International Education, 2012). As programs of study become more rigorous and detailed and outline specific courses for each semester, it is difficult for students to incorporate long-term study abroad into schedules, especially students in engineering programs. As a result, short-term study-abroad opportunities increased tremendously over the past decade. Study-abroad programs are typically faculty-led, take place during winter, spring, or summer breaks (Guyer, 2011), and allow students to incorporate an international learning component during their university experience. Study abroad provides students with a chance to discover new cultures and environments (Drexler & Campbell, 2011) and to reflect on their own culture's shortcomings (Miller, 1993). A chance to travel to another country to see how engineering is used in another culture is an eye-opening experience for students. Global corporations seek culturally aware individuals (Henthorne, Miller, & Hudson, 2001), which encourages this transformative international experience for engineering students.

Engineering students have predesigned programs with specific course requirements each semester. Short-term study abroad offers students an overseas opportunity they may not otherwise experience without falling behind in the degree program (Donnelly-Smith, 2009). Future engineers must learn to adapt to global changes and trends and assist developing and developed countries (National Academy of Engineering, 2004). They are globally competent with both global teamwork and global sustainability skills (Baker & Ağar, 2011). Short-term study abroad is valuable for students to develop critical thinking skills (Shupe, 2013) and to analyze current issues in engineering. Baker and Ağar (2011) stated that engineers face global

challenges they need to solve including energy security, pollution, access to clean water, poverty, resource depletion and climate change. Overseas experiences educate current engineering students with new ideas to enable a solution to these global challenges.

González, Rodríguez, Olmos, Borham, and García (2013) emphasized the need for research studies on the impact of education changes on engineering students. Students earn academic credit through study abroad and benefit in significant ways (Salisbury, Paulsen, & Pascarella, 2010). An overseas experience expands students' perspectives by removing them from established networks and routines, and placing them into new situations (Haines, 2013). It is imperative to reflect on the study-abroad experiences of engineering students to determine the impact on their future career. Few studies analyze the outcomes of short-term study abroad with engineering students. This study specifically looks at the cultural adjustment, communication implications, and experiential learning of engineering undergraduate students studying abroad in Germany during their winter break in 2012.

Review of Literature

Short-term study abroad leaves lasting educational effects on students (Ritz, 2011). To learn to communicate with others that come from different cultures is an invaluable skill for any college graduate (Waco, 2008). Future engineers are no different. As students, it is essential to prepare themselves for work in a dynamic intercultural workplace and to possess the communication skills and cultural awareness to be successful engineers. It is important to explore the impact of study abroad on engineering students in order to help faculty design programs that foster global engagement and experiential

learning. Additionally, these transformative experiences provide educators with opportunities to link class concepts with real world application (Ritz, 2011). Intercultural communication skills are beneficial to the engineering profession. Studying the development of such skills through study abroad offers insight on future possibilities for institutes of higher education.

Short-Term Study Abroad

Short-term study-abroad programs are typically eight weeks or less, and are the most common type of program for students to study abroad (Donnelly-Smith, 2009). Short-term study-abroad programs generally delve into a specific subject at the host location such as culture, history, language, or environment (Guyer, 2011). Other study-abroad programs enhance skills related to specific majors on a global level such as nursing, business, or engineering. Through a sojourn abroad, students develop intercultural and social skills that are oftentimes used both overseas and back at home. Short-term study-abroad programs are usually structured to accommodate the specific needs of a degree program, to enhance language skills, and to promote individual growth.

Students obtain a number of life changing skills as a result of study abroad. Shupe (2013) observed the development of critical thinking skills by students while studying abroad. Students adapt to new situations, interact with native people, navigate new transportation systems, and undergo an intercultural transformation (Gardner, Steglitz, & Gross, 2009). In addition, Clarke, Flaherty, Wright, and McMillen (2009) found that students studying abroad possessed increased openness to cultural diversity and greater intercultural proficiency. One of the goals of study abroad is for students to transform into global citizens (Doerr, 2013). As a result of each of the

encounters and explorations overseas, students start to evolve into global citizens. The skills students acquire while abroad are invaluable to their success back home not only academically, but for their future careers as well.

Students who study abroad can easily transfer their overseas experience on the job. Employers believe that study abroad enhances many of the skills employees need to possess to be successful on the job (Gardner, Steglitz, & Gross, 2009). The workplace seeks students who possess global competencies and understand cultural differences. Short-term study-abroad participation helps students achieve these skills to become more marketable upon graduation. Critical reflection helps students articulate their overseas experience to meet the needs of a company during an interview. Structured journals provide ongoing reflection for students during and after the study-abroad program (Donnelly-Smith, 2009). Students use their journals to reflect on their experiences and translate them into valuable examples for employers. Additionally, they transfer skills learned abroad to market themselves upon completion of their program of study. When students reframe their experiential learning, it demonstrates their global competencies and marketable skills to employers. For the engineering profession, the overseas experience enhances students' résumés and furnishes them with encounters to reflect on as they work to resolve global engineering issues.

