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2017

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UNIVERSITY OF CALIFORNIA

Santa Barbara

Developing a Global Engineer: Study Abroad Experiences of Engineering Majors in One
University System

A Dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy in Education

by

Lesley Noel Seccia

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January 2018

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October 2017

Developing a Global Engineer: Study Abroad Experiences of Engineering Majors in One

University System

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by

Lesley Noel Seccia

Dedication

This dissertation is dedicated to my parents, without whose unfailing love and support my academic endeavors would never have been possible.

Acknowledgments

I would first like to thank and acknowledge my advisors, Dr. Hsiu-Zu Ho and Dr. Sharon Conley, also my committee co-chairs. Thank you for constant support, important feedback, and words of wisdom. Thank you to Dr. Jenny Cook-Gumperz for coming up with new ideas and encouraging me to think about my dissertation in new ways. I am grateful to you all for your interest in my research, your patience, and your thoughtfulness.

The students and academic advisors who were part of this study deserve to be acknowledged as well. To the students, particularly those that were part of the interviews, thank you for your openness regarding your education abroad programs. I enjoyed getting to know you, and I'm rooting for you all to find success in your future careers. To the advisors, thank you for sharing your insight into study abroad. Many of you connected me to students who formed the basis of this study. You all do important work, and I hope your contributions to this study will provide value for education abroad programs and colleges of engineering.

I also would like to thank my work colleagues. To say this dissertation would not have been possible without their support is the absolute truth. My colleagues and managers have been so supportive of my since I began this journey. To Donna, who led by example in working and earning her PhD. To Roberto, for never batting an eye when I had to flex my schedule. And to Meredith, for listening to this whole journey during our twice-daily fifteen minute walking breaks.

My friends, particularly Emily, Megan, Lauren, and Amber, who are so impressive in their own rights, provided love, support, and much needed breaks from studying.

My family set me up for success in completing a PhD. Thank you to my father, who always pushed me to do better in academics than I ever thought I could; my mother, who although passed away before I started graduate school, encouraged my love of reading from a young age; my grandmother, with whom I spent many hours while I was growing up and is one the most loving and devoted people I know; and my husband, Devid, who sacrificed much of his own life in order for me to finish my dissertation. Devid, thank you for your constant encouragement, for staying up late with me and getting up early to take me to work, and for being the best friend and husband I could ask for. I love you all and am so grateful that you are in my life.

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ABSTRACT

Extensive literature on study abroad outcomes documents the benefits of study abroad for all undergraduate students, regardless of academic major. However, engineering majors, at 5% of all undergraduate students nationally who study abroad, are substantially less likely to study abroad than their social science peers, at 17.3% participation (IIE, 2016). Yet engineering majors have much to gain from international experiences: engineering is a global profession, and these future engineers will be expected not only to work in diverse teams but also travel and work abroad.

The purpose of this study is: (a) to explore the goals, motivations and challenges or barriers that undergraduate engineering majors face in their decision-making regarding study abroad, particularly in comparison to those motivations and barriers identified in the literature; (b) to identify outcomes of study abroad for this group of students and how they believe study abroad might impact their future; and (c) to explore students' decision-making regarding engineering study abroad from academic advisors' perspectives. These advisors not only support undergraduates' academic needs on campus but also help them plan for study abroad.

The theory of reasoned action (Fishbein & Azjen, 1975) and transformational learning theory (Mezirow, 1991) formed the theoretical framework for this study. Combined, these theories form the basis of a conceptual model to explain the decision-making process of studying abroad and how study abroad can be a transformative learning experience for study abroad participants.

This study employed a mixed methods methodology (Creswell, 2014) to address the research questions. First, a survey was sent to engineering undergraduates who had

participated in study abroad at 8 different undergraduate institutions within a university system. Then, based on survey responses, in-depth interviews were conducted with 11 of the survey participants. Concurrently, 7 academic advisors were interviewed in order to shed light on the advising process for engineering majors to study abroad.

Personal and institutional factors were found to be the primary considerations in deciding whether to study abroad. Personal factors included students' desires for cultural experiences and their internal drive to overcome any obstacles they faced. Institutionally, curriculum restrictions for engineering majors and student fears about delay in graduation challenged study abroad participation. Outcomes included students' alteration of career plans, increasing their insight into other cultures, and increasing their comfort with working abroad.

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CHAPTER ONE: INTRODUCTION

Engineering is a global profession. Current and future engineers will need to work together to combat global climate change, consider the sustainable development of less-developed regions of the world, and even explore space (Grandin & Hirleman, 2009). Additionally, the outsourcing of jobs and global sales may require that engineers be called upon to move abroad. To succeed, engineers must feel comfortable in cultures other than their own.

Despite the global nature of the profession, engineers in America have been characterized as lacking vital cross-cultural skills (Blumenthal & Grothus, 2009; Jesiek, Zhu, Woo, Thompson, & Mazzurco, 2014). University preparation in global competency is limited: incorporating such preparation into the undergraduate engineering curriculum is difficult due to the highly structured curriculum and sequential coursework. The challenge of giving undergraduate engineers a global experience is reflected in the number of engineering majors nationally who study abroad: less than 5% of all undergraduates who studied abroad in the 2013-2014 school year were engineering majors (IIE, 2015a). In order to increase participation, some universities have begun to create global engineering programs that will prepare undergraduate engineers for global work. These programs include coursework in global issues, increased opportunities for international interaction on campus, and enhancement of study abroad opportunities specifically for engineers.

This study sought to explore one aspect of global engineering education: study abroad. The rationale for engineering majors to go abroad is clear: Allan E. Goodman, President and CEO of the Institute for International Education (IIE), notes that “innovation and job growth require individuals to possess the capacity to think and act on a global basis,

and ... there's no faster path to this skill set than study abroad" (Goodman, 2009, p. 6).

However, do engineering majors who do study abroad feel they develop "the capacity to think and act on a global basis" as a result of their study abroad experience? What outcomes do they self-report? These and other questions were explored in this study.

Background of the Problem

Study Abroad in General

As the participation in study abroad has grown, so too has the commitment of colleges and universities to international issues. Across the United States, "institutions began to think through global education in broader terms, placing study abroad within a richer mix of curricular and co-curricular offerings, integrating it within a more strategic and coherent plan" (Hoffa & DePaul, 2010, p. 7). These "internationalization" efforts have encouraged student and teacher mobility, created collaboration for teaching and research worldwide, and improved academic standards and quality (Knight, 2003). Expanding international opportunities on campus have also led to different types of "study" abroad programs; indeed, education abroad is a more fitting term. For example, short-term programs, service learning programs, and international internships are all common offerings.

The expansion of internationalization efforts has meant that more students are studying abroad than ever before. According to the Institute for International Education, an organization that tracks study abroad participation across the United States, U.S. student participation has more than tripled over the last two decades (IIE, 2015c).

Increased participation is a positive trend, as empirical literature has found many benefits to studying abroad. One measure, called the Intercultural Development Inventory, has consistently indicated that students return home more accepting of cultural difference and

more able to adapt to other cultures (Hammer, 2012; Jackson, 2008; Lou & Bosley, 2012; Paige, Cohen, & Shively, 2004). Other studies have found that students expand their global mindedness after studying abroad. Global mindedness has been described as “a worldview in which one sees oneself as connected to the world community and feels a sense of responsibility to its members” (Hett, as cited in Clarke, Flaherty, Wright, and McMillen, 2009). For example, using Hett’s (1993) Global Mindedness Scale, Clarke and colleagues found that students who studied abroad scored significantly higher in measures of interconnectedness, cultural pluralism, and efficacy than students who stayed on campus. International experiences have also been found to increase creativity in several ways:

- (a) providing direct access to novel ideas and concepts from other cultures, (b) creating the ability to see multiple underlying functions behind the same form, (c) destabilizing routinized knowledge structures, thereby increasing the accessibility of normally inaccessible knowledge, (d) creating a psychological readiness to recruit ideas from unfamiliar sources and places, and (e) fostering synthesis of seemingly incompatible ideas from diverse cultures. (Leung, Maddux, Galinsky, & Chiu, 2008, p. 170)

Employability and Study Abroad

Engineering students in particular may not feel studying abroad can increase their employability. Employers have been found to rank academic major as far more important than other educational opportunities when making hiring decisions (Trooboo, Vande Berg & Rayman, 2008). However, the results of recent studies are promising that education abroad is valued by employers, from both employers’ and students’ perspectives alike.

In an important study on employer attitudes toward education abroad, Trooboff et al. (2008) asked employers to rank the relative value of education abroad with other international educational experiences. While academic major was by far the most highly valued asset, senior managers ranked study abroad higher than other international experiences like completing and internship abroad or completing an area studies certificate. Companies who earned an annual international revenue of more than 25% ranked education abroad higher than those that earned less than 25% of their revenue internationally. In terms of personal qualities, two of the top five qualities hiring managers looked for (listens and observes well and flexible/adapts well) were considered enhanced by study abroad.

Students may also perceive study abroad as valuable for employability. Potts (2015) aimed to explore how recent graduates perceived the benefits of studying abroad in relation to their careers. Regarding career direction, 69% of the respondents felt that study abroad increased their motivation or passion for their career. In terms of obtaining their first job, 66% of respondents felt that studying abroad made them more attractive to employers.

Global Engineers

One of the purposes of this study is to explore whether students become “global engineers” (Chang, Atkinson, & Hirleman, 2009) as a result of studying abroad. A global engineer, as conceptualized in this study, has developed or enhanced (a) global competency and (b) professional, or soft, skills. While other factors and attributes may also help characterize global engineers, for the purposes of this study I have limited the definition to global competency and the development of soft skills. Before describing the two concepts in detail, I will first give a background of why global engineers are necessary in the 21st century.

Globalization of the Engineering Profession

The sciences in general, and engineering in particular, have been notably impacted by globalization. At universities, “scientific research is a global, rather than national, enterprise” (Blumenthal & Grothus, 2009, p. 12). Indicators of globalization at the higher education level include international research projects, the use of English for publishing, and the growing international labor market for both students and scholars (Altbach & Knight, 2007). In the workplace, globalization has created increased demand for highly-educated workers who are willing to move around the world for jobs.

American engineers, even if they live in the United States, must feel comfortable working in multicultural teams. Multicultural teamwork has its benefits. These teams have been found to “develop innovative solutions to problems that may not be created in more homogeneous teams” (Chang et al., 2009). Further, creativity is enhanced in culturally and ethnically diverse teams (Continental AG, 2006).

Globalization, then, requires that engineers become global engineers. No longer can engineers simply be proficient only in the technical subjects: they must also “be informed about international technological trends and business practices and familiar with languages and cultures” (Chang et al., 2009, p. 1). Some scholars are concerned that American undergraduates may not be ready to become global engineers. Downey and colleagues (2006) note that in American universities “the traditional engineering method, which is still taught regularly in engineering science courses, offers no method or mechanism for working with people who draw boundaries around problems in different manners” (p. 109). Collaboration with those who define or solve problems differently is needed in the global market.

Global Competency for Engineers

The global nature of engineering means that undergraduates need to be prepared to work in a global marketplace. Engineers may be called to work at a branch office in another country or they may work in multicultural teams. For these reasons, global competency has been documented as a desired quality for future engineers (Chang et al., 2009; Downey et al., 2006; Jesiek et al., 2014; Lohmann, Rollins, & Hoey, 2006). However, global competency is a complex and multifaceted concept. Some scholars have attempted to define global competency (Downey et al., 2006; Hunter, White, & Godbey, 2006; Morais & Ogden, 2011; Parkinson, 2009), while others have sought to describe ways global competency can be attained (Lohmann et al., 2006) or situations in which global competency is needed (Chang et al., 2009; Downey et al., 2006; Jesiek et al., 2014).

In one attempt at defining global competency, Parkinson (2009) asked leaders across academia and industry to rank attributes one would expect to find in a globally competent engineer. Based on their rankings, globally competent engineers:

1. Can appreciate other cultures.
2. Are proficient working in or directing a team of ethnic and cultural diversity.
3. Are able to communicate across cultures.
4. Have had a chance to practice engineering in a global context, whether through an international internship, a service-learning opportunity, a virtual global engineering project or some other form of experience.
5. Can effectively deal with ethical issues arising from cultural or national differences.

(p. 12-13)

These attributes are important, but they may not tell the whole story. Jesiek et al. (2014) argue that “such lists have tended to lack explicit grounding in empirical studies of engineering practice, including typical kinds of work situations and related behavioral requirements” (p. 1). In order to identify context-appropriate behaviors, Jesiek and colleagues reviewed which types of situations are most common for engineers. Three common engineering contexts were reviewed: technical coordination, understanding and negotiating engineering cultures, and navigating ethics, standards, and regulations. Then, for each context, the authors described the types of cross-cultural skills needed. As an example, technical coordination involves coordinating with others in order to complete projects on time. The types of skills needed in this situation include capabilities related to teamwork and leadership, and particularly the capability to adapt to cultural norms and communicate in culturally appropriate manners. Study abroad has been recognized as valuable for developing these types of skills (for example, Vande Berg, Connor-Linton, & Paige, 2009).

Developing global competency is particularly important at the undergraduate level, before engineers enter the work force. Coursework in international studies, second language proficiency, and an international experience (i.e., study abroad) contribute to the development of global competency (Continental AG, 2006; Hayward, 2000; Hunter, 2004; Lohmann et al., 2006). Some scholars argue that each of these components (coursework, language proficiency, and an international experience) must all be utilized to develop global competence (Lohmann et al., 2006). For that reason, many schools of engineering are creating global engineering options for students to get the skills they need. As an example, the University of California at Irvine recently developed a “Program in International Engineering” which allows students to not only take courses abroad for credit but also intern

at a global company in Germany.

Despite the need for global competence, few studies have empirically measured global competency for undergraduate engineers. In one attempt, Lohmann and colleagues (2006) of the Georgia Tech International Plan (GTIP) created a multifaceted assessment schema that expressed each learning objective in measurable terms. For example, to measure comparative global knowledge, they expected that students would be able to “demonstrate substantively the major social–political–economic processes and systems” (p. 125) of the host country. Additionally, each learning objective contained multiple methods of assessment. For comparative global knowledge, students might complete a required international affairs course, take a pre-/post-international-experience questionnaire, or write a post-international-experience reflective essay. Results from assessment methods were needed for use in programmatic improvement as well. At the time of publishing, the assessment schema was being implemented; however, the assessment plan is useful in that it documents multiple ways global competency can be assessed.

New Emphasis on Soft Skills

In this study, one of the attributes of a global engineer is their development of soft skills. The accrediting board of many American colleges of engineering has also recognized that success in engineering is based on more than just technological and “hard” skills like math and science. In the year 2000, the Accreditation Board of Engineering and Technology (ABET) added a section on professional “soft” skills to highlight “skills in communication and persuasion, the ability to lead and work effectively as a team member, and an understanding of the non-technical forces that affected engineering decisions” (Shuman, Besterfield-Sacre, & McGourty, 2005, p. 43). At a more granular level, the skills cited in the

guidelines include:

- (a) ability to apply knowledge of mathematics, science, and engineering
- (b) ability to design and conduct experiments, as well as to analyze and interpret data
- (c) ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) ability to function on multidisciplinary teams
- (e) ability to identify, formulate, and solve engineering problems
- (f) understanding of professional and ethical responsibility
- (g) ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) recognition of the need for, and an ability to engage in life-long learning
- (j) knowledge of contemporary issues
- (k) ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. (ABET guidelines, 2016-2017)

While these skills are not necessarily specific to study abroad, it has been speculated that study abroad can be an effective way to improve these skills (Bettez & Lineberry, 2004; DiBiasio & Mello, 2004; Shuman et al., 2005). Some have argued that these skills cannot be taught or assessed in a classroom alone (Shuman et al., 2005). If students are expected to have a broad understanding of the impact of engineering solutions in a global context, encouraging them to study off campus is an important way to do that.

Others have taken a more critical view of the soft skills. Orbst and Jones (2003)

noted that the emphasis on the “ill-named soft skills” must move beyond public speaking, management skills, and the ability to work well in teams; instead, students must understand the implications of the technical work on societies around the world. They warn that “technique without conscious, we know, is danger” (n.p.).