Experiential Learning

Experiential learning is part of the overall study-abroad experience. This term has been coined in education to signify that experience with reflection is learning (Dewey, 1938). Fowler (2008) stated that the outcomes of experiential learning can span from gaining a new skill to personal growth. Glaze (1999) stated that observing in the field stimulates wanting to know

more. From a study-abroad perspective, experiential learning is defined as a reflection on one's own experience overseas that generates a path of discovery and personal growth no classroom can provide. Experiential learning can take place in many forms, but this definition is used for the current study.

Part of experiential learning in study abroad is adjusting to a new culture. Prior to departure, intercultural proficiency is difficult to teach in a classroom since students aren't necessarily exposed to other cultures in that setting to prepare them for when they graduate (Munoz, Wood, & Cherrier, 2006). There is added value to learning when expanded beyond the traditional classroom walls, in an international setting (Clarke et al., 2009). Fowler (2008) found that reflection on experiential learning became more significant to overall learning itself when used in nursing education. Johns and Thomspon (2010) conducted research with nursing students who studied in Guatemala and found their worldviews had changed as a result of study abroad. Glaze (1999) stated that "there is more to learn in the field than is ever incorporated into an in-class lesson plan" (p. 442). Short-term study-abroad programs allow students to actively engage in experiential learning every day. When students apply classroom readings and discussion to real-world experiences, they make connections in the learning process. In a study-abroad setting, students oftentimes use a foreign language, eat different foods, and engage in activities they might never try back at home. These experiences make a strong impact on their personal development, and are the core of experiential learning.

Study-abroad programs offer one of the best ways for students to engage in experiential learning. Only 2% of American students at the college level study abroad each year (Institute of International Education, 2012). The globalization process today makes it imperative that more students

study abroad. Experiential learning through study abroad gives students an opportunity to hone their intercultural communication skills and expose themselves to a new environment.

Study Abroad and Engineering Programs

Specialized programs should be offered at universities to meet the growing needs of the economy and employers, and to generate more experiential learning. Curricular demands are arduous in many degree programs, and do not allow students a semester away (Guyer, 2011). As a result, short-term study-abroad programs are structured opportunities for students to engage in experiential learning while meeting degree requirements (Donnelly-Smith, 2009). In degree programs such as engineering, nursing, and business, students fall behind if gone for a semester. Nursing students, for example, benefit from study abroad with increased intercultural awareness, ability to adapt to unfamiliar cultures, and increased personal growth (Edmonds, 2010). Engineering companies seek graduates with the ability to adapt to a multicultural environment (Haddad, 1997).

As the world moves toward a "more sustainable energy economy" (Baker & Ağar, 2011, p. 3724), it is essential that engineering students build their global competencies through experiential learning abroad. Short-term study abroad offers engineering students an opportunity to hone in on their engineering skills while applying them at a global level. Witnessing engineering from a new perspective abroad can invigorate students to improve their own engineering competencies and skills, and to apply them in a larger scale, whether at home or abroad.

Short-term study abroad has lasting effects on students across all disciplines. This experiential learning process gives students a chance of a

lifetime to actively engage in a new environment, and to explore the world around them with curiosity. Several studies have investigated intercultural competencies and cultural awareness as a result of study abroad, and more specifically in long-term programs. As short-term study abroad has increased in popularity over the past decade, it is imperative to analyze how students experience cultural adjustment and transition in this short period of time overseas. In particular, it is important to determine if engineering students gain communication and cultural skills as a result of participation in short-term study-abroad programs.

To date, few published studies use qualitative methods to evaluate the outcomes of students' experiences in short-term study-abroad programs. Students' narratives provide specific examples of cultural adjustment and transition during their time overseas. Cultural adjustment can be reflected in narratives from students who discuss their experiential learning process. This research study specifically focused on engineering students who participated on a three-week winter program in Germany. The following research question was the basis for conducting the study:

> RQ: How do engineering students experience cultural adjustment through a short-term study-abroad program?

Methods

The International Winter University (IWU) in Kassel, Germany, offers a short-term study-abroad program during winter break with a focus on culture or engineering, lasting approximately 25 days. Students who attended this program took structured German lessons together in the morning, and culture or engineering classes in the afternoon. This study analyzes the experiences

of those in the engineering track only. Some engineering classes were off-site excursions to places including a wind park, SMA—a company—and a bioenergy plant to see renewable energies in action. The engineering courses and excursions were led by experts from Germany and included topics such as climate change, wind energy, geothermal technology, hydro power, low energy housing, solar thermal technology, and photovoltaics. In addition to the German and engineering courses, students also participated in optional cultural exchange activities held in the evenings after class. These included German folk dancing, German cooking, international movies, and day trips to Frankfurt and Marburg on Saturdays.

An academic advisor from the College of Engineering and Applied Science at the home institution led the group for the first 10 days of the program until a transition was made to Kassel from Berlin—all but two students paid an additional cost to participate in a guided tour in Berlin prior to the program; the two students who did not pay the additional cost to participate in the tour went to Berlin on their own. Grades were administered by a faculty member at the home institution when the students returned, based on a combination of their final exam scores in Germany, journal entries, and a final presentation in the US regarding their experience in the program.

Participants

Thirteen students participated in the study-abroad program at International Winter University in Kassel, Germany, during the winter break of 2012 as well as this research study. All of the participants were American students with an engineering or computer science major who attended the same midsized Midwestern university. The students ranged from 20 to 28 years

old, three were female and 10 were male, and none of them studied abroad previously. Students spanned from sophomores to fifth year seniors in their program of study. All students stayed with host families for the majority of the time in Germany, with the exception of the optional Berlin program for three days prior to the academic portion of the study-abroad program. Five of the students did not have a roommate with their host family, and eight had either an American university student or another foreign student as a roommate.

Data Collection

Prior to departing for Germany, students had predeparture orientations with the group leader and the study-abroad office. During this time, the researcher was present to explain the project and to seek their permission to participate in the study. Participation in the study was voluntary, although writing in their journal was worth 25% of their overall grade for the program. All students signed the Institutional Review Board (IRB) approved informed consent forms and agreed to participate. Data was collected through structured journals, narrative interviews with individuals and small groups, and participant observation during the first ten days of the program.

Journals were a required part of the program, and asked specific questions for students to respond to regarding their host family experience, observations about the host culture, interactions with other students, challenges and surprises in the host culture, how free time was spent, how the study-abroad experience enhanced their engineering skills, communication issues, and culture shock (e.g., Why did you decide to study abroad? Describe your first interactions with your host family. What has been the most challenging to adjust to while studying abroad so far? How has your

study-abroad experience enhanced your engineering skills?). Given the short time abroad, a total of 10 entries were required starting from predeparture to returning to the US. Each entry had a minimum requirement of 200 words, but allowed for students to elaborate on anything they deemed important to express about their study-abroad experience. All journals were formatted the same prior to conducting data analysis. Pseudonyms were used to report the results to maintain the confidentiality of the participants.

Following the end of the program when students returned to the US, the researcher conducted narrative interviews with all students within one month of reentry. Participants were interviewed individually, in pairs, or in one group of three to accommodate their schedules and availability. A private interview room in the College of Engineering and Applied Science and a vacant classroom provided the backdrop for the interviews. Twenty-one open-ended questions solicited narratives about the students' study-abroad experience (e.g., What was the biggest surprise that you experienced or observed while studying abroad in Germany? Give me an example of a cultural misunderstanding you experienced while studying abroad in Germany. How did you see yourself change as a result of studying abroad? Describe your experience living with a host family.). Several questions probed for an elaboration of the questions they answered in their journals. A total of eight interviews were transcribed by the researcher including four individual interviews, three interviews with two participants, and one interview with a small group of three students. All 13 study-abroad students participated in the interviews as well as submitted journals for this research project.

Additionally, the researcher attended the first 10 days of the program while the group leader was in Germany and took notes about the interactions with students and observations on their behavior each day. Each night the

researcher typed up the notes and elaborated on the observations made during the day. These notes were used to support themes that evolved in both the journals and interviews.

Data Analysis

Data triangulation was used to review multiple perspectives in order to establish credibility using qualitative research (Pitts, 2009; Schwandt, 1997). The researcher read and reread the journals, interview transcriptions, and ethnographic notes to analyze the data for themes. Responses generated a wide range of words used to describe the same phenomena. To analyze the data from the transcripts more deeply, the researcher listed descriptive words and phrases used to answer each journal entry and narrative response and clustered for themes (Edmonds, 2010). Some questions from the journals overlapped with questions during the interview. Longer, more descriptive narratives were provided in the interviews that supplemented the responses from the journals. These responses were combined together as similarities surfaced in the transcripts.

Data analyzed from students' journals, narratives from postprogram interviews and observation field notes demonstrated several predominant categories related to personal adjustment, communication issues, and experiential learning. Themes appeared for each category that are discussed in the following section. Analysis of data revealed one dominant concept that crosses all three themes—friendship—which played a critical part in responses.