However, four of the soft skills were explored in this study: two “process skills” and two “awareness skills” (Shuman et al., 2005). Due to the constraints of this study, it was not possible to explore the development of all eleven of the soft skills. The process skills assessed were ability to function on multidisciplinary teams and ability to communicate effectively. The awareness skills include the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context and knowledge of contemporary issues.

Engineering Participation in Study Abroad

While study abroad is an important way for undergraduate engineering students to develop global competency and soft skills, these students study abroad at lower rates than those in other majors (see Table 1.1; IIE, 2015a). The lack of American science and engineering students with experience in a culture other than their own has been called a “distressing trend” (Goodman, 2009). Calls to increase engineering participation in study abroad have come from education abroad administrators, who consider having a study abroad experience a competitive advantage (Goodman).

Table 1.1
Fields of Study of U.S. Study Abroad Students (%),
 2013/14

Field of Study	Percentage
Business & Management	19.6
Social Sciences	18.7
Physical or Life Sciences	8.0
Foreign Language and	7.8

International Studies	
Fine or Applied Arts	7.0
Other Fields of Study	6.7
Health Professions	6.0
Communications and Journalism	5.6
Engineering	4.6
Humanities	4.1
Education	3.7
Undeclared	2.6
Math or Computer Science	2.1
Agriculture	1.9
Legal Studies and Law Enforcement	1.5

Source: IIE, 2015a

Some studies have examined whether incoming undergraduates intend to study abroad as a way to explain actual participation in study abroad. In Stroud’s (2010) study, intent was measured by asking freshmen students (n = 2,258) “What is your best guess as to the chances you will participate in a study abroad program?” The results indicated that students in engineering majors were less likely to intend to study abroad than their peers in other majors. One of the only statistically significant negative factors of intent to study abroad was majoring in engineering.

Salisbury, Umbach, Paulsen, and Pascarella (2009) also measured intent to study abroad with a large sample of freshmen undergraduates (n = 2,772). In contrast to the Stroud study, their sample of students came from across the United States at a wide variety of institutions. Intent was measured by asking students if they planned to study abroad. Contradicting Stroud’s (2010) findings, the results did not indicate statistically significant differences in intent to study abroad between engineering majors and those majoring in fine arts, foreign languages, or humanities. However, results indicated that students at large research universities were between 10 and 13 percentage points less likely than students at

liberal arts colleges to intend to study abroad. Thus while majoring in engineering might be a negative factor at some institutions, it might not explain low rates of participation at others.

Statement of the Problem

Despite the growth in study abroad participation for science, technology, engineering, and math majors in recent years, the rates of participation for engineering and computer science majors remain lower than other majors (IIE, 2015a). However, study abroad is a vital resource for students entering the global engineering profession. Thus, for those few engineering majors who do study abroad, we need to know their motivations for going, experiences abroad, and perceived outcomes. Additionally, while there is a growing body of literature on discipline-specific outcomes for engineering students, few research studies have explored the development of professional skills and global competency through study abroad specifically for engineering majors. As the field of engineering becomes increasingly globalized, the need to learn more about whether study abroad develops global engineers is evident.

Statement of Study Purpose

This purpose of this study is to: (a) explore the goals, motivations and challenges or barriers that undergraduate engineering majors face in their decision-making regarding study abroad, particularly in comparison to those motivations and barriers identified in the literature; (b) identify outcomes of study abroad for this group of students and how they believe study abroad might impact their future; and (c) explore engineering study abroad from academic advisors' perspectives. As a result, this study provides a unique perspective of prospective engineers who chose to study abroad and the factors that influenced their decision-making, as well as what they experienced while abroad and their perceived

outcomes. In this study, the academic majors associated with engineering include those that are typical found in the College of Engineering or Computer Science at most universities in the United States: for example, bioengineering, civil engineering, mechanical engineering, electrical engineering, chemical engineering, and computer science/engineering.

Research Questions

The research questions that this study addresses are:

1. What are undergraduate engineering majors' goals and motivations for studying abroad?
2. What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?
3. What outcomes do undergraduate engineering majors report as a result of studying abroad?
4. What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

Theoretical and Conceptual Framework

The current study draws on Fishbien and Ajzen's (1975) theory of reasoned action and Mezirow's (1991) transformational learning theory to guide the study. Fishbien and Ajzen's (1975) theory helps explain the impact of students' attitudes and social factors in their decision to study abroad. Mezirow's (1991) theory helps explain why the learning experiences during a study abroad program can be transformative. Both these frameworks are explained in more detail below.

Theory of Reasoned Action

Fishbien and Ajzen's (1975) theory of reasoned action helps explain volitional behaviors, such as deciding whether to participate in education abroad. The theory posits that a person's attitude toward the behavior and the subjective norm directly relates to the person's intent to perform that behavior. An attitude is "the amount of affect for or against some object" (p. 11) where affect is defined as "a person's feelings toward and evaluation of some object, person, issue, or event" (p. 12). The subjective norm consists of other peoples' beliefs about performing the behavior. A person may or may not be motivated to comply with the subjective norm for performing the behavior.

In the case of study abroad, a student may have certain positive or negative attitudes toward study abroad. Additionally, the social pressure by family, friends, faculty, and university administrators to study abroad or not may also impact his or her intention. In totality, this theory suggests that it is the student's attitude and others' beliefs about studying abroad will determine if the student intends to study abroad.

Transformational Learning Theory

Transformational learning theory (Mezirow, 1978, 1991) serves as a framework to understand how engineering majors can become global engineers through studying abroad. Transformative learning occurs when students reflect on their culturally-developed perspectives or assumptions about the world and later take action to transform their beliefs. Transformative learning theory stemmed from Mezirow's (1978) study of women re-entering college and the work force after extended periods away. Some women entered these programs for personal development, others wanted to re-enter the job market. The original study examined factors that challenged or facilitated the effectiveness of re-entry programs.

Mezirow found that these programs served as a catalyst for women's perspective transformations, leading to dramatic changes in their actions. Women were then able to recognize "the social, economic, political, psychological, and religious assumptions that shape these structures—presuppositions inherited but rarely examined critically" (p. 7) and then were able to rebuild their "personal frame[s] of reference, self-concept, goals, and criteria for evaluating change" (p. 7).

Mezirow (1991) continued to build upon his original conceptualization of perspective transformation by further describing the ten sequential phases toward transformation:

1. A disorienting dilemma.
2. Self-examination with feelings of guilt or shame.
3. A critical assessment of epistemic, sociocultural, or psychic assumptions.
4. Recognition that one's discontent and the process of transformation are shared and that others have negotiated a similar change.
5. Exploration of options for new roles, relationships, and actions.
6. Planning a course of action.
7. Acquisition of knowledge and skills for implementing one's plans.
8. Provisional trying of new roles.
9. Building of competence and self-confidence in new roles and relationships.
10. A reintegration into one's life on the basis of conditions dictated by the new perspective. (p. 168-169)

Researchers have determined that these stages are not necessarily linear (Cranton, 2002) and not all stages are required to achieve transformative learning (Brock, 2009). Some scholars have questioned whether transformative learning occurs directly at the end of an event or can

occur gradually over time (Brock, 2009). Indeed, several theories describe college students' gradual maturity over time (i.e., Baxter Magolda, 1999; Kegan, 1994).

The theory draws from constructivism, critical theory, and deconstructivism in social theory (Mezirow, 1991). Meaning making, an idea drawn from constructivism, is critical to transformative learning theory: the meanings we attribute to a particular experience are “acquired and validated through human interaction and communication” (Mezirow, 1991, p. xiv). Additionally, the way we interpret the world is entirely based on our past personal experiences. According to Mezirow (1991), our assumptions are always subject to revision based on our life experiences.

Some researchers (Hunter, 2008; Merriam & Caffarella, 1999) have narrowed the learning process into three phases: critical reflection, discourse, and action. These phases are triggered by a disorienting dilemma. The disorienting dilemma is a profound experience: “these disorienting dilemmas of adulthood can dissociate one from long-established modes of living and bring into sharp focus questions of identity, of the meaning and direction of one's life” (Mezirow, 1978, p. 12). Indeed, exposure to “a different culture with customs that contradict our own previously accepted presuppositions” (Mezirow, 1991, p. 168) often constitutes a disorienting dilemma. The disorienting dilemma can be any of several key events in the study abroad experience: perhaps “problems, challenges, and confusing hurdles a learner will experience in the course of forging a new routine overseas” (Hunter, 2008, p. 98). Examples might include different food choices, different modes of living, or different political beliefs. Another word for disorienting dilemma could be “culture shock,” which is more familiar in study abroad parlance. Culture shock, like a disorienting dilemma, helps

“catalyze many aspects of personal development and self-realization” (Chambers & Chambers, 2008, p. 129).

Transformation is possible when one critically reflects on his or her meaning structures. Meaning structures are divided into meaning schemes and meaning perspectives. Meaning schemes involve “specific knowledge, beliefs, value judgments, or feelings involved in making an interpretation” (Mezirow, 1991, p. 5). A meaning perspective “is a habitual set of expectations that constitutes an orienting frame of reference that we use in projecting our symbolic models and that serves as a (usually tacit) belief system for interpreting and evaluating the meaning of experience” (p. 42). Examples of factors shaping our meaning perspectives include social norms/rules, cultural/language codes, tolerance of ambiguity, and inhibitions.

Critical reflection is comprised of three types: content, process, and premise. Content reflection is “reflection on *what* we perceive, think, feel, or act upon” (p. 107). Process reflection is “examination of *how* we perform these functions of perceiving, thinking, feeling, or acting and an assessment of our efficacy in performing them” (p. 108). Premise reflection is “our becoming aware of *why* we perceive, think, feel, or act as we do and of the reasons for and consequences of our possible habits of hasty judgment, conceptual inadequacy, or error in the process of judging” (p. 108). In order for transformative learning to occur, there must be premise reflection. Premise reflection “requires the person to see the larger view of what is operating within his or her value system, for instance, and could transform a meaning perspective rather than a meaning scheme” (Kitchenham, 2008, p. 114).

Reflection can take on many forms. Individual reflection might encompass journaling or blogging. Group reflection includes discourse with others. The purpose of

discourse is to “challenge learners to view difference as an opportunity for learning and to encourage students to make a mindful effort to find agreements surrounding reality, which leads to the development of new understandings of the world” (Hunter, 2008, p. 99).

Reflective discourse, which Mezirow (2000) also calls dialogic learning, is “devoted to searching for understanding of issues or beliefs, assessing the evidence and arguments of differing points of view, and being open to looking at alternative points of views” (Mezirow, as cited in Ogden, 2010, p. 51). In study abroad, this could mean talking with host families, a peer, or a cultural mentor to make meaning of the experience. But while Mezirow (1991) asserts the importance of reflection, some studies have also found transformation is possible even without reflection. For example, Taylor (1997) found that some participants in his study reacted to culture shock with little or no questioning of their assumptions; other studies found that individuals may not be conscious of their reflection yet still revise meaning structures (Taylor).

Learning, when it encompasses meaning schemes and meaning perspectives, can either be normative or transformative. Normative learning occurs when one reorganizes meaning schemes to include new information. The meaning perspective makes room for the new experience, but the meaning perspective does not profoundly change. In an engineering example, a student abroad might feel that a particular lab experience works in the context abroad, but he might not understand how what he learned could be relevant to his experience in the United States.

Transformative learning, on the other hand, occurs when one reconsiders worldviews (which might also occur outside an individual’s awareness; Taylor, 1997). This transformed meaning perspective “is the development of a new meaning structure that results in the

individual questioning previously held values and beliefs” (Kumi-Yeboah, 2014, p. 113).

For example, a student working in a lab might become critically aware that the way he works in a particular lab in the United States is not the preferred way, and through reflecting on the lab experience his thinking becomes more discriminating, inclusive, and integrative.

Transformative learning is complete “when the individual fully incorporates the new learning” into their lives following re-integration (Kumi-Yeboah, 2014). For example, after study abroad a student’s perspective has become more global-minded because study abroad gives students an opportunity to challenge their untested assumptions.

Adapted Model of the Decision to Study Abroad

In order to explain decision-making regarding study abroad, Kasravi’s (2009) adapted model of the decision to study abroad is fitting for this study. Kasravi builds on the personal and social factors of the theory of reasoned action (Fishbien & Ajzen, 1975) and adds in institutional factors as well. The adapted model of the decision to study abroad is based off of models in two dissertations, Booker’s (2001) decision-making process to study abroad and Peterson’s (2003) decision to study abroad model. In the adapted model (see Figure 1.1 below), personal, social, and institutional factors affect students’ attitudes toward study abroad, which then lead to their decision to study abroad. These factors may influence each other and some of the factors may overlap. In Kasravi’s model, personal factors include students’ perceived outcomes, perceived obstacles, and personal characteristics. Social factors include perceived social pressures, primary sources of information, and experiences and recommendations of others. Institutional factors include types of study abroad opportunities, requirements for study abroad, advising resources and support, heritage seeking programs available, funding sources, and recruitment and marketing sources.

Kasravi's (2009) study focused on two groups of students: one group consisted of undergraduate students of color who had been accepted to a study abroad program at the University of California, San Diego, and the other group consisted of sophomores and above, regardless of race, who had decided not to apply for a study abroad program. These groups were asked about the influence of personal, social, and institutional factors in their decision-making regarding study abroad. She found personal factors were the most significant factor for students of color in their decision to study abroad. Personal growth was the largest motivation for studying abroad, and personal characteristics like their internal drive and motivation to have a study abroad experience outweighed barriers they faced.

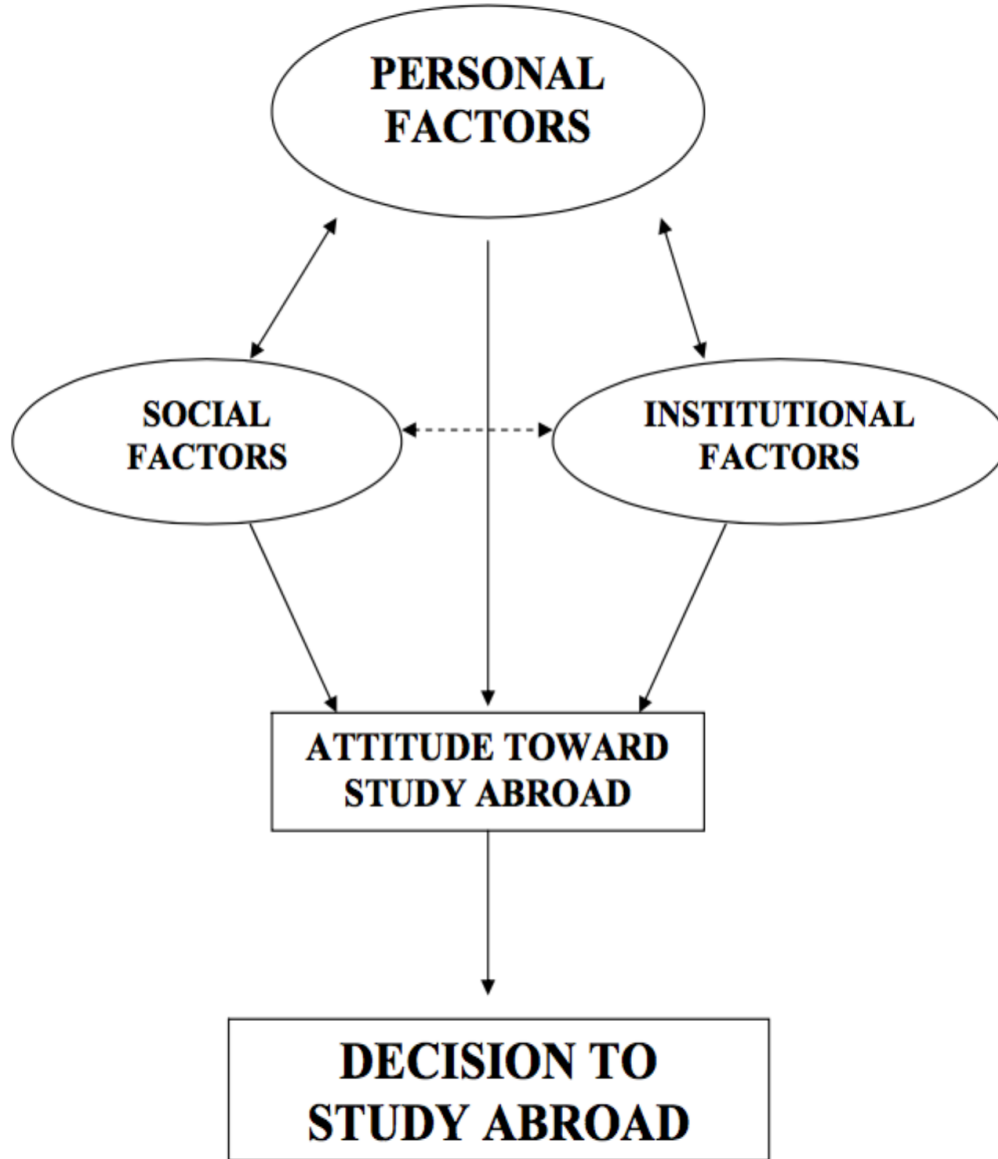


Figure 1.1. Adapted model of the decision to study abroad (Kasravi, 2009).