Results

Study-abroad programs promote intercultural, social, and language skills (Doyle et al., 2010). In a short-term program designed to foster global exchange in engineering ideas, there is the hope that students also gain skills in engineering as well. The data from this research study found three categories of themes, with sub-categories for each. This section will explore what engineering students shared about their experience on a short-term study-abroad program to Germany in both their journals and through narrative interviews. The three categories discussed include barriers faced, strategies used for adaptation, and learning outcomes.

Barriers Faced by Students

Participants observed a number of differences between U.S. and German culture that related to time and language. The program structure was rigorous and full of activities, which allowed for limited free time for students to engage in additional endeavors and adventures. Students made many comments on the extensive agenda that left them with little time on their own. In addition, many journal entries and comments during the interviews focused on the students' lack of communication skills while in Germany. In particular, students expressed their frustration about the absence of German skills to use in public and host-family members who did not speak enough English while at home. In addition, communication issues arose with fellow classmates from Australia when speaking English. Australians used idiomatic expressions not known by the U.S. students, and caused a number of "funny" situations in conversation. The following sections explain how both time and language caused barriers to their cultural adjustment in their study-abroad program.

Time. The interpretation of time was a dominant theme among all students while studying abroad. The concept of time, how they spent time, the lack of free time, and being on time were among this theme. Each student shared different stories about how time impacted their experience abroad and affected day-to-day events. This barrier students did not necessarily allow students to fully immerse themselves in the culture as they had imagined. Given the time constraints of the full schedule, students had little time to participate in other activities in the community or to explore on their own.

Students interpreted the concept of time differently as the days progressed during their sojourn. Time passed slowly the first several days, and began to pass quickly towards the end. As students adjusted to the schedule and to their host families, time went by faster, and many students noted this change in their journal entries. To this affect, Aaron commented:

> We are now half way through the second week. Just earlier in the week I was thinking about how it feels as if we have been here so long already, and now it seems just the opposite. We have to leave in just 10 days and now it seems like we haven't been here long enough.

Students indicated they spent their time together as a group for most of the program. Class started in the morning and ended in the early evening each day. They ate together, rode the tram together, and participated in excursions and field trips as a group. The little free time they had they went shopping, ate dinner, or explored the city—usually late at night. Andrea explained:

> I have been spending the majority of my time walking around downtown and checking out stores and things around City Point. I have typically been hanging around with most of the people from the (university's) group.

In contrast, Jill reflected on how she spent time and noted that she wished she had spent some time on her own to take in more of her surroundings. She indicated this would give her time to think away from the group so she could better process the experience. Jill never said that time spent with the group was not good, but that, had she spent more time alone in the city, her experience would have been different.

Participants also noted the lack of free time during their program. The structure of the schedule contained so many activities that they felt they did not have time to study or do much outside of the program schedule. Students received eight hours of instruction each day with scheduled breaks and lunch, and concluded at 5 p.m. each night. Extracurricular activities included in the cost of the program were available to attend frequently, and students felt obligated to take advantage of these opportunities, especially since they had paid for this part of the program. Robert commented at the end of the second week in Germany that:

> The free time between classes are still really non-existent. We get done with class around 5, then I go home and eat with my family. After dinner I can either go back the 30 minutes to the town or stay and chat with my family.

Andrea noted "The IWU program is so packed full of social events to fill the little time we have after class that I am not home very much at all." And Jessie added that there is no time to relax because "We are always on the go." This time barrier to integration into the German culture prevented many students from actively engaging in more outside events on their own, or spending more time with their host families.

Additionally, many students lived at least 30 minutes away from school via public transportation. If they missed the tram, they had to wait another

30 minutes for the next one. The trams ran less frequently in the evenings so students had to make choices on whether to go home and spend time with their host families, or stay close to school to explore and talk with friends. Each student had different host-family experiences that helped make their decisions on how to spend their free time. If they had a host family they enjoyed or who spoke English well, many students chose to spend more free time with their host family. Those who did not have a closer connection with their host family chose to spend time in the city to hang out with fellow classmates after classes. Overall, the majority of the time issues pertained to the program structure itself and its intensity of scheduled events. Despite other challenges during their short-term study-abroad program, students most often explicitly expressed frustration with the time barrier.

Language. Language was the other predominant barrier that students faced during their overseas experience. Three of the study-abroad participants studied German previously in high school, which proved helpful in their daily communication. The remaining students emphasized how much fun they had in German class, but did not use their German skills a lot outside of the classroom. They used their language skills to order food and beer, and to make purchases at stores. While some students felt they lacked language skills to get by, others began to feel confident after a short period of time. This was exemplified by Scott:

> My German skills are developing pretty well. I am able to understand a great deal of what my host family is saying while they talk to me in German but I am still having trouble trying to formulate sentences while talking to Germans. Most of my high school German knowledge has come back and

> I'm fairly confident in my ability to ask how much an item is and being able to order drinks.

Scott rekindled his German skills through class and felt he could use them with native speakers. He was not afraid to try to use what little he knew, and had a positive time adapting to the new language.

Greg and Chris individually shared a story they experienced that described when they realized their lack of German language proficiency. The language barrier prevented them from getting the food they anticipated as they tried to order in German. They went to get dinner after class with limited time to eat, and found a food stand that featured pictures of food with numbers. Greg explained:

> I tried to order in German and I must have been horrible because we got the wrong food . . . And it was vegetarian food . . . but we had a good laugh about it later, and still today.

Greg also described how he pointed to the sign and assumed the vendor understood what he was asking for. Chris also seemed perplexed by the situation when he told his version of the story. He thought he knew his numbers and it later appeared he did not know how to order in German after all. This illustrated the frustration students experienced when their German language skills did not develop as well as they had hoped. Dave also vented his frustration regarding his language skills. He shared:

> I think I'm burning out in my German language class. For the first week I was really pumped to learn German. I thought that it would progress faster than it has, and that I would be able to use it more with my host family. Unfortunately that has not been the case for me. Realizing now that I set

> my goals a bit too high for my German-speaking proficiency, I feel less motivation to learn than I did previously . . . It's still cool to be able to speak a small amount.

The language frustration occurred with many of the students who had never studied a foreign language previously. This may have had an effect on their learning process. Renewable energies—engineering—was the main reason to study abroad on the program. German classes assisted with basic communication skills for some, but not for others. This may be in part due to their general lack of interest in learning the language. This barrier hindered some students from wanting to speak with natives in German. Other students compared their experience in German class to their high school Spanish classes. A few indicated they started to take notes like they had in Spanish class so that it was more useful to them. In some cases, if a teacher used real-life situations for the lesson, students paid more attention. Jessie commented:

> The first couple of classes I have taken in German are very fast paced . . . [The teacher] has done a good job of answering all of our many questions we have for him. He is gave us the two main verbs, to be and to have, which I thought was really helpful since we do use those two verbs all the time while also giving us more things that we would need to say to cashiers and vendors. I am trying to structure my notes like I did when I took Spanish in high school with the verbs that I learn which is helping me out a bit.

The few students who had previous language classes applied this skill to German classes. This demonstrates how some students had an easier time communicating than others. A few students struggled with their language skills, and others tried to use these skills in public with restaurants, bars, and

shops when they could. Students had a limited vocabulary and struggled in many situations, but embraced the short period of time in Germany and made the most of their novice communication skills. Despite the language barriers, students found ways to communicate their needs by helping each other when necessary.

Finally, several students discussed their communication with fellow students in the IWU program in Germany. Students from various parts of the world also attended the German and engineering classes. Many participants commented on how speaking to native English speakers from Australia had a host of unexpected communication and language issues. For example, Jill explained that one of the Australians told her that she "forgot her jumper in the classroom" and Jill had no idea what the Australian student was talking about. She later learned that "jumper" meant "hoodie" in American terms. This generated regular exchanges of American and Australian terminology that required interpretation and led to laughter in many cases. Students found it shocking that although they all spoke English, they still were unable to understand each other at times. This illustrated how students overcame communication difficulties to build relationships with others in the program and built a new "foreign" vocabulary base in their own language to break down this barrier.

Strategies Used for Adaptation

Students employed a number of strategies to successfully navigate the barriers and challenges throughout their short-term study-abroad program. Despite their struggles with time and language, they learned to adapt to the new culture through their daily routines, adhering to local norms, and forging relationships with their host families and each other. Even though

the program was just over three weeks in length, each student found his or her own way to adjust to the experience abroad.

Routines. Overall, students expressed how daily routines affected their study-abroad program experience. Acculturation—or cultural adjustment—is defined as the ability to physically and mentally adapt to a new environment until feeling comfortable enough to operate "normally" again (Berry, Kim, Minde, & Mok, 1987; Ward, Okura, Kennedy, & Kojima, 1998). Cultural adjustment takes many forms, including adjusting to a new schedule. Participants on the study-abroad program experienced cultural adjustment through their adaptation to time and routines. Their interactions with their host family, instructors, and other German natives they met also influenced part of this adjustment process. The arduous schedule each day left students tired, but excited to see one another and to explore with the little free time they had at the end of the day.

Students attended regularly scheduled classes for the duration of their short-term study-abroad program. German classes took place in the morning, and engineering courses and lectures took place in the afternoon. In addition, excursions and extracurricular activities were a part of the program's offerings. Every Saturday an excursion via train brought students to a nearby city, and several nights of the week students participated in cultural activities including German dancing, German cooking, intercultural exchanges, movie nights, and a hockey game. Chris reflected on this routine and stated he would miss "having a set schedule" even though they did not get enough sleep. Kevin echoed the latter part of this and stated "the thing that has been the hardest to adjust to is the lack of sleep." Students commented that they slept much less than they would have liked or needed,

but it became part of their routine while in Germany. Their schedules were "so busy" that they adjusted to this routine, because they realized it was just a short-term adjustment while abroad. Students utilized a routine to overcome the time barrier. Despite being "jam-packed" every day, they embraced the opportunity to try something new if it was available and were involved in almost every activity offered through the IWU program itself.