The most significant social influences included peers/significant others and past participants. Interestingly, these social influences differed for Latino/Hispanic American students and Asian/Asian American students. Latino students had fewer peers that had studied abroad, so they cited teachers as more significant sources of influence than Asians, who cited peers as their primary sources of influence. Institutional factors that positively influenced students included program offerings, the availability of heritage-seeking programs, an internationalized campus culture, and marketing by the university. The major barriers included program cost and restrictions in financial aid for study abroad, although course transferability, cultural norms, and family resistance were also cited as barriers.

Other studies have also questioned decision-making in study abroad. Salisbury et al. (2009) liken decision-making in study abroad to college choice theory. Both college-choice theory and the decision to study abroad model follow sequential orders: first, students develop a predisposition or intent to study abroad, then students search for an appropriate program and evaluate whether the program fits with their degree requirements and personal preferences, and finally students select the location and dates for the program and depart.

Academic advisors play a crucial role in all three phases. From actively promoting study abroad, to advising regarding how to fulfill degree requirements while abroad, academic advisors are necessary for students to participate in study abroad. However, few studies appear to explore the academic advisors' role in this process.

The present study utilizes Kasravi's (2009) model to explore the facilitators and challenges of studying abroad for undergraduate engineering majors (see Figure 1.2). Similarly to Kasravi's model, personal factors include students' perceived outcomes, perceived barriers, and personal characteristics. Examples of perceived outcomes include

cultural learning, learning another language, engineering or other academic learning, and better career opportunities. Perceived barriers include finances, restrictions regarding degree requirements, time to degree, lack of program options for engineering majors, difficulty in transferring credit to the major, and lack of peers who have successfully studied abroad. Personal characteristics include students' internal motivation and desire to study abroad, such as their willingness to study abroad despite degree requirements. Like Kasravi's (2009) study, social factors include perceived social pressure from family and friends, primary sources of information, and experiences and recommendations of others. However, I also have added advising and faculty engagement in this category, as I consider both advisors and faculty who actively promote study abroad as social factors. Institutional factors include factors that do not depend on the attitudes and experiences of others, things like academics and curriculum, types of study abroad opportunities, and recruitment and marketing.

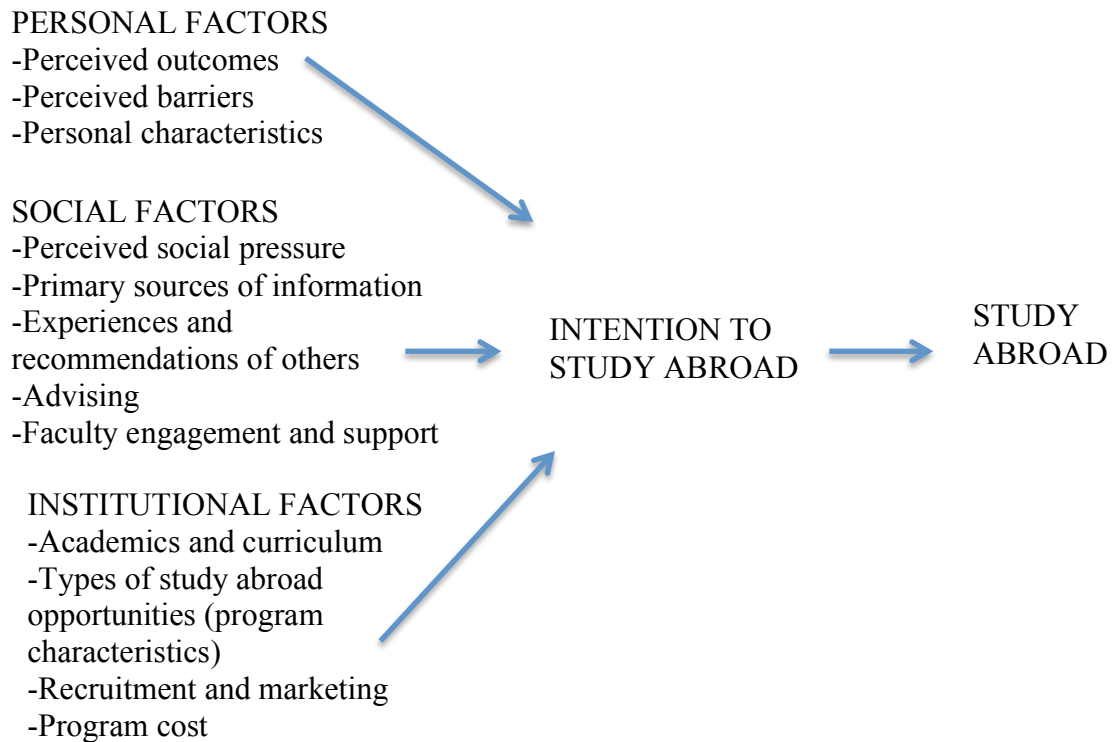


Figure 1.2. Adaptation of Kasravi’s (2009) decision to study abroad model for the present study

Revised Integrated Theoretical and Conceptual Model

Johnson’s (2016) revised integrated theoretical and conceptual model, which describes the transformation process while abroad, is appropriate for this study. The model is based on research that explored how students in a design discipline make meaning of study abroad and how the experience will impact their future plans; these disciplines included architecture, housing studies, landscape architecture, product design, apparel design, interior design, retail merchandising, and graphic design.

Johnson’s study centered on transformative learning theory (Mezirow, 1991) to

explain the meaning making process for the students in creative majors in her study. She also included other theories regarding creativity in her model; while a detailed analysis of the theories connecting to creativity is outside the scope of this study, multicultural experiences have been found to increase creativity for all individuals who interact with people from other cultures (Leung et al., 2008).

The conceptual model displayed below (Figure 1.3) depicts three phases of transformation. First, an individual in a creative major is influenced both by his or her own cultural environment (domain) and by the traditions and standards of the chosen creative field. The transition abroad, itself a disorienting dilemma, starts a process of transformation through encounters with people from other cultures, leading to the development of new meaning structures (Mezirow, 1991). Last, when an individual has returned home, he or she may access aspects of the cultural environment (domain) from both the home and host culture.

Johnson's model was refined based on her mixed methods study. She first sent participants a brief survey that attempted to understand how study abroad contributed to successful learning or changes in their creative work. She received survey responses from 69 students in creative majors (such as architecture, graphic design, apparel design, and interior design). Results from the survey indicated that 89.9% of respondents used something they learned on study abroad to think about a problem or assignment in a creative field in a new way. In data analysis, she used survey responses simply as descriptive data to illuminate her qualitative findings.

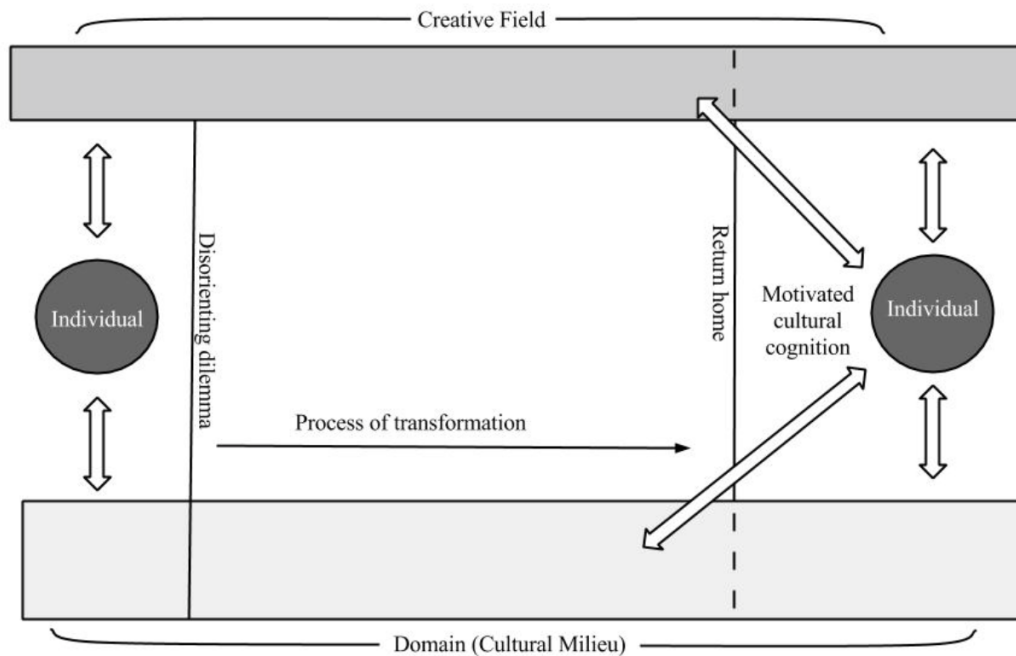


Figure 1.3. Revised integrated theoretical and conceptual model (Johnson, 2016).

From the survey responses, 20 of those participants agreed to be interviewed. Of the 20 interview participants, seven were recent alumni, nine were seniors, and four were juniors. Because the interview participants represented nearly one-third of the survey participants, “the interview analysis both echoes and amplifies the thematic findings from the qualitative survey data” (p. 94). The findings indicated desire to travel as a primary motivator for studying abroad, and many students were encouraged to go abroad after hearing about the value of study abroad from friends or family members. The reasons for selecting certain cities were more varied. As students in creative majors, the most common reason for selecting a location was “the appeal of the local design scene” (p. 149); however, curricular restrictions played a role in some participants’ decisions as well.

Reflection, a key component of transformational learning theory, was evidenced in three different ways: solitary (i.e., journaling), group/dialogic (i.e., talking with others) and artistic/expressive (i.e., through photography and sketching). While the reflection relating to solitary and group/dialogic is consistent with transformative learning theory, artistic/expressive is a new finding in this study. This artistic reflection helped pave the way for change related to creativity: perspective change (aesthetic and creative) and process change (inspiration seeking, borrowing and applying new ideas, design identity and approach, and design process and procedures) as a result of study abroad. In terms of the long-term influence of study abroad, she noted that study abroad inspired alumni to continue to travel and pursue careers or graduate degrees abroad.

Proposed Integrated Conceptual Model

This current study builds on Johnson's (2016) study, but changes the focus from creative majors (such as architecture and graphic design) to engineering majors (such as electrical engineering and computer science). Engineering majors have different needs than creative majors, but their meaning-making through study abroad is just as important. The conceptual model below (Figure 1.4) provides a lens for understanding the study abroad experiences for engineering majors, from the decision making stage, to learning experiences while abroad, to the outcomes upon return. The model integrates both the theory of reasoned action (Fishbien & Ajzen, 1975) and transformative learning theory (Mezirow, 1991). Undergraduate engineering majors face many obstacles while studying abroad, and there are personal, social, and institutional factors that positively and negatively influence their decision (Fishbien & Ajzen, 1975; Kasravi, 2009). Once these students enter the new culture, which serves as the disorienting dilemma, they go through a process of

transformation that triggers a perspective change. Upon return home, this perspective change manifests itself as outcomes related to personal growth, career opportunities, and more. The context of both the home institution and the host institution influences the type of learning and the outcomes that are possible.

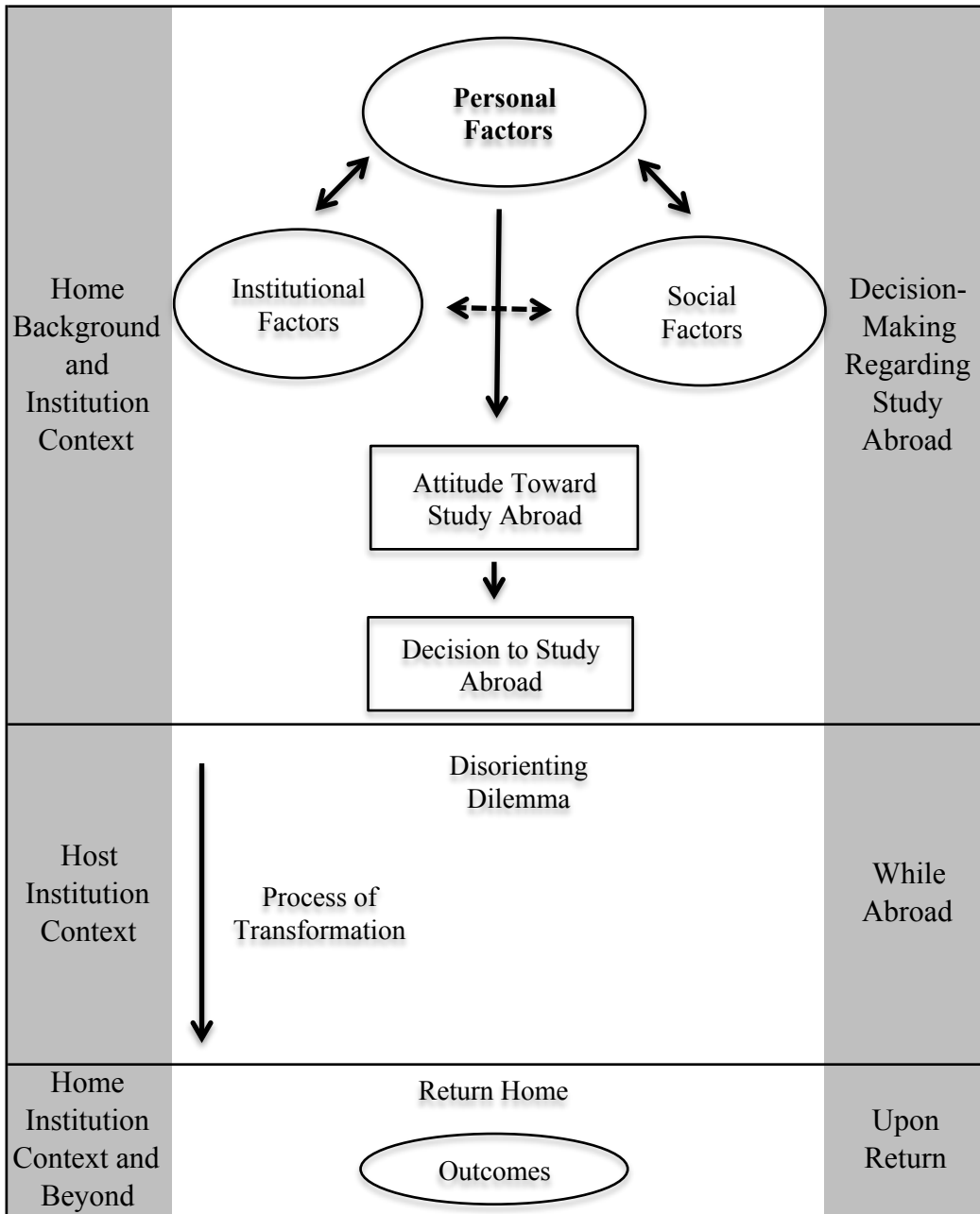


Figure 1.4. Proposed integrated conceptual model for understanding the experiences of undergraduate engineering majors who study abroad, based on Johnson’s (2016) and Kasravi’s (2009) models.