Adhering to local norms. One of the local norms emphasized by students was punctuality. Arriving on time to classes, public transportation, and excursions was stressed to students during the program, and they noted this in both their journal entries and during the interviews. A few students elaborated on a discussion with the German team that organized the classes. These German natives explained how punctuality is important, and the students respected this for the duration of the program. This strategy to adapt relates back to the barrier of time as students found ways to maximize their time on the program by adhering to the local norm of punctuality.

Although punctuality was emphasized during the program, students also learned that "getting a quick bite to eat" was not possible. Many students expressed their frustration with the long wait for dinner if they went out to eat as a group. It would take up to three or more hours to order, eat, and pay the bill at local establishments. However, as time went on, students also noted in their journals that going out in a large group could affect this long wait, and that they started to observe their host families sitting together for long periods of time at home as well when eating dinner. They realized that this local norm of enjoying dinner together was something they could be a part of, whether with friends out in the community or at home with their host families.

Host families. Students expressed good and bad experiences with their host families. Those students who expressed that they did not like their host family typically had difficulty communicating with them in German or English. Students who had a positive experience conveyed that their host families would commend their German skills and teach them additional phrases. Tom exemplifies the latter as he reflected on his experience using German:

> Taking my beginning German class has really helped me around the house at my host family. Even though my family speaks English really well, it is still fun to try and talk with them in their natural language. I figured they are making a big sacrifice; we should at least try as well. I am sure others have benefitted even more if their host families don't speak much English.

This participant had a positive experience with his host family, and realized their contribution to his study-abroad experience. He gave his best effort to use his German language skills, even if his host family spoke English. This demonstrates how a short-term study-abroad experience helps students adapt their behavior to receive more from the sojourn, and this strategy helped him build a better relationship with his host family.

Kevin also engaged in regular use of German with his host family. He echoes the positive experience that Tom had:

> My German language has been coming along pretty good. I am able to formulate small sentences and basic sentences, which helps me order food and talk to the children at home . . . The only places I really use German are at home, trying to speak with my host parents and their children, and at restaurants, while ordering or paying . . . The most exciting place that I used German was at the hockey game last Friday night where my host dad told me some phrases to shout.

Host parents helped students learn phrases that applied to the conversations they had, the situations they were in, or that helped in common scenarios. This influenced how students felt about their language abilities and how they either continued or discontinued developing their language skills. Since host families were a part of the study-abroad experience, some students spent more time with their family than others. They utilized the little free time they had to learn more about Germany through spending their evenings and weekend time with the families. In the end, this helped a number of students adapt to some of the barriers they encountered while abroad.

Friendship. During short-term study-abroad programs, students often rely on their peers to adjust to the new culture (Edmonds, 2011). They go through similar experiences together and this causes a strong "bond." In Germany, it was no different for the engineering students. They used the terms "life-long friends" and "it feels like we were a family" to describe their time together. Students enjoyed the excursions and extracurricular activities organized by the program so they could talk with other students to get to know them better. Participants explained they did not know one another before studying abroad, but had met a few people in their classes in the US. Their initial fear of not having a good time was eliminated just days into the program. By far, friendship was the strongest strategy to help the students adapt overseas. Tom explained his thoughts on forming friendships abroad:

> Meeting other students from other parts of the world has been great and really fascinating. I have made many friends. They all seem very open to talk with and become friends with easily. I was pretty happy that there are not people that I have to physically work at to be friends with or try to talk with. I was afraid that there might have been some awkwardness with

> someone. There is always that one person. But I am happy to say that here in Kassel, I have not met that one person yet.

Other students reiterated Tom's feelings, stating that they felt as if they had "known each other forever," and made plans to reunite during spring break. Students anticipated there would be an "outcast" in the group, but no one fell into this category. Their friendship deepened throughout each excursion, class, and outing they had together. Jessie displayed his excitement about his peers when he returned home:

> Having all these people to share the same experience with me in this program has definitely helped with not being too overwhelmed with everything around me. That's the biggest thing that I feel I took (home) with me, is the friendships I developed with the other students and even the IWU staff.

Students further reflected on their new "friends for life" back at home and indicated they easily maintained contact with these new friends through the Internet. The bonding experience abroad made every adventure memorable and reinforced their desire to work on a more global scale in engineering. Friendship helped all students get through the time and language barriers with ease.