Significance of the Study

The study’s significance lies in understanding not only the decision-making factors

that prompt some engineering majors to study abroad, but also the role education abroad can have in the development of global engineers. Past literature has tended to focus on the discipline-specific outcomes for engineering majors (DiBiasio & Mello, 2004; Maldonado, Castillo, Carbajal, & Hajela, 2014; Schubert & Jacobitz, 2013). While these studies are invaluable, not all universities have engineering-specific study abroad programs. This study adds to the literature by focusing on study abroad programs that were open to all majors across the university system. Additionally, much of the literature regarding engineering study abroad focuses on one university. This study broadens the scope by examining study abroad at eight campuses of a university system.

Many empirical and anecdotal studies have listed barriers that engineering majors face in their attempts to study abroad, but this study moves beyond the barriers to understand the influences, both positive and negative, of study abroad participation. Additionally, much of the empirical literature specific to study abroad does not include theory, even though theory is necessary to guide the research and interpret the findings. My study utilizes the theory of reasoned action (Fishbein & Azjen, 1975) as well as transformative learning theory (Mezirow, 1991) to help answer the research questions. The conceptual framework is the integrated conceptual model for understanding the experiences of undergraduate engineering majors who study abroad, which is adapted from Johnson's (2016) and Kasravi's (2009) studies.

The exploration of the experiences of engineers while abroad furthers understanding of how study abroad can be a meaningful and transformative experience. The field of engineering is now more global than ever. Undergraduates finishing degree programs must now have the skills to become "global engineers" (Chang et al., 2009). Skills gained through

study abroad can help engineers become global engineers (Grandin & Hirleman, 2009). This study seeks to determine if it is possible to become a global engineer through study abroad.

For institutions as well as practitioners in the field of international education, understanding engineering majors' needs and outcomes for study abroad can help to design programs that better meet the needs to this population of students. Engineering majors are underrepresented in study abroad (IIE, 2016) and this current research seeks to increase their rates of participation. Institutions and practitioners will benefit from the results of this study as they attempt to encourage more engineering majors to study abroad.

Chapter One Summary

Engineers are entering careers that are heavily influenced by globalization. For engineering undergraduates, soft skills and global competency are needed to be successful. However, many undergraduate engineering programs lack opportunities for their students to develop these much-needed skills. One opportunity, study abroad, is available at most undergraduate institutions across the country. Study abroad has been documented as an effective way for students to develop important skills like cultural competency and empathy. Using the theory of reasoned action (Fishbein & Azjen, 1975) and transformational learning theory (Mezirow, 1991) as a guide, this study explored and analyzed both the decision-making factors of engineering majors who chose to study abroad and the outcomes they reported as a result of studying abroad. It also explored these issues from the perspective of academic advisors.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this literature review is to shed light on engineering majors and study abroad. It discusses the entire study abroad experience: participation in study abroad, goals and motivations for the experience, barriers faced and drawbacks to leaving the university for a term, learning that can occur while abroad, and future aspirations as a result of study abroad. For that reason, this literature review is organized into the following areas: (a) participation in study abroad; (b) outcomes of study abroad (intercultural competency; long-term and career influence; and personal development and global awareness); (c) studies using transformative learning theory as a framework; and (d) engineering study abroad. It concludes with a section on the relationship of the literature to the current study.

Participation in Study Abroad

Much attention has been devoted to describing and understanding participation in study abroad. The total number of undergraduate participants has increased dramatically in recent years as universities expand their program offerings. In the decade from 2004/2005 to 2014/2015, national participation increased from 205,983 to 313,415 students (IIE, 2016). Data reveals that part of the reason for the increase in participation in study abroad is due to program duration. Traditionally, studying abroad was for the duration of one's junior year. Now, program options range from short summer programs to yearlong programs. Indeed, 63.1% of students studying abroad in 2014/15 participated in a short-term (summer or eight weeks or less) program (IIE, 2016). Such short-term programs may be popular because they cost less than semester or yearlong programs and because they are "a foot in the door" for students who may be reluctant to leave the country (Dessoiff, 2006).

In a one of the first large-scale study abroad evaluations, Carlson, Burn, Useem, and

Yachimowicz (1990) explored American student motivations for studying abroad. Students who participated in study abroad were compared with a group of students who did not participate. In the study abroad group, 19% of respondents were science and math majors, while in the non-study abroad group, 40% were science and math majors.

For students who studied abroad, the primary motivations were to learn the language of the host country and experience a new culture. Career was also an important consideration: (a) over 20% of the study abroad group viewed an international experience as important for career development, (b) the study abroad group was more open to career choices than the non-participating group, and (c) the study abroad group also was more interested in an international career than those who did not participate.

The groups also differed in their consideration of academics. For the study abroad group, academics were of secondary importance in their motivations to study abroad. By contrast the non-participating group indicated that they did not study abroad because of “perceived lack of curricular relevance of study abroad and the perception that study abroad may delay their graduation from college” (p. 17). The authors suggest that perhaps better integrating study abroad into the curriculum would allow more students to study abroad.

Since the Carlson et al. (1990) study, other studies have also devoted much attention to the link between career aspirations and participation in study abroad. Some research suggests that students enrolled in math and physical science majors do not intend to participate in study abroad because of the missing connection between study abroad and career benefits (IIE, 2004). Other research points to inflexible academic requirements as an explanation for the underrepresentation of engineering majors (Grandin & Hirleman, 2009). Women are traditionally overrepresented in study abroad, and one explanation for this is that

they are typically enrolled in humanities and social science majors, which have more flexible requirements, and may be less career-oriented (Bloomfield, 2004).

Sanchez, Fornerino, and Zhang (2006) compared motivations to study abroad for students from China, France, and the U.S. American and French students were less motivated to study abroad because of the perceived lack of career value. Students from these countries perhaps felt that their educational opportunities at home contained enough preparation for careers, and thus were less motivated to go abroad. Moreover, students from the U.S. were more likely to see study abroad experiences as opportunities for pleasure and adventure than students from China.

Following up on the Sanchez et al. (2006) study, Relyea, Cocchiara, and Studdard (2008) examined the effect of perceived value on students' participation in study abroad. A total of 471 students enrolled in an undergraduate business program returned the survey (51% were male). Business majors were chosen due to their limited participation in study abroad. The authors hypothesized that "the relationship between risk propensity and the likelihood of engaging in an international experience will be moderated by perceived career value" (p. 351). In this way, "when students perceive the career value to be low, high risk takers will be less likely to participate in an international experience compared to when students perceive the career value to be high" (p. 351). Risk was defined broadly: students face physical risk, financial risk, performance-related risk and psychological risk when they choose to study abroad.

Findings indicated that students with a higher propensity for risk were more likely to study abroad. However, if the perception was that the international experience provided little to no career benefit, even students who were high risk takers were less likely to study abroad.

This was true even with the moderating control variables of age, gender, and foreign language ability. Career value is an important influence of study abroad participation.

The importance of perceived value is noted in other studies as well. Spiering and Erickson (2006) conducted a study with two groups: students who chose to study abroad and students who attended an information session but ultimately did not study abroad. They used the diffusion of innovation theory as the framework. Two surveys were distributed: one to the group that studied abroad ($n = 75$), and the other to the group that did not study abroad ($n = 29$). Students were asked to rank the reasons they participated (or did not participate) based on five attributes: (a) relative advantage—students must decide studying abroad is worth it before they decide to participate; (b) compatibility—students must see studying abroad as within their normal characteristics and compatible with their expectations for college; (c) complexity—the easier the process for studying abroad is, the more likely they are to go; (d) trialability—students who have had an international experience before may be more interested in studying abroad than those that have not; and (e) observability—students who have seen how others have benefited from studying abroad will be more likely to participate as well.

The results indicated that study abroad must be seen as beneficial for students to participate. For students who did study abroad, relative advantage was chosen as the primary reason for 67% of respondents. The second most selected factor for studying abroad was trialability, meaning that they have always had a desire to go abroad. In contrast, non-participating students ranked complexities involved in the process and the compatibility of study abroad with other plans as the biggest deterrents. These results are similar to those of Carlson et al. (1990), who also found that the non-participating group cited the lack of

relevance of study abroad for their major and fear of delaying graduation. In both studies, students who did not study abroad likely felt the process was too complex for the benefits they might receive. These results are interesting, as they indicate that money and time are not the sole deterrents to studying abroad.

One limitation of Spiering and Erickson's (2006) study, though, is that we do not know what "relative advantage" the students perceive studying abroad will give them. For example, is the relative advantage related to career opportunities or personal growth? These questions could be answered through a qualitative study that provides the voice of student participants. Additionally, this study may not be generalizable to all undergraduate majors, as the authors did not differentiate results by major.

The results from the proceeding studies (Carlson et al., 1990; Relyea et al., 2008; Sanchez et al., 2006; Spiering & Erickson, 2006) study indicate that students must see the benefit of studying abroad in order to participate. Goldstein and Kim (2006), however, found slightly different results through their survey. Their sample included 178 students (90 women, 78 men, and 11 unidentified). Within this sample, one group studied abroad for at least one semester ($n = 61$) and the other that did not participate in a study abroad program ($n = 105$). Their findings indicated no difference between groups in terms of major, concern for time-to-degree, or employers' perceptions of study abroad. Instead, they found that positive expectations of international study, low levels of ethnocentrism and prejudice, and interest in learning a foreign language all positively predicted participation in study abroad. In the implications sections, the authors suggest that increasing student participation in study abroad may be related to "developing and implementing programs that provide students with accurate expectations of study abroad, reduc[ing] prejudice and ethnocentrism, and

facilitat[ing] students' understanding of the value of language learning" (p. 519). In other words, encouraging students to look beyond academic restrictions and career benefits may promote participation.

Other studies (Rust, Dhanatya, Furuto, & Kheiltash, 2008) have looked at student involvement in college to determine if involvement is related to participation in study abroad. The Rust study utilized data from the 2003 Cooperative Institutional Research Program (CIRP) Freshman Survey, which was filled out by 400,000 students at 614 colleges and universities nation-wide. The survey asked all students the question "What is your best guess as to the chances that you will participate in a study abroad program?" More than half of the students (53.8%) indicated that there was either a good chance or some chance that they would study abroad.

Student involvement was measured in five areas: academic, social, political, diversity, and community. Students who indicated there would be a very good chance or some chance of studying abroad were more involved in each of the five areas than those who indicated very little chance or no chance of studying abroad. The area of diversity involvement registered the highest coefficient at 0.848, meaning that students who either socialize with other racial/ethnic groups or have a desire to understand other cultures are more likely to intend to study abroad. As Rust et al. (2008) point out, students who are more interested in diverse interactions and getting out of their comfort zones would logically be more likely to study abroad, where cultures can be quite different than their own. Interest in study abroad was roughly equal across ethnic groups: Caucasian students, while around 83.7% of students who studied abroad in 2003/04, were not significantly more likely to intend to study abroad over any other ethnic group.

Participation by Gender

Women have consistently studied abroad at higher rates than men, and men are considered an under-represented population in study abroad (IIE, 2016). Factors that account for the difference in participation rate are not the same for men and women (Twombly et al., 2012). Anecdotal accounts give possible explanations for why there are differences in participation, but there is also a lack of empirical research confirming these differences (Redden, 2008).

In one extensive study on gender differences and study abroad, Salisbury et al. (2010), concluded that there is a “complex interplay between gender differences, individual values and attitudes, and pre-college and in-college educational experiences, when situated in the context of the decision to participate in a specific educational program” (p. 637). Using data from the Wabash National Study of Liberal Arts Education, their sample of 4,501 students included first-year, full-time undergraduate students at 19 institutions across the United States. Their report produced several key findings:

- academic ability and financial status do not affect intention to study abroad differently for males and females;
- higher level of parents’ education positively affected women’s intention to study abroad, but had no effect on men’s intention to participate in study abroad;
- high school involvement had a significant negative effect on men’s intention to participate in study abroad, but it had no effect on women’s intention to participate in study abroad;
- openness to diversity increased intention to participate for both men and women, but the magnitude of the increase was much greater for men than for women;

- women who had taken more courses that focus on diversity and difference were significantly more likely to intend to study abroad, but the same was not true for men;
- an increase in peer interaction did not impact women's intention to participate, but it had a negative affect for men.

In the previously described study done by Goldstein and Kim (2006), “women scored significantly lower than men on ethnocentrism, had more positive expectations of study abroad, and greater foreign language interest” (p. 516). While not significantly different, women who participated in study abroad scored lower on ethnocentrism than men who did not participate, and higher in language interest and positive expectations than men who did not participate. These results are consistent with the Salisbury et al. (2010) study, particularly in the area of ethnocentrism. Openness to diversity, seemingly similar to ethnocentrism in the Goldstein and Kim study, increases intention to participate in study abroad. Males who are more open to diversity are more likely to participate in study abroad.

Academic major is a common explanation for why women tend to participate in higher numbers than men. Women are more likely to major in languages, humanities, or social sciences and these majors are more conducive to studying abroad (Twombly et al., 2012). But as Redden (2008) points out, women nationally still participate at higher rates even in the sciences and engineering, which are male-dominated majors. Even with the rise in short-term programs, which often take place over summer and have minimal or no foreign language requirements, male participation has not markedly increased.

Another consideration is women's future plans. Some research has indicated that women may consider their future roles as mothers in deciding to study abroad while in college. In her master's research, Jill McKinney found that motherhood, age, and safety

were considerations (as cited in Redden, 2008). For example, women may not be able to travel abroad later when they are parents, and they may feel safer travelling with a group rather than independently.

Involvement in high school has been considered as a factor to explain gender differences, but with puzzling results. Greater high school involvement (measured through how often students participated in extracurricular activities including community service and volunteering, how often students studied with friends, and how often students talked with teachers outside of class) has been found to negatively affect men's participation in study abroad (Salisbury et al., 2010). The authors explain that for men, being more involved in high school might lead to greater involvement in college activities, making them less likely to want to leave campus.

Exploring male non-participants in particular, Lucas (2009) classified male non-participants into four groups: idlers, players, workers, and strategists.

- *Idlers* are not very involved on campus and describe themselves as lazy. Reasons for nonparticipation could be that they “might not have paid attention to messages about study abroad, put off applying, or simply not have been interested” (p. 233).
- *Players* are focused particularly on their friends and having fun. They view study abroad as a vacation and “expressed concern that study abroad was too structured and culturally-focused” (p. 233). Lucas (2009) hypothesizes that this group of students would likely participate at higher rates if study abroad were marketed as “fun.”
- *Workers* are the career-driven group who make strategic decisions based on aspirations of success. This group might contain a lot of STEM majors who are

career-focused. Because they view marketing for study abroad as directed too much towards fun and adventure, they might not see the benefit of study abroad for them.

- *Strategists* are also career and success-oriented, and they use academic and extracurricular activities (like jobs and internships) to achieve these goals. While this group could participate in study abroad if they see the clear benefit to their careers, they are still less likely to participate because they “tend to view work and internships as more important experiences than study abroad” (p. 236).

Regardless of their classification, for men the benefits of studying abroad must outweigh the extra effort it takes to embark on a study abroad program (although Goldstein and Kim, 2006, found no significant differences between participants and nonparticipants and perceived career value). According to Lucas, study abroad marketing may promote messages that appeal to women, but not men. Marketing literature may need to be revised in order to clearly indicate to men not only that study abroad is available regardless of their major but also that studying abroad can increase their appeal to employers.

Advising

The role of academic advisors in study abroad is under-researched. Few studies discuss how students make use of academic advisors or how advisors influence engineering participation. Some studies provide anecdotal information that the lack of appropriate information about study abroad opportunities may be one of the reasons for limited participation. Advisors themselves may not have enough information to effectively encourage study abroad (Dessoff, 2006).

A few studies gave recommendations for how advisors can promote participation for all students. Relyea et al. (2008) note the importance of university personnel in promoting study abroad for undergraduates. While they do not explicitly define who would be considered university personnel, it can be assumed these would be faculty, staff, and academic advisors who work closely with students. University personnel can increase participation in three ways:

1. By putting the risks associated with an international experience into perspective. One fear that students often have is that study abroad will delay their graduation. With university personnel's help, students can see that they can gain credit at their home institution with courses taken abroad.
2. By travelling often and speaking positively about their experiences. Students will follow these actions because they mimic the behavior of university personnel.
3. By discussing the value of studying abroad for students' careers. As the authors state, "U.S. students often view their careers from a limited national perspective failing to take into account the globalization of business" (Relyea et al., 2008, p. 357).