Learning Outcomes

Finally, experiential learning evolved out of the excursions, lectures, and host families. Students compared learning engineering in the US to Germany. They felt that instruction in Germany was similar to the way they already learned back home, but enjoyed experts as lecturers about renewable energies—the

focus of the study-abroad program. Participants made observations about the way their host families live—including composting, closing doors to conserve energy, and using solar panels on their homes—the way the entire German community recycles, and how further ahead in engineering the country is in general. Additionally, some students commented on how it was easier to go to class in Germany and understand their English than to listen to international student teaching assistants (TAs) back at their home institution. Overall, through experiential learning, they gained a deeper understanding of the application of their engineering skills.

Real-world application. As engineers, students analyzed their day-to-day activities and classroom experiences. They observed closely and commented on the way Germans pay a deposit on their bottles and recycle regularly. Participants were shocked not to see litter anywhere, and compared this to their hometown where that is not the case. Students also discussed how the excursions and lectures inspired them individually, in regards to their area of expertise in engineering. Their enthusiasm to use what they learned grew throughout the program. Becky discussed her feelings of the program when she returned home:

> My overall thoughts of the IWU program are good. I feel this experience really helped me gain more knowledge on renewable engineering and was a great experience overall. I would definitely recommend this program to anyone. I feel this helps students see how different slash similar other countries or universities apply their engineering knowledge. I saw how in Germany they support renewable energy and how it has impacted their culture in many ways. When someone is done with a bottle, beer bottle, coke bottle, etc., they return the bottle back to the store or bar they bought

> it at and get a refund on it. That way they know that people are recycling. I feel this is a start going "green" in the US, and that people should put that into consideration.

This participant looked at the entire study-abroad program and felt that she learned how renewable energies impact everyone each day. Her first-hand experience showed her how she is able to improve the world and culturally interact with others.

Other students reflected on how witnessing renewable energies in action from the excursions and experts in Germany versus from a theoretical perspective taught by the international TAs in the US was incredible because it showed them the power of renewable energies. They compared learning in the US from international TAs who only spoke from theory to how the excursions and experts in Germany showed them the power of renewable energies. Kevin explained what he learned as a result of participating on the program:

> Hearing from experts on multiple different renewable technologies was an awesome experience, because they are people that really care about what they are doing and are trying to advance the awareness and technology of their topic. The excursion to the biogas plant, the wind farm, SMA visit, and the silver mine were also great experiences where I was able to actually see these renewable energies at work and learn of them in not only a theoretical setting, but in a practical way was very beneficial . . . It seems to me the people in Germany are much more aware of how doing their part helps the overall good of the country. It seemed like recycling was bigger in Germany than in the US, and people actually did it. Also, even in Berlin there wasn't ever very much litter on the ground. Most places seemed cleaner than the US

For many students like Kevin, renewable energies was a topic they wanted to learn more about before participating in the study-abroad program. The experience overseas afforded them an opportunity to observe renewable energies in action and revealed how these energies make a more sustainable environment to live in. Several students observed how their host family kept doors closed to conserve energy. They misinterpreted this as the family not wanting to talk with them, but later learned this is how they cut their heating costs at home. Students found many homes with solar panels to help control the cost of energy as well.

The study-abroad experience enhanced their engineering skills and harnessed new ideas for their careers. Students gained skills not achievable in the traditional classroom. All of these observations made by students embody the true meaning of experiential learning through study abroad.

Discussion

This study examined how university students in an engineering program experienced cultural adjustment through a short-term study-abroad program. The results demonstrate that students gained engineering skills through experiential learning. Students also faced barriers, including time and language barriers, during their time abroad. To combat these barriers, strategies for adapting to the new culture also emerged that include embracing daily routines, adopting to local norms, and forging relationships with host families and each other. Adapting to a new culture is part of the study-abroad experience, even in short-term programs. It is imperative that researchers continue to study how short-term study abroad affects engineering students.

Implications

There are important implications from the findings that affect engineering education. Faculty and staff in engineering programs are challenged to provide a curriculum to students that empower them with the skills needed to step into their engineering career. Students also require cultural competence to enter the global workplace today (Gardner, Steglitz, & Gross, 2009). The use of short-term study abroad has an extraordinary impact on how future engineers build their foundation of knowledge. It is imperative to study engineering students' experiences abroad to develop appropriate curricula and opportunities overseas that cannot be experienced in the traditional classroom. This study used qualitative research that may not be generalized to all engineering students. However, the predominant themes suggest that short-term study abroad fosters global competencies and new communication skills for engineers, as well as the importance short-term study abroad plays in students' education.