Additionally, the literature suggests that all university personnel should serve as "change agents" (Spiering & Erickson, 2006). Change agents influence and change students' potentially negative opinions regarding study abroad.

Study abroad advising should not be a role taken on only by staff advisors. Faculty play an important role in encouraging study abroad:

Educating faculty on the process for study abroad would also prove beneficial. Faculty could advise students more effectively on their class choices so that students can be better prepared on what classes they take on their home campus

and what classes they take abroad so as not to delay their graduation. In addition, making faculty aware of the various programs available to students in their academic area might help make them more supportive of the idea. (Spiering & Erickson, 2006, p. 321)

Goals and Motivations for Studying Abroad

Universities often promote study abroad as a way for students to gain global citizenship and transform their lives. The benefits of studying abroad, explained in more detail in a later section, include intercultural understanding and competence and personal development and maturity (Van Hoof & Verbeeten, 2005). Program administrators may find understanding students' goals and motivations for embarking on study abroad useful as they seek ways to better match program content and structure with students' goals and motivations (Chambers & Chambers, 2008, p. 129).

Traditionally, students are motivated to study abroad to improve their foreign language skills (Allen, 2009), yet for engineering students who often do not have time to take foreign language classes in college, foreign language may not be their top motivation. Other common motivations include cultural gain (Green, Hesel, & Bartini, 2008; Goldstein & Kim, 2006; Van Hoof & Verbeeten, 2005), increasing cross-cultural understanding (Salisbury et al, 2009; Stroud, 2010), resume-building (Dessoiff, 2006; Relyea et al., 2008), and pleasure-seeking (He & Chen, 2010; Lucas, 2009). These goals are not mutually exclusive—a combination of goals and motivations might compel a student to study abroad (Twombly et al., 2012).

The first study described provides valuable insight into why students choose their particular study abroad program. Van Hoof and Verbeeten (2005) conducted a study

regarding why students decided to study abroad and why they chose their program. Their sample included 1,487 undergraduates at the University of Northern Arizona (UNA) who were classified as either outbound (from the U.S. and studying abroad) or inbound (from another country and studying at UNA). They collapsed both exchange students and study abroad students into one group. They received responses from 353 students (23.74% response rate) with over 80% of students coming from the United States and over 50 majors represented. The authors do not report engineering as a major, which implies that very few engineering majors' perceptions are included in this study.

In the first section of the survey, students were asked to rank six potential reasons for their decision to study abroad, with one additional option as "other." The top three reasons students chose to study abroad were:

1. It was a good opportunity to live in another culture.
2. It was a good opportunity to travel.
3. The country the exchange program was located in.

Other studies have also found "travel" and "experience life in a new culture" as chief reasons for studying abroad (Chambers & Chambers, 2008; He & Chen, 2010; Van Der Meid, 2003). Students were also asked why they chose the particular institution, with again six potential reasons plus an option for "other." The top three reasons were:

1. It was available as a partner at my home institution.
2. I liked the country the program was in.
3. People I know also go/went there.

Interestingly, none of the results indicate that students chose their program because of academic potential.

These findings are further reinforced by in a national study sponsored by the American Council on Education, Art and Science Group, and the College Board (Green et al., 2008). The survey, which took place in April 2007, documented responses from 1,509 college-bound high school seniors regarding their interests in study abroad and other international learning activities. The top three primary motivations for studying abroad included:

1. Expanding their horizons by living in another culture (46% of respondents).
2. Being able to travel and see other parts of the world (27% of respondents).
3. Learning a different language (9%).

The following goals were cited by less than 7% of respondents:

- improving career prospects;
- getting to know others from different parts of the world;
- studying things you cannot learn in the United States;
- being a better citizen; and
- promoting world peace.

As documented by these findings, study abroad generally is not seen as an academic or career improvement endeavor. Besides language learning (Chambers & Chambers, 2008; Green et al., 2008), academic goals are not typically cited as a chief motivation.

Some researchers have questioned whether ethnic minority students study abroad for different reasons than the majority of their peers. Beausoleil (2008) conducted a study with Korean Americans. Results indicated that Korean Americans chose to study abroad in Korea to search for cultural roots and because of their ethnic heritage, although language acquisition and family relationships were common as well. Van Der Meid (2003), on the other hand,

found that Asian students cited learning about one's cultural roots as the fifth of eight reasons for studying abroad. Instead, results indicated that Asian students who participated in heritage-seeking study abroad cited other motivations: (a) advantage of opportunity abroad, (b) learn a new culture, and (c) improve language skills. More research is needed to understand why ethnic minority students may have different goals for studying abroad.

Many findings from quantitative literature are echoed in the qualitative literature. Qualitative studies offer the advantage of not giving students pre-determined choices for their motivations to study abroad. Because student motivations are dynamic and based on contextual factors, Chambers and Chambers (2008) used ethnography/participant observation to explore student motivations for 41 students in Siena, Italy. They found seven chief motivations: learn Italian, experience life and culture, meet people and make new friends, develop independence and self-confidence, figure out who I am, do something different and exciting, and have a good time. Notably, besides the goal to learn Italian, none of the other goals are academic. However, the authors assert that non-academic learning is also important. They cite Rebekah Nathan, who in her ethnography of undergraduate life at a public university found that "students assess in-class learning as making a much smaller contribution (i.e., 35% on average) to their overall learning in college than to 'elective social activities and interpersonal relationships'" (as cited in Chambers & Chambers, 2008, p. 151).

Outcomes of Study Abroad in General

This section discusses studies that address outcomes of study abroad, both shortly upon students' return to their home campus and in the long run. Documenting outcomes is important as these outcomes indicate to students, faculty and the university community, and employers alike that there are benefits of studying abroad. Three outcomes are discussed

here: (a) intercultural competency; (b) career and long-term; and (c) personal development and global awareness. While these three categories form the basis of this section, it begins with a discussion on outcomes relating to the duration of study abroad. Outcomes that differ based on gender are noted throughout this section where appropriate.

Duration of Study Abroad

While studying abroad for one's entire junior year might have been traditional, other program lengths have recently become more popular. For example, participation in short-term programs, defined as eight weeks or less, has doubled from 8% in 2003/04 to 16.5% in 2013/14 (IIE, 2015d). Sixty percent of programs last eight weeks or less (IIE, 2015d). Meanwhile, participation in programs that occur over an academic year decreased from 6% in 2003/04 to 2.9% in 2013/14 (IIE, 2015d).

Donnelly-Smith (2009) explains that short-term programs are typically faculty-led, academic in nature and allow students to study one topic in-depth. While students in these programs may not be able to enroll in classes at a local university abroad, short-term programs relate to coursework at the home university. Being abroad itself is "an integral part of a larger learning experience" (p. 12). Additionally, short-term program tend to be more inclusive of all types of participants than full year programs:

they are generally more affordable than longer programs, they appeal to students who might not be able or willing to commit to a semester or a year abroad, and they allow students in structured academic programs like engineering, nursing, and education to study abroad without falling behind in their programs. (Donnelly-Smith, 2009, p. 12)

Several studies have examined student experiences and/or outcomes for varied program durations (e.g., Chieffo & Griffiths, 2003; Dwyer, 2002; Medina-Lopez-Portillo,

2004). As an example, Dwyer (2002) looked at three different program durations (full year, semester long, and summer—typically eight weeks) to study the effects of program length on a variety of student values, academic competencies and interests. She used longitudinal data of Americans who had studied abroad in over 50 years of programming. Of the total sample of 3,723 respondents, 32% (n = 1,191) studied abroad for a full year, 62% (n = 2,308) of the sample studied abroad for a semester and 6% (n = 224) studied for a summer term. She reported results across five areas: general findings, academic attainment, intercultural development, career impact and personal growth. Overwhelmingly, Dwyer found that studying abroad for a full year had more “significant, enduring impact” (p. 161) but “the impact is impressive regardless of term length” (p. 160). She found that full year students (44%) are more likely to use foreign language on a regular basis than semester-long (30.5%) or summer-term students (37%). Additionally, full year students were twice as likely (7%) to receive a PhD than any other program length. She found that full-year participants were more likely to report increased self-confidence as a result of studying abroad than semester and summer term students. Likewise, full-year students were more likely to report that studying abroad enabled them to tolerate ambiguity, influenced their participation in community organizations, and caused them to change or refine their political views. However, regardless of program length, more than half of all participants reported personal growth.

Ingraham and Peterson (2003) also found that the longer the students studied abroad, the stronger the post-program outcomes were. Length of sojourn was significantly correlated with each of the five factors: personal growth, intercultural growth, career development, language learning, and academic performance. The category with the strongest impact,

regardless of program length, was intercultural growth. This finding makes sense, as one of the goals of studying abroad is to increase intercultural awareness. Scores in career development, defined as “Studying abroad has made me reconsider my career plans” and “Studying abroad has helped me find professional direction,” were less than moderate ($M < 3.0$) for students who studied abroad for 7 weeks or less, but became stronger the longer students studied abroad. The authors explain that students will not necessarily change their career paths as a result of one program, but these low scores also probably reflect that students’ goals for going abroad are not for career opportunities.

Studies regarding program duration are common, and many studies have as their focus outcomes of study abroad based on duration. More studies that compare outcomes with program duration are reviewed in the following section. While the consensus appears to be that the longer the students study abroad, the more impactful the program is, results are promising for all students regardless of the length of time abroad.

Intercultural Competency

Many studies have found that students develop intercultural competency while abroad. Some have compared development of intercultural competence abroad with students who stay on campus (Williams, 2005). According to Twombly et al. (2012), the assertion that study abroad creates ideal conditions for improving intercultural competence is rooted in the contact hypothesis (Allport, 1954). The contact hypothesis “proposed that prejudice held by one group toward another group could be reduced if individuals from both groups participated in sustained interpersonal contact” (Twombly et al., 2012, p. 71). While the contact hypothesis originally was rooted in the U.S. context, Amir (1969) reviewed efforts of inter-ethnic and international relations. He found while the majority of the studies support

the assertion that contact between international groups produced positive change in both groups, there were several unfavorable conditions in which sustained contact could increase or even intensify prejudice:

These unfavorable conditions include when the contact is ‘unpleasant, involuntary or tension laden,’ when one group is ‘in a state of frustration (i.e., inadequate personality structure, recent defeat or failure, economic depression, etc.)’ potentially leading to ethnic ‘scapegoating,’ [blaming local difficulties or inequality on another specific racial or ethnic group] and when the two groups find each other’s moral or ethical values objectionable. (as cited in Twombly et al., p. 72)

One often-used tool, called the Intercultural Development Inventory (IDI; Hammer, Bennett, & Wiseman, 2003), is a measure of the development of intercultural competency. This measure is based on Bennett’s (1993) developmental model of intercultural sensitivity, which proposes the development of intercultural competence can be measured along a continuum from an ethnocentric mindset to an “ethnorelative” mindset. The IDI is used in many quantitative and mixed-methods studies.

As has been argued by scholars in the field of intercultural competence [IC], length of time abroad is a critical component to developing intercultural skills (Bennett, 2009, Gudykunst, 1979, Leung and Ward, 2000, as referenced in Medina-Lopez-Portillo, 2004). Thus, many studies attempt to determine if developing intercultural competence is possible in programs of short time frames. In a large study called the Georgetown Consortium (Vande Berg et al., 2009), researchers measured gains of intercultural competence in correlation with program duration (in addition to many other factors). The research sample for intercultural competence consisted of 1,297 students, 1,159 of whom enrolled in study abroad programs

and 138 of whom stayed on campus. Students came from three different American colleges or universities and enrolled in 61 different study abroad programs. Using the IDI, researchers found the only significant increase in intercultural development at the .05 level was for students who studied abroad for 13-18 weeks (n = 742), or roughly one semester. Other program lengths (an academic year; 19-25 weeks; 8-12 weeks; and 1-3 weeks) resulted in IDI gains that were smaller than the semester length and also were not deemed statistically significant. The group abroad for 4-7 weeks actually decreased IDI scores at the end of the program. While the semester group sample size was nearly three times larger than any other group, the semester abroad seems to be effective length of time abroad for intercultural development. Other studies, described later, also note that the semester is an ideal time abroad for intercultural growth. The authors of the study attribute growth in IC to interventions made by the program to specifically support growth. As they state,

the negative gains [in IC] for students abroad for 4–7 weeks and the very small gains for those in 8–12 week programs reinforce the importance of having resident staff available on-site to help students increase their awareness of and ability to respond to cultural difference in these shorter time frames. (p. 20)

The Georgetown Consortium study also examined gender differences in student outcomes. In measuring target language learning abroad, they found that for both male and female students who studied abroad, their scores increased significantly more than the control group who stayed at home. However, female students made significantly greater progress than males. The authors suggest that intervening in male language learning abroad may help to increase their scores. In terms of intercultural competency, females made statistically significant gains in their IDI scores, whereas males did not, and even decreased

slightly. The authors suggest that those who develop the curriculum should pay special attention to the intercultural learning needs of males, both before departure and while abroad.

In another much smaller study measuring the increase in IC in a short duration, Anderson, Lawton, Rexeisen, and Hubbard (2006) looked at a five-week program of students studying abroad in English-speaking countries ($n = 16$). The program was faculty-led and consisted of one week on campus, two weeks in England, and then two weeks in Ireland. While abroad, students took classes on British life and culture and politics. They lived in host families in London and in a student housing near the university in Cork, where no Irish students were living at the time. No specific interventions by program staff, like cultural mentoring or a targeted curriculum, were noted. Results indicated that students did grow in IC along the IDI, but the growth was not measured as statistically significant. As in the Georgetown Consortium study (2009), it is possible that the four-week abroad program may simply be too short of a timeframe to make gains in IC. The authors suggest that interventions with students (such as cultural mentoring) are needed to significantly increase IC.

Other studies have also reported that the longer the timeframe the more students develop intercultural competence. Medina-Lopez-Portillo (2004) used the IDI to measure intercultural sensitivity for students studying in Mexico in two different cities for varying lengths: a seven-week program in Taxco ($n = 16$), and a semester-long (16-week) program in Mexico City ($n = 9$). No specific strategies to develop students' IC were mentioned. The Mexico City students started the program more than 10 points ahead of the Taxco students on the IDI, even falling into an increased stage. While she did not find statistical significance, she did find that the semester-long students made more progress along the continuum than

the seven-week students, with a 1.61 increase as a group versus a .45 increase as a group, respectively. While not statistically significant, her most noteworthy finding is that “while less than one third of the students (31%) in the seven-week Taxco program advanced to the next DMIS [developmental model of intercultural sensitivity] stage [as measured by the IDI], fully two-thirds of the students (67%) in the sixteen-week Mexico City program did” (p. 185). These findings support the notion that a semester is an ideal length of time to develop intercultural sensitivity.

Studies measuring intercultural competence qualitatively tend to have much smaller sample sizes than studies using the IDI, and they also tend to purport more of an increase in IC than the IDI data shows. Hammer (2012) suggests that the inflated increase in IC is due to the style of interviewing. As he states, traditional open-ended interviewing “do[es] not gather developmental information; [it] simply gathers different (i.e., hypersensory memory) data from students about their experiences” (p. 129). In other words, students may inflate their development in intercultural competence in interviews and journals. Nonetheless, qualitative studies are helpful in exploring students’ views of their own growth in IC. Qualitative studies answer questions not easily answered through surveys, such as at which moments were students challenged to act with intercultural competence and how did they respond?

Covert (2013) explored the role of self-efficacy and personal agency in intercultural competence. In analyzing student journal entries and transcriptions of semistructured interviews, she found that a key factor in developing intercultural competence was “intentional and purposeful changes in communication and behavior to fit host culture norms” (p. 175). Thus the choice to act in interculturally competent ways and to adapt to

host cultural norms was deliberate. Covert (2013) also uncovered that students need to be challenged in order to develop IC. She noted “students should enroll in programs that are slightly above their linguistic and cultural abilities” (p. 175) so that they have a chance to get out of their comfort zones and practice IC. Too little challenge may make students feel “safe and satisfied” (p. 174) and not feel the need to push themselves. This seems to hold important implications for island programs or programs where students spend most of their time abroad with co-nationals (as in Anderson et al., 2006).

Regardless of program length, scholars have determined that full immersion without any sort of interventions, like cultural mentoring and guided reflection, cannot effectively increase intercultural competence (Paige & Goode, 2009; Root & Ngampornchai, 2012; Vande Berg et al., 2009). Cultural mentors meet frequently with students while they are abroad and serve several purposes: increase interest and opportunities for intercultural learning, encourage more time spent with the host family rather than other American students and guide students in their perceptions of cultural similarity and differences (Vande Berg et al., 2009). Guided reflection, another type of intervention, engages students in intercultural learning and also transformative learning. Such reflection should be taught even before students leave the home campus:

If students who are preparing for an education abroad experience are encouraged to critically reflect on their own personal cultural positioning, including their different social identities, this will better enable them to carry these practices of critical reflection into their overseas experience. (Root & Ngampornchai, 2012, p. 526)

Long-term Outcomes and Career Influence

Despite the prevalence of studies linking study abroad to immediate impacts, little

attention has been directed to long-term benefits as a result study abroad. Long-term benefits may be difficult to study as participants relocate to other countries or are difficult to track down (Potts, 2015). However, as employability is a central argument to encourage more students to study abroad, studies looking at career outcomes are important to this claim. Studies have generally found that studying abroad does have a positive impact on undergraduates' career direction (Norris & Gillespie, 2008; Potts, 2015). In an attempt to assess the career impact of studying abroad, Norris and Gillespie (2008) utilized data in a survey conducted by the Institute for the International Education of Students (IES). The sample included 17,000 alumni who had studied abroad with IES between 1950 and 1999. They found that study abroad had a significant impact on skill development: 77% agreed that they acquired skill sets while abroad that influenced their career path, and 62% reported that their study abroad experience ignited interest in their career direction.

The results of alumni with global versus non-global careers were also compared. Alumni who studied abroad two times or more were more likely to have international careers. Alumni with global careers were also nearly three times more likely to have changed their career plans after studying abroad, indicating that education abroad may play a significant role in career development. Additionally, several program characteristics corresponded strongly with global work: studying abroad for a full year, taking classes at a host university, participating in an internship abroad, and living with a host family.

In a large study called "Beyond immediate impact: Study abroad for global engagement," or SAGE, Paige et al. (2009) surveyed 6,391 study abroad alumni from three to 45 years after participation. Participants were first asked the impact of a variety of common college experiences as undergraduates on their lives today. Three experiences out

of twelve were labeled as having a “strong impact” by more than 50% of participants: study abroad (83.5%), friendship/student-peer interactions (73.8%), and coursework (66.2%). Additionally, study abroad influenced their careers: 75% of participants indicated that study abroad had helped their career to a large or some degree.

Considering that study abroad was so important for participants’ lives, the authors then asked how globally engaged the participants were. In the study, global engagement was defined as:

civic commitments in domestic and international arenas; knowledge production of print, artistic, online and digital media; philanthropy in terms of volunteer time and monetary donations; social entrepreneurship, meaning involvement in organizations whose purpose and/or profits are to benefit the community, and the practice of voluntary simplicity in one’s lifestyle. (p. S30)

In asking whether studying abroad influenced the level of involvement in the global engagement categories, more than 50% responded that study abroad had influenced their involvement either to a large degree or some degree in nearly all the categories. The only category that had less than 50% agreement was philanthropy—respondents did not feel that study abroad influenced their monetary donations or volunteer work. The authors conclude that these results are unique to study abroad participants, as non-participants are unlikely to be as globally engaged.

Fry, Paige, Jon, Dillow, and Nam (2009) conducted a mixed-methods retrospective study of study abroad alumni to determine the impact of study abroad on participants in terms of (a) career development, (b) educational attainment, (c) knowledge and skills acquired, and (d) basic values and world view. There were 684 survey responses and 53

follow-up interviews. The study included participants from three different points in time: those who had recently graduated, those who had graduated five years ago, and those who had graduated ten years ago. The significance of this study is that it shows that study abroad can be transformative for participants in many areas and stages of their lives. In terms of graduate school, 63.3% of respondents pursued graduate school, far higher than the national average. When asked about the most important impact of study abroad, the following areas were mentioned: language fluency (16.2% of respondents), appreciation of the other culture and cultural similarities/differences (14%) and broadening one's perspective/becoming open-minded (13.7%).

The qualitative analysis provided further insight into the quantitative findings. Findings revealed there were several influences of decision-making to study abroad: personal characteristics, previous international experiences, and other factors like encouragement from professors and the nature of the home institution as a strong provider of study abroad programs. Interview participants also mentioned several program characteristics that they liked, including studying with other Americans, short-term programs, and host and international student interactions. In terms of overall impact of study abroad, data revealed two major categories: study abroad influencing subsequent behavior and study abroad influencing subsequent worldviews and philosophies of life. Examples include the influence of study abroad on career choice and a newfound commitment to global engagement.

One potential limitation of this study is that only 4.6% of the respondents were engineering majors. Their voices may be minimized in light of other majors that have more representation in this study. The current focuses solely on engineering majors in order to bring their voices to the forefront.

Personal Development and Global Awareness

Studies regarding the personal development of students provide strong support for the effectiveness of studying abroad, regardless of program duration. Findings indicate that study abroad contributed to student flexibility, adaptability, and independence (Klahr, 2002); understanding of social, political, and environmental implications in other countries (Klahr, 2002); student identity (Dolby, 2005); expanded perspectives and global mindedness (Braskamp, Braskamp, & Merrill, 2009; Chieffo & Griffiths, 2004; Dolby, 2007); maturity and personal development (Potts, 2015); and increased intercultural awareness and intercultural sensitivity (Anderson et al., 2006; Pedersen, 2009; Williams, 2005). With the exception of Klahr (2002), few studies have looked specifically at the personal development of engineering majors.

Chieffo and Griffiths (2004) attempted to determine if students enrolled in a short-term study abroad program (4 weeks or less) could acquire greater global awareness than those who stayed on campus. Using a post-program survey with a matching on-campus (n = 400) and study abroad group (n = 600), global awareness was measured through four categories: intercultural awareness; personal growth and development; awareness of global interdependence; and functional knowledge of world geography and language.

The mean score for students abroad was higher on all questions than those of the on-campus group, and overall the differences between the two groups were significant on most questions. In the section on intercultural awareness, all differences between the groups were significant except for one question: consciously withheld judgment on international event/issue. The authors surmise “students in the abroad group were generally more cognizant than their peers at home of varying national and cultural perspectives” (p. 170).

Similarly, all questions except one in the personal growth and development category consisted of significant differences between the two groups. Particularly relevant to the current study are the sub-questions related to communication and language. Namely the students who studied abroad were significantly more patient with those who do not speak English well. Patience is an arguably important skill for engineering majors, who will likely conduct research or work with people from other countries whose native language is not English. In the category for functional knowledge, all questions except one (“Looked up non-English word in dictionary”) showed significant differences. This is not surprising as students who are travelling abroad are learning skills appropriate for international travel. The smallest category, global interdependence, produced no significant differences in the questions regarding U.S. policy and trade: “Explain U.S. foreign policy to someone from another country” and “Comfortable in understanding of U.S. trade relations.” The authors surmise the questions may be too specific and that more general questions regarding global interdependence might be needed on future surveys.

Other studies have attempted to measure general outcomes of study abroad in different ways. The GLOSSARI (Georgia Learning Outcomes of Students Studying Abroad Research Initiative) assessment project by Sutton and Rubin (2004) is one of the most often-cited studies in education abroad literature. At the University of Georgia, the authors create an assessment that looked at cognitive and academic outcomes. The sample contained two groups with about 250 current and recent alumni each: one group was comprised of students who had studied abroad and the other group was comprised of students who had never studied abroad. The learning outcomes measured included: (a) knowledge of strategies and skills for functioning in other cultures, (b) knowledge of intercultural interaction techniques,

(c) global interdependence, (d) knowledge of comparative civics, and (e) knowledge of world geography.

Findings indicated that students who studied abroad scored higher than the comparison group on measures of functional knowledge, knowledge of world geography, knowledge of cultural relativism, and knowledge of global interdependence. The groups did not differ significantly on the dimensions of verbal acumen, interpersonal accommodation, or cultural sensitivity.

Some authors have problematized study abroad, despite its proven ability to foster personal growth. Negative outcomes have been noted: students may return with a hierarchical view of their home culture (Downey et al., 2006). Zemach-Bersin (2007) problematizes the notion of “global citizen.” In her view, global citizenship is a notion granted by higher education institutions, not national governments. Students develop global citizenship while taking courses abroad that are closely monitored and approved by their home institutions. The development of global citizenship is dependent upon “the privileges of mobility, economic comfort, and socio-political freedoms” (p. 21). Not all students are granted the opportunity to become global citizens. She further notes that “claiming global citizenship in the context of American students studying abroad is symptomatic of U.S. narcissism, entitlement, and fallacious claims to universality that function hand in hand with projects of cultural imperialism and neo-colonialism” (p. 22).

Weaknesses of Assessments

While assessing learning outcomes of study abroad is needed, assessments have been criticized (Twombly et al., 2012; Sutton & Rubin, 2004). Some study abroad assessments tend to focus on customer satisfaction rather than tangible learning outcomes. Surveys ask

questions like “I was able to enroll in the classes I needed,” “My host family was friendly and helpful,” or “I would recommend this program to other students at my college” (Sutton & Rubin, p. 67). These types of surveys can be helpful “in their efforts to continuous quality improvement, as well as in recruiting students and in solidifying institutional support” but they tend to “support generic values of study abroad, rather than more tangible demonstrations of improved learning outcomes” (p. 67). Additionally, measures tend to focus on post-experience reports of students, rather than pre/post gains in student growth or learning (Chieffo & Griffiths, 2003). These deficiencies could be overcome by using pre- and post-test measures of student learning while abroad. Small sample size is a common weakness as well, as many quantitative studies contain fewer than 100 participants, and qualitative studies contain fewer than 10 (Chieffo & Griffiths, 2004). Self-selection bias of participants is also an issue (Twombly et al., 2012): students who study abroad might generally be those students who are more willing to learn about issues related to international travel and study.

The present study cannot overcome all assessment weaknesses cited previously, but it does attempt to overcome some. First, it used a mixed-methods design (a quantitative survey with a large sample size and qualitative interviews). Second, various perspectives were included, from both students and academic advisors. Third, the survey included learning outcomes in addition to customer-satisfaction-type questions.

Studies Using Transformational Learning Theory as a Framework

The literature reviewed in this section all used transformational learning theory as the framework to understand the potential for perspective transformation of students studying abroad. Mezirow’s (1991) theory has been used to explain the development of global

citizenship (Ogden, 2010), the meaning making of students in design majors (Johnson, 2016), and the changing values and beliefs of international graduate students from Africa (Kumi-Yeboah, 2014). Transformational learning theory is applicable to study abroad, as when we step outside our own cultural contexts, we can better understand our assumptions and perhaps change them. Mezirow explains that “dramatic personal and social changes become possible when we become aware of the way that both our psychological and our cultural assumptions have created or contributed to our dependence on outside forces that we have regarded as unchangeable” (p. 88). Students studying abroad face many disorienting experiences that can cause them to re-think their untested assumptions. Throughout the following studies, it is clear that in order to achieve perspective transformation, critical reflection is vital (Foronda & Belknap, 2012; Koskinen & Tossavainen, 2004; Wessels, Holmes, & Herrera, 2011) and that mentoring facilitates critical reflection (Kumi-Yeboah, 2014). However, not all ten steps are required in order to achieve transformative learning (Kumi-Yeboah, 2014).

Mezirow’s (1991) transformative learning theory asserts that transformation begins with some sort of disorienting experience. Trilokekar and Kukar (2011) studied the disorienting experiences and reflection of pre-service teacher candidates (TCs) while working abroad. While other studies suggest that the study abroad experience may not be disorientating enough for students (Ogden, 2010), Trilokekar and Kukar noted that “students repeatedly spoke about incidences that might best be described as challenging ‘disorienting experiences,’ which made them uncomfortable and confused” (p. 1142). Trilokekar and Kukar specifically sought to understand how the TCs described the disorienting experiences they faced in their work abroad experiences and how reflection helped them to overcome disorienting experiences.

The researchers selected a purposive sample of five undergraduate teacher candidates (TCs) that reflected the diverse population of students at York University in Canada. The five TCs identified as Chinese (n = 1), South Asian (n = 2), Caucasian (n = 1), and Afro-Canadian (n = 1). The TCs participated in two types of programs: one was a three-month work abroad program and the other a one-month placement in a school abroad. Both programs contained mandatory reflection, either through blog-writing or a personal journal, and both included a final reflective piece of writing upon return to Canada.

Upon interview analysis, the data indicated four types of disorienting experiences: (a) experiencing racial dynamics; (b) experiencing “outsider” status; (c) engaging in risk-taking/experiencing new identities; and (d) recognizing privilege and power relations. Racial dynamics, and how those differ in other cultures, was a central finding of the study. Two of the students found that their skin color afforded them privilege and power, which they felt uncomfortable with. The other three students personally experienced racism. Nita, a student of Asian descent, explained “I found that in [that country] what they expected from you was very much tied together to the color of your skin. So if they see that you are non-white, the attitude that you get is completely different than the one a white person would get” (p. 1145). Nancy developed a new empathy for her students who are cultural outsiders in Canada: “Now I have a better idea of what it’s like to be a foreigner coming into a place. So the kids that don’t speak English or [who] are new, I can kind of relate to them a little better now” (p. 1145). The TCs were all challenged by the experiences of being different from the mainstream host society, whether physically, culturally, or linguistically.

The main modes of reflection were journaling and blogging, although some also mentioned communicating with others and silent reflection as well. While written reflection

was part of the program requirements, three of the five TCs wrote in their journals because they wanted to. However, after analyzing the journal entries, the study authors found that disorienting dilemmas were not necessarily a catalyst for perspective transformation. In their writing, the TCs “revealed a limited ability to relate some of their study-abroad experiences in ways that would revise or develop new frames of reference” (p. 1149).

While the Trilokekar and Kukar (2011) study adds important findings regarding disorienting experiences and reflection, it does have a few limitations. First, the sample is very small. Because only five students participated, their experiences may not be generalizable to other students in the same program. Second, these teaching students may have different conceptualizations of disorienting dilemmas based on their teaching experience. Their experiences may be more pronounced than for students from different undergraduate majors such as engineering or for those who study abroad in more culturally-similar countries such as England or Ireland.

Another study (Wessels et al., 2011) looking at pre-service teachers attempted to determine their meaning perspectives and meaning schemes that guided their understandings of the Mexican school system. Fifteen pre-service teachers participated in a three-week school placement in Mexico. As the goal of the placement was for students to have increased contact with diverse students as well as to develop cross-cultural competencies, these teachers both observed and aided classroom teachers. About half of the pre-service teachers spoke Spanish, while the other half had limited understanding of Spanish or spoke none at all. The schools were not bilingual schools.

Using a microethnographic methodology by utilizing written assignments, observations, and semi-structured interviews, the authors determined that the overarching

meaning perspective for these pre-service teachers was that “U.S. educational practices are effective—Mexican children get shortchanged” (Wessels et al., 2011, p. 17). They identified three meaning schemes that reinforced this perspective: the perceived lack of structure in the classroom, lack of teacher control, and lack of teacher professionalism. In the implications section, the authors argue that a key takeaway from the study is that for the majority of the pre-service teachers, transformative learning was not possible without reflective learning and critical reflection on their assumptions. In order for these teachers to effectively work with immigrant students, they must move past their “deficit perspective on Mexican educational practices” (p. 15). However, without an openness and willingness to test their assumptions, it appears that reflection may serve only to reinforce their meaning schemes and perspectives.

Rowan-Kenyon and Niehaus (2011) attempted to determine whether a short-term (one-week) education abroad trip was transformational for students. Unlike other studies that attempt to measure transformative learning immediately upon return, this study sought students’ perspectives one year after the experience in the Czech Republic. This gave students time to decide whether the trip had contributed to a crucial aspect of transformative learning: action.