Engineering educators use theories to instruct in the classroom. When real-world application can be applied, it changes how students view the skills they gain. Participants on this short-term study-abroad program focused more on the applicability of engineering projects to their area of expertise. Experts in the field lectured and showed examples of engineering work, and students connected this to theories learned from their home institution. They viewed engineering through a new lens and witnessed it on a global level. This research suggests that experiential learning can improve engineering students' understanding of concepts and ideas and expose them to global challenges first hand. An overseas experience enhances their education at home, and generates new ideas students can explore once they return.

In addition, administrators are able to benefit from the results of short-term study-abroad research. It is important to balance the program activities, classroom time, and special events so that students have enough time on their own to explore the host location and interact with locals. Exposure to the host culture allows students to integrate with people they may not otherwise meet, practice their novice language skills, and learn about the new culture at their own pace. Affording enough time with host families is also important for successful cultural adjustment. Students may not always have the best host family, but it does provide valuable opportunities for students to practice their language skills and to interact with locals who are usually friendly and willing to help foreigners.

Even with a demanding schedule, administrators must provide a routine for students to adapt to while studying abroad. In a short-term study-abroad program, there is a lot of material to cover in a short period of time. With an organized schedule, students know where to be when, and can develop a routine that is easy to adhere to, as seen with the engineering students in Germany. The daily routine helped students adapt to the local culture by providing a framework for their interactions each day. This was highly beneficial in this research study, and could be helpful to future study-abroad programs as well.

One implication faculty and administrators must consider with short-term study-abroad programs that are not focused on language acquisition is to prepare students for potential communication barriers. As students indicated, they used their novice German language skills with the staff at the university, ordering in restaurants, and with their host families. With little to no language skills, students aren't able to hold an in depth conversation or ask questions they may have at a restaurant or store. It is essential to prepare

students in advance of the study-abroad program for a possible language barrier, and how to cope with this barrier when overseas. A short course in basic communication skills prior to departure, or a printed "cheat sheet" of commonly used phrases can reassure students they can get around even when they aren't fluent in the host language. Furthermore, selecting host families that have some English language skills can help ease the transition for students once they arrive. A number of students benefited from conversations with their host families, and learned about the local culture, food, and phrases. In some cases, students unexpectedly learned about renewable energies from the way their host families lived. Host families are an asset in helping students adapt as they provide informal learning opportunities outside of the classroom.

Finally, an important implication to short-term study abroad is the relationship building that takes place overseas. Social interactions with peers help study-abroad students adapt and bond with one another, as Edmonds (2011) suggested. When students go through the same experience together, there is a transformative learning experience that takes place as they connect and relate, especially in a foreign environment. Part of the interpersonal growth study abroad students experience is in part due to the social interactions of the program, and the informal bonding outside of their classroom overseas that can't be replicated in the home environment.

As engineers face global challenges (Baker & Ağar, 2011), they must possess communication and critical thinking skills to solve these ongoing crises. Participants experienced a number of challenges and barriers when studying abroad that have provided useful implications for future short-term study-abroad programs. It is imperative that administrators and faculty utilize this in designing and implementing short-term study-abroad

opportunities for engineering students. Overall, students embraced the challenges and barriers they faced by developing adaptation strategies and believed they gained invaluable skills as a result of studying abroad.

Limitations and Future Research

This study offered a new perspective from engineering students through qualitative research, though it possessed limitations. First, the sample size was small and only examines one engineering short-term study-abroad program. Future studies need to examine larger sample sizes, or multiple short-term study-abroad programs to compare results. Additionally, triangulation of data, including journals and narrative interviews, produced a number of themes in students' adjustment process. This data came from one mid-sized Midwestern university and cannot be generalized across all populations. Further studies should include both quantitative and qualitative methods to determine themes not possible in qualitative research alone. Students also received prompts and questions to write about in their journals to help stimulate the process of reflection regarding their study-abroad experience. Future studies may ask students to write freely on their own in hopes they share stories about their study-abroad experience that are not covered in the specific questions. Finally, students provided stories through narrative interviews. Due to their schedules, some were conducted individually, in pairs, and in one group of three students. Telling their stories with additional students present may have influenced the responses of some students or changed how they answered the questions. In the future, individual interviews can eliminate the same response from students and potentially develop different themes.

Short-term study abroad has significant effects on global learning. Intercultural communication skills are invaluable to all college students (Waco, 2008). It is important to study the impact of study abroad on engineering students in order for them to become globally competent in their field. Discovering new ways to integrate engineering on a global scale helps students stand out from their classmates. Study abroad enriches the traditional classroom experience and connects students to real-world applications. Short-term study abroad offers engineering students the chance to engage in cultural-exchange opportunities without falling behind in the program of study (Donnelly-Smith, 2009). Engineers must possess cultural sensitivity and communication skills to solve global engineering challenges. Intercultural communication skills are beneficial to the engineering profession, and studying the acquisition of this through study abroad can offer insight on future possibilities for institutes of higher education. ■

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