Of the seven students that participated in interviews, only four of those students indicated that the trip was life-altering. These four students explained that the trip influenced future travel plans and career plans, and also changed their perspective of their lives. Two students highlighted the newfound respect and empathy that they had for English language learners, and another student was more willing to take risks. The authors attempted to determine why four students experienced profound change, and three students felt the trip did not change them very much. They surmised that the difference lies not in what happened

before or during the trip, but in the year following the trip. For example, one of the four transformed students explained that the one-week trip served as a gateway experience that got him thinking about his next international experience. Perhaps the other three students needed more guided reflection or cultural mentoring by faculty or staff during the program, and more time for critical reflection after the program ended, in order to truly experience transformative learning.

Similarly, Foronda and Belknap (2012) found that the nursing students in their study did not achieve perspective transformation, and they note that “transformative learning is not a guaranteed result” of a study abroad experience (n.p.). The nursing students (n = 10), who were all pursuing their associate’s degree in nursing, went to a low-income, culturally-different location (the Amazon rain forest) yet still did not seem to achieve perspective transformation. A disorienting experience, even within a very different culture, may not be enough to promote perspective transformation. The evidence that the nursing students did not achieve perspective transformation comes from the authors’ interpretations that “no participants discussed intent to make personal changes or engage in social action” (p. 12). The authors identified three blocks to transformation: egocentrism/emotional disconnect; perceived powerlessness/being overwhelmed; and vacation mindset. In their discussion section, the authors recommend pre-departure orientation to help students better understand the systems of the host country. Additionally, they suggest that international programs should be designed with debriefing sessions, reflection, and group problem-solving. Indeed, all students may need time to make sense of their encounters in a new culture, reflect upon cultural differences and similarities, and further investigate advantages and disadvantages about what they experienced while abroad (Sloan, Ho, Sciacky, & Otto, 2017). Sense-

making includes cognitive comparisons between the home and host culture but supports are needed in order for students to truly facilitate processing of the experience (Sloan et al., 2017). Similarly Koskinen and Toassavainen (2004) reported that for nursing students, simply working in a foreign culture is not enough to promote intercultural learning. Guided reflection, particularly with a mentor, and debriefing upon reentry are key to incorporating new perspectives into their future behaviors.

The current study attempts to explore how engineering majors transform as a result of their study abroad experience. In particular, it asks students to describe their reflection practices both while abroad and since return. According to the research described previously, questioning previously held assumptions may not be possible without guided reflection.

Engineering Study Abroad

Studying abroad is just as impactful for engineering majors as it is for students in the social sciences and humanities. Bettez and Lineberry (2004) created a survey instrument with six engineering-specific questions. These engineering-specific questions model the general criteria under ABET Engineering Criteria 2000 (described previously, i.e., ability to function on multi-disciplinary teams, ability to communicate successfully, etc). The authors were seeking data beyond general student satisfaction, as they noted a recent study that found that 95% of institutions measure student satisfaction but many fewer measure language proficiency, career-related outcomes, or intercultural proficiency.

While their sample size of their pilot survey was small ($n = 6$), their findings were promising. Five students reported an increased interest in pursuing an engineering career in a multi-national corporation as a result of study abroad. Four of the six reported that their

experience abroad had a beneficial effect on their engineering skills. Students also reported that study abroad added to their understanding of other cultures and themselves.

Barriers to Engineering Participation in Study Abroad

Relative to other disciplines, engineers face more barriers to study abroad, whether they are real or perceived (Grandin & Hirleman, 2009; Heisel & Stableski, 2009; Klahr, 2002; Klahr & Ratti, 2000). This may explain why engineering majors are much less likely than other majors to study abroad. The following section reports on common barriers for engineering participation as cited in the literature.

Academic. The chief barrier cited for undergraduate engineers to study abroad is academic. Sometimes credit is not allowed for study abroad courses (Klahr, 2002), limiting opportunities for engineers to make timely progress toward their degree. Additionally, courses taken abroad may interrupt course sequences, potentially delaying graduation. In an unpublished evaluation of a National Science Foundation (NSF) study abroad opportunity, Twombly (2010) found that students cited two chief concerns: the hierarchical nature of the curriculum and not receiving credit for study abroad courses. She explained that “This concern expressed itself mainly as one of the students finding themselves behind if they could not take the right courses abroad and fears of being unprepared to take higher-level courses necessary for their major” (as cited in Twombly et al., 2012, p. 62). Heisel and Stableski (2009) also noted student concerns for meeting degree requirements, and the especially important concern that lengthening time to degree would mean paying more in tuition.

Student perceptions. Literature examining student perceptions often cite both real and perceived barriers of study abroad. Many of these barriers are considered “perceived”

because, upon clarifying these misconceptions, study abroad is more achievable than students might realize. Klahr and Ratti (2000) cited several misconceptions from engineering majors: for one, engineering majors may not be aware of program options. They may assume that the program is too expensive or that they must speak a foreign language to be eligible.

Engineering students may also have “the misconception that the United States is the world leader in technological research and development, so they will not learn much about engineering in other countries” (p. 87). Students may perceive that staying on campus to work with faculty members and conduct research is more important than an international experience (Heisel & Stableski, 2009; Twombly et al., 2012).

While foreign language knowledge and awareness of cultural difference compels students in the humanities and social science to go abroad, engineering students might find these motivations irrelevant for the engineering degree (Wainwright, Ram, Teodorescu, & Tottenham, 2009). Students also may feel that learning a foreign language is not necessary because “the universal language of mathematics and science allow scientists to share their work even when they cannot speak each other’s language” (Wainwright et al., p. 381). As further evidence, degree programs in engineering often do not require that students take courses in a foreign language. In fact, faculty in the sciences tend to de-value language learning over technological skills, noting that English is the language of the sciences (Chang et al., 2013; Grandin, 2006).

Some students might not participate in study abroad based on the belief that their careers will not benefit. They may assume that “that they will not gain tangible benefits, such as higher salary upon entering the job market” (Klahr & Ratti, 2002, p. 87).

Additionally, without employer pressure, neither the curriculum nor student attitudes are likely to change (Blumenthal & Grothus, 2009).

Lack of tradition. Another barrier reported is lack of tradition in the field. Engineering schools have traditionally preferred to educate students on campus by focusing on the core curriculum and giving students research opportunities and internships locally (Blumenthal & Grothus, 2009). Even encouraging study of a foreign language can be difficult: “Calls to bring back a foreign language requirement, for example, meet with strong resistance in science and engineering programs already under heavy pressure to accommodate an ever-expanding body of knowledge in the core curriculum” (Blumenthal & Grothus, p. 13). However, many study abroad programs are now offering research and internship opportunities for engineering majors. For example, the University of California Education Abroad Program website advertises at least nine program options that are specifically designed for engineering majors, providing research opportunities and courses in science and engineering.

Lack of faculty support. In addition to the lack of tradition in the field, faculty may not be supportive of study abroad. Only one-third of U.S. faculty have studied or conducted research abroad (O’Hara, 2009) so they may not see the benefits of learning abroad (Klahr, 2002). An equally low amount of U.S. faculty (33%) have reported collaborating with international colleagues in research (O’Hara). STEM faculty are less likely than their colleagues in other departments to incorporate an international perspective into the curriculum (Grandin & Hirleman, 2009; O’Hara).

Ellzey described two reasons that faculty may not be as supportive. The first is that there is a lack of cross-disciplinary activities on campuses: “Even though there is

considerable expertise across any given campus to support international study, such as in language departments, there is little encouragement or incentive for faculty to cross the disciplinary divides in order to work together” (as cited in Grandin & Hirleman, 2009, p. 13).

The second is the academic rewards system:

Building successful international programs for engineering students is labor intensive and requires substantial time commitments from faculty and administrators. Since faculty are promoted and tenured by traditional teaching, publication, grantsmanship, etc. and not by sending students abroad, there is little incentive for faculty to work in this area. (Grandin & Hirleman, p. 13)

While campus leaders may promote study abroad at the institutional level, faculty determine integration of study abroad into the curriculum. Faculty are often skeptical of courses taken abroad, feeling that courses at the home university might better prepare students to become engineers (Twombly et al., 2012). Indeed, in order to increase the academic legitimacy of study abroad, some scholars have noted that “the easing of credit-transfer restrictions, for example, confers a certain measure of academic legitimacy that often, then, contributes directly to increased participation by a more diverse cohort of students” (Hoffa & DePaul, 2010, p. 5).

Faculty attitudes are not trivial. While only 43% of US faculty believe that study abroad is important for students (O’Hara, 2009), when they encourage study abroad, participation increases (O’Hara; Paus & Robinson, 2008; Spiering & Erickson, 2006). Paus and Robinson conducted a study at a small private school in the United States. They found that faculty and parent encouragement were statistically significant motivators for students to study abroad. Only 11.4% of students in the sciences felt that faculty strongly encouraged

them to study abroad, whereas 31.4% in the social sciences of students felt that faculty strongly encouraged them to study abroad. As the authors noted, “very few students in the sciences were actively discouraged from studying abroad, but the important point is that they did not feel encouraged either” (p. 42). O’Hara noted that in data from the National Survey of Student Engagement (NSSE), “when faculty are surveyed on the importance of international exposure, a one-point increase in a Likert scale rating of importance (for example, from important to very important) translates into a 20 percent increase in student participation in study abroad” (p. 40). As noted by Spiering and Erickson (2006), faculty encouragement strongly influences science majors to study abroad.

Overcoming Barriers to Study Abroad for Engineering Majors

Promoting study abroad for engineering majors means convincing students (e.g., on the part of academic advisors and others) that the experience abroad will be worth the complexity of getting there. Thus designing study abroad programs that are interesting to students and aid in degree progress are important ways to increase participation amongst undergraduate engineering majors. For example, the University of California Education Abroad Program offers three programs, one in England, Ireland, and Scotland, which allow students to take a full-year of calculus-based Physics in one summer program. These programs not only allow students to complete major requirements and perhaps shorten their time to degree, but they also provide them with an international experience. Physics also tends to be a highly impacted course, so by taking these courses abroad it helps alleviate enrollment capacity concerns on the home campus.

Another way to promote participation is to offer a design feature. Design courses “provide a realistic engineering experience of hands-on team work on a design problem”

(Courter, Millar, & Lyons, 1998). These courses have two benefits: one, they give students a realistic picture of what it is to work as an engineer and two, they promote interest in engineering when at the beginning level courses are fragmented (Courter et al.). Such design courses are particularly important for retention, as studies have shown that design projects support retention in the major (Courter et al). Design projects that take place internationally have the added benefit of giving students opportunities to develop cross-cultural communication skills and work in multinational teams.

Programs that offer design experiences abroad have been successful. Maldonado et al. (2014) found that a two-week project-based international experience was an effective way to “foster a student’s interest in the curriculum” and “expose them to a multicultural setting that they are likely to encounter in their professional careers” (p. 388). In another example, DiBiasio and Mello (2004) of Worcester Polytechnic Institute’s (WPI) Global Perspective Program (GPP) found that students who completed projects abroad produced superior results to those who remained on campus. The authors explain that “our sense is that issues such as learning preferences, motivation, willingness to take intellectual risks, teaming skills and other attributes separate the GPP cohort from their peers who stay on campus (p. 246). The program is extremely successful, as WPI sent more engineering students abroad than any other U.S. university as of 2002 (DiBiasio & Mello). Results from the WPI program also indicate that education off-campus might be equal, or superior, to education received at the home campus.

Considering the rigid nature of the engineering curriculum, engineering majors are naturally reluctant to spend some or part of the academic year abroad. Thus short-term programs, either during the summer or at the end of school terms, are appealing to students

looking for an international experience without interfering with degree progress (Maldonado et al., 2014; Schubert and Jacobitz, 2013). Other benefits of short-term programs include serving a “stepping stone” for students who are concerned about leaving the U.S. (Chang, Groll & Hirleman, 2013; Donnelly-Smith, 2009), they allow students with commitments during the school year (work and athletics, for example) to study abroad, and they may be cheaper than semester-long programs (Donnelly-Smith). These short experiences may not only promote international awareness but also contribute to engineering skills. Blumenthal and Grothus (2009) note that “Such study offers an intense educational opportunity and ideally stimulates longer-term interest in international education, language study, and global careers, while also providing students with skills that will better prepare them to be competitive in the global market place” (p. 13).

Schubert and Jacobitz (2013) concluded that short-term programs for engineering majors create awareness of the global nature of engineering. The program at their institution, called a “Compact International Experience” (CIE), offered two- to three-week engineering courses that took place in either Australia or France. The authors found that the CIE contributed to students’ perception of international awareness. Another notable finding was that students strongly agreed that the international experience enhanced their aspects of engineering knowledge and that the international experience helped them to understand the impact of engineering solutions in a global and societal context. Other such short-term trips have also found benefits. Olson and Lalley (2012) found that studying abroad in freshman year, even for two weeks, could be a catalyst for further interest in international experiences. Results indicated that 59% of engineering majors participated in another international activity since the freshman year program and 70% sought out contact with international

students, albeit limited or moderate. Other studies have found that study abroad increased students' interest in their major as well as skills in their major.

As important as program characteristics are, the recommendations of students themselves may also be an effective way to promote study abroad. Wainwright et al. (2009) found that at Emory University, “word of mouth was the most effective way to disseminate information” (p. 389). Students learned about study abroad through their friends, but also through leaders in the residence halls, student government, and orientation. The formal student advisory board that program administrators created served several purposes: the board “informed us about student concerns, the members were good advocates of the programs, and helped popularize the programs through campus outreach” (p. 389).

The importance of support by engineering faculty and staff in successful program design should not be overlooked. In a study analyzing American and European international exchanges and internships for engineering undergraduates, Klahr and Ratti (2000) found that one characteristic common to successful programs was that the college of engineering and/or their academic departments promoted study abroad. As they note, this finding “illustrates the importance of engineering faculty and administrator participation in promoting and implementing international programs for engineering students” (p. 89). In fact, faculty may even enjoy teaching abroad: Maldonado and colleagues (2014), who were also instructors in their program, note that “nothing brought greater satisfaction than to see the passionate engagement of students in their activities in both formal and informal settings and to know that such experiences can very often be transformational to a student” (p. 389).

Klahr (2002) offers four incentives to help faculty promote study abroad:

- Establish faculty-led study abroad programs during the summer or semester.

- Give more funding for faculty-initiated international opportunities.
- Create an international education advising committee in the College of Engineering to support the creation of international activities, including international minors and other international programming.
- Provide regular updates to faculty regarding the number of students studying abroad, both within in the college and in each department.

Wainwright et al. (2009) described improving faculty support by educating faculty regarding study abroad opportunities for engineering students at luncheons and seminars Heisel and Stableski (2009) also encourage university leaders to recognize the importance of international education “in faculty job descriptions and announcements, incorporating it into tenure and promotion guidelines, and offering financial support for research projects that include international collaboration” (p. 34).

Successful Engineering Study Abroad Programs

Klahr and Ratti (2000) note the following four additional characteristics that successful U.S. programs share:

- they are generally integrated into an undergraduate engineering degree program and curriculum;
- they were initiated by colleges of engineering in cooperation with an “international programs office” at a university;
- they are generally supported and promoted by engineering faculty and administrators; and
- they have been in place longer than “developing” or “unsuccessful” programs. (p. 89)

Broadening the characteristics of successful engineering programs that typify both U.S. and European programs, Klahr and Ratti (2000) add:

- they offer study-abroad or intern-abroad opportunities in English-speaking settings;
- they award full credit at the home institution for required engineering courses completed at the host institution;
- they offer scholarships and financial aid for participation in the program;
- they require participating students to have completed at least their second year of university coursework prior to participation in the program; and
- they eliminate the barrier of “stringent curricular design, sequencing, and requirements reflecting accreditation standards.” (p. 89)

Another successful program is the International Engineering Program (IEP) at the University of Rhode Island. The IEP promotes foreign language learning because it is a dual degree program, offering students both a foreign language degree and a BS in engineering. Additionally, the program has overcome the time-to-degree obstacle by expanding the curriculum to take five years to complete. Students obtain both international study and internship experience. In their fourth year, students spend one semester studying abroad followed by a six-month paid internship. While engineering is about 17% women at URI, John M. Grandin, the director of the IEP, notes that this program often serves to recruit women into engineering (Dessoiff, 2006).

Although many successful programs take place during the summer, 47% of students indicated that their preferred length of study abroad is one semester (Green et al., 2008).

Program administrators at Emory University found that three characteristics created

conditions that allowed students to make progress to their degree while studying abroad for a semester: (a) they offered a limited amount of options at highly-ranked international institutions, (b) they chose institutions that are well-known and well-regarded for their science education, and (c) the international institutions offered science courses in English. Emory faculty not only screened these programs carefully but also visited program sites (Wainwright et al., 2009).

Relationship of the Literature to the Current Study

The literature reviewed in this chapter revealed the complex process of deciding to study abroad and the potential benefits to students for participating in a study abroad program. Deciding to study abroad for engineering majors is particularly complex as they weigh the benefits of leaving campus over potentially falling behind academically (Grandin & Hirleman, 2009). Part of promoting study abroad for engineering majors includes convincing them that this experience will help them in the long run, either through career value or personal transformation. While engineering majors may understand the global nature of the engineering profession, they may not value study abroad over other important on-campus experiences like research and internships (Twombly et al., 2012).

In response to question one (What are undergraduate engineering majors' goals and motivations for studying abroad?) the literature indicated a wide and varied perspective on goals and motivations for going abroad. Studies have shown that students will cite desire to travel, improve a foreign language, and learn about a new culture as motivations to participate (Chambers & Chambers, 2008; He & Chen, 2010; Van Der Meid, 2003; Van Hoof & Verbeeten, 2005). Desire to improve engineering skills is not expected to be a main motivation, as other studies did not find academic interests to be a motivator (Carlson et al.

1990; Van Hoof & Verbeeten, 2005). Some literature pointed to facilitators and barriers to studying abroad. Factors such as students' internal drive, family and peer support, and marketing have been found to facilitate study abroad (Kasravi, 2009). While academic advisors are not often discussed in the literature, it is expected that the recommendations of faculty will influence students to study abroad (O'Hara, 2009; Paus & Robinson, 2008). The theory of reasoned action (Fishbein & Ajzen, 1975) helps to explain the decision-making of these students.

In response to question two (What barriers and challenges do undergraduate engineering majors face in their attempt to study abroad?), it is expected that challenges will range from curricular restrictions to faculty discouragement of study abroad (Grandin & Hirleman, 2009; O'Hara, 2009; Paus & Robinson, 2008). Other challenges will include program cost and restrictions in financial aid for study abroad (Kasravi, 2009) as well as student misperceptions about the difficulty of studying abroad (Klahr & Ratti, 2000), and student desires to stay on campus for research opportunities (Heisel & Stableski, 2009; Twombly et al., 2012; Wainwright et al., 2009)

In response to research question three (What outcomes do engineering undergraduates report as a result of studying abroad?), it is expected that students will report an increase in international awareness and appreciation (Anderson et al., 2006; Schubert & Jacobitz, 2013; Vande Berg et al., 2009). The experience may also increase interest in engineering (Maldonado et al., 2014; Wainwright et al., 2009), enhance aspects of their engineering knowledge, and help them to understand the impact of engineering solutions in a global and societal context (Bettez & Lineberry, 2004; Schubert & Jacobitz, 2013). Based on the research, the experience will increase students' desire to work internationally (Bettez &

Lineberry, 2004). Outcomes may also differ based on program duration (short-term/semester/yearlong). Research shows that all outcomes will be impressive regardless of program length, but outcomes for yearlong students still tend to be more impactful (Dwyer, 2002; Ingraham & Peterson, 2003). Transformational learning theory (Mezirow, 1991) gives a framework for understanding how transformation may occur in students. However, the literature indicated that for some students, transformational learning is not possible (Foronda & Belknap, 2012; Rowan-Kenyon & Niehaus, 2011; Wessels et al., 2011). This could be because of lack of interventions by program staff to encourage critical reflection on assumptions through journaling, group problem-solving, or one-on-one advising (Koskinen & Tossavainen, 2004; Wessels et al., 2011).

In response to research question four (What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as barriers and challenges that these students face?), there is little literature that discusses the role of the academic advisor in education abroad advising or their perspectives on education abroad. However, some literature documents the necessity of academic advising to promote participation. Advisors who misinform students (perhaps by having only a limited knowledge of study abroad options) may actually prevent students from participating (Dessoiff, 2006). Spiering and Erickson (2006) suggested that advisors serve as "change agents" to change the negative perception of the ability to study abroad for engineering majors by explaining the benefits of study abroad to interested students. Literature revealed that in order to promote participation in study abroad, advisors will help dispel perceived barriers, speak positively about their own international experiences or those of other students, and discuss how study abroad can be valuable for students' careers (Relyea et al., 2008).

While the literature in this chapter reviewed study abroad participation for students from a wide variety of majors, there is still a lack of empirical research for undergraduate engineering majors. This study seeks to address the gap in the literature through quantitative and qualitative exploration. Students' goals and motivations, challenges, outcomes, and future choices are all important to consider as we seek to increase study abroad participation and develop global competency in engineering majors.

Chapter Two Summary

This literature review brought together a range of topics to examine study abroad experiences for all undergraduate students, with special consideration for students enrolled in engineering majors. Participation in study abroad appears to largely vary by students' goals and motivations. For some students, career motivations are prevalent, but for others the opportunity to explore other cultures is more important. Non-participants may find the process too complex or find that study abroad would significantly interfere with time to degree. While very little literature references academic advisors, their role is to speak positively about the benefits of studying abroad and to help students make a plan where the experience fits into their schedule. Outcome literature documents the varied benefits of studying abroad, from short-term gains like personal growth and intercultural competence, to long-term gains like career influence and global engagement. However, engineering majors fall into a special category with more academic and career needs than other students. Some incentives for engineering majors may be to offer a program involving a design feature, to encourage faculty to promote about study abroad in their classes, and to offer short-term experiences abroad. The following chapter will discuss the methods used to examine the

study abroad experiences of engineering students in one university system, from both academic advisors' perspectives and students themselves.

CHAPTER THREE: METHODOLOGY

The purpose of this study was to explore the goals and motivations and barriers and challenges regarding study abroad participation for engineering majors and the outcomes they perceived as a result of studying abroad. It also examined these issues from the perspectives of academic advisors. A mixed-methods methodology relying on both a quantitative survey (for students) and qualitative interviews (with students and academic advisors) was utilized in this study. This chapter provides an overview of (a) the research questions this study sought to address; (b) the study context; (c) the general methodological design; (d) philosophical worldview; (e) description of the pilot study (f) data sources; (g) data collection procedures (both survey and interview); and (h) data analysis.

Research Questions

The four research questions this study addressed were:

1. What are undergraduate engineering majors' goals and motivations for studying abroad?
2. What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?
3. What outcomes do undergraduate engineering majors report as a result of studying abroad?
4. What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

Context

This study was conducted through a ten-campus state university system in the western United States. Nine of the campuses contain both graduate and undergraduate programs, while one campus contains only graduate students. The university system is heavily impacted by the sciences: throughout the ten-campus system, the proportion of STEM students has risen from 39% to 50% over the past decade. Each campus is also quite diverse. The number of underrepresented minority students (African American, American Indian, and Hispanic/Latino) in the STEM fields has risen in the past decade, from 14% to 23%. Female enrollment in STEM has remained mostly flat at 46%. (Due to confidentiality, the source of this data is not published).

The tables below identify trends in engineering degrees awarded and study abroad participation in the 2014-2015 and 2015-2016 academic year. Table 3.1 reports system-wide data. System-wide (comprising all 9 undergraduate campuses) there were over 6,000 engineering/computer science degrees awarded. Males made up 80% of the undergraduate degrees awarded. The most common ethnic group was Asian (46%) followed by White (28%) and Hispanic/Latino (12%). International students (8%) were more likely to earn engineering degrees than African Americans (2%).

Table 3.1
System-Wide—Engineering/Computer Science Degrees Awarded, Academic Year 2014-2015

Degree	Ethnicity	Gender
5,758 BS	2% African American	20% female
320 BA	0% American Indian	80% male
	12% Hispanic/Latino	
	46% Asian	
	28% White	
	3% Domestic Unknown	
	8% international	

The following tables indicate the System-Wide Study Abroad Program (SWSAP) participation in the 2015-2016 school year. Table 3.2 indicates that 368 engineering and computer science students participated in study abroad for the 2015-2016 academic year. Note that this data may be inflated, as these numbers include environmental science, B.S., majors, which are not traditionally part of colleges of engineering. As a whole, engineering students represent 4.4% of all SWSAP participants and computer science students represent 2.2% of all participants. These numbers are consistent with national trends, which report 4.6% engineering majors and 2.1% math/computer science majors participating in study abroad (IIE, 2015a).

Table 3.2

System-Wide Engineering Study Abroad Participants, Academic Year 2015-2016

Discipline	Number of Participants	Percent of all SWSAP
Engineering*	245	4.40%
Computer and Information Sciences	123	2.20%

Source. SWSAP, May 2016

* Note that the number of participants is inflated, as Environmental Sciences, BS, is included in the Engineering totals. However, the number of engineering participants system-wide is probably lower than reported here.

General Methodological Design

This study employed a mixed-methods methodology to investigate both undergraduate engineering majors' and academic advisors' perspectives of study abroad. A sequential explanatory design (Creswell, 2009, 2014) consisting of two phases of data collection was utilized. The first phase (quantitative) consisted a survey that was distributed to undergraduate engineering majors. The second phase (qualitative) consisted of individual interviews with a sample of undergraduate engineering majors who had completed the survey. A final source of data (individual interviews with academic advisors) was collected

while both the survey and interviews with undergraduates was ongoing. The overarching value of mixed-methods inquiry is that it can draw on the strengths of both quantitative and qualitative research, thereby redressing the weaknesses of each approach (Creswell, 2009). In a sequential explanatory design, follow-up qualitative interviews help explain quantitative results, giving a voice and feeling to the statistical analysis.

Because more weight is given to the qualitative findings in this study, design features are more similar to those of qualitative methods. According to Merriam (2009), qualitative data illuminates how people interpret their experiences and the meaning they give to these experiences. Merriam (2009) further identifies four factors common to qualitative inquiry:

1. A focus on meaning and understanding. By focusing on meaning and understanding, qualitative research attempts to understand how people make sense of their lives and interpret what they experience. It does not attempt to predict the future.

2. The researcher as the primary instrument. In addition to interacting with participants and interacting with the data, the role of the researcher is to “clarify and summarize material, check with respondents for accuracy of interpretation, and explore unusual or unanticipated responses” (Merriam, 2009, p. 15).

3. An inductive process. Because data analysis is inductive, researchers use data analysis in order to inform theory, not to test theory.

4. Rich description. Qualitative research is richly descriptive by including a thorough description of the participants and the context of the study.

The challenges of mixed-methods procedures were still relevant in this study. Challenges include the overwhelming amount of data and the time-intensive nature of data collection (Creswell, 2009). For example, in this study there were 145 responses to the

survey, plus an additional eleven interviews with students and seven interviews with advisors.

Philosophical Worldview

According to Creswell (2014), researchers must identify their philosophical worldview, "a basic set of beliefs that guide action" (p. 6), also known as epistemologies and ontologies. For this project, a pragmatic worldview was adopted. Patton (2015) aligns pragmatism with another approach called generic qualitative inquiry. Both these worldviews "strive for practical understandings and wisdom about concrete, real-world issues" and "seek practical and useful insights to inform action" (Patton, 2015, p. 152).

Creswell (2014) notes that mixed methods studies tend to adopt a pragmatic approach because "researchers emphasize the research problem and use all approaches to understand the problem" (p. 10). Thus, researchers may draw from both post-positivist assumptions and constructivist assumptions, common to quantitative and qualitative research methods, respectively. In post-positivist research, for example, "a researcher begins with a theory, collects data that either supports or refutes the theory, and then makes revisions and conducts additional tests" (Creswell, 2014, p. 7). Thus instruments that measure participants' observations of the world is an important aspect of post-positivist research.

While this current study does include a survey instrument designed to measure engineering majors' observations of study abroad, it is also not connected to theory the way traditional post-positivist research is. Thus this study draws more on the constructivist worldview, which assumes that "individuals develop subjective meanings of their experiences ... [that are] varied and multiple, leading the researcher to look for the complexity of views rather than narrowing meanings into a few categories or ideas"

(Creswell, 2014, p. 8). Importantly, distinct from post-positivist assumptions, constructivists generate theory by the data collected in the research project.

Pilot Study

Prior to data collection, a pilot study was conducted in order to test the survey and interview protocol for students (not academic advisors). Professors with expertise in the field first reviewed the survey and protocol (Appendices G and I). The original survey and interview protocol for students were modified in various ways. For example, the order of the survey was modified slightly to move demographics to section two as opposed to at the end of the survey, because one professor felt that this information was too important to leave to the end. Additionally, a question regarding general student satisfaction of the experience was added based on one professor's interest in satisfaction. Regarding the student interview protocol, a question regarding the impact of study abroad on students' understanding of engineering was added, as well as questions related to giving advice to programs who are planning study abroad for engineering majors.

A pilot study for both the survey and student interview protocol was conducted with three students enrolled in undergraduate science majors (Biology, Environmental Science, and Biopsychology) at Campus 1. Science majors, as opposed to engineering majors, were selected for the pilot study as the population of engineering majors who have studied abroad is limited. While only minor wording changes were needed for the survey, the interview protocol was shortened by deleting repetitive questions. Otherwise, no major revisions were made.

Data Sources

As noted, data for this project were generated through three sources: a quantitative survey and individual interviews with two groups (undergraduate engineering majors and academic advisors). In the following section, the creation of the survey instrument and the interview protocol will be discussed.

Survey Instrument

The survey (see Appendix G) was created using the online survey tool Qualtrics, which allowed for online distribution. The survey drew in part from the previous works/instrumentations of similar studies exploring education abroad (see Appendix H; e.g., Bettez & Lineberry, 2004; Chambers & Chambers, 2008). Upon opening the survey, students were first required to give consent (see Appendix A). The survey then contained four broad topics: (a) goals and motivations for studying abroad, (b) barriers and drawbacks, (c) perceived outcomes as a result of study abroad, and (d) the impact of the study abroad experience on engineering knowledge and hard and soft skills. Survey questions were written based on the review of literature. Descriptive statistics for all study abroad survey responses are provided in Chapter 4.

Section 1: The first section of the survey called “Your Study Abroad Experience” contains questions regarding the study abroad program the student participated in. These 11 questions ask for descriptions of the study abroad program (i.e., the country their host university was located in, how long they were abroad for, what was their housing situation). It is a mixture of open-ended questions (i.e., What was the language of instruction at your school?) and close-ended questions with response options (i.e., What year in school were you at the time of studying abroad? Freshman, sophomore, junior, senior).

Section 2: The second section, titled “Demographic Information,” asks for participants’ background information, including gender and ethnicity, but also academic information like which university campus they attend, what their academic major is, and which year in school they are in (for example, junior, senior, alumnus). Descriptive statistics for all background questions are provided in Chapter Four.

Section 3: The third section, called “Your Study Abroad Goals and Motivations,” is comprised of 13 statements and one open-ended question. The 13 statements related to goals and motivations were drawn from literature that asked students about their goals and motivations, as described in the literature review (for example, Beausoleil, 2008; Chambers & Chambers, 2008; Van Der Meid, 2003; Van Hoof & Verbeeten, 2005). Sample items designed to measure goals/motivations include “It was a good opportunity to travel” and “I wanted to improve my engineering skills.”

The second question in section 2 is open-ended and asks respondents to rank their top three goals and motivations, which may or may not come from the previous 13 statements. As the list may not have been representative of all goals and motivations, this question allowed students to give voice to their own reasons for studying abroad.

Section 4: The fourth section, called “Barriers and Drawbacks,” is comprised of 14 statements and one open-ended question. It is modeled after the previous section on goals and motivations. The barriers and drawbacks were drawn from literature that reported challenges for undergraduates in general and engineering majors in particular who desired to study abroad (for example, Blumenthal & Grothus, 2009; Grandin & Hirleman, 2009; Salisbury et al., 2009). Sample items designed to measure barriers/drawbacks include “Too difficult to leave because of course requirements” and “Lack of support by faculty in the

College of Engineering.” The second question asked “Out of all the barriers listed above, and other barriers you can think of, what were your top three barriers or drawbacks to studying abroad? Please list them here.” This open-ended question ensured that all barriers students may have faced were captured, even ones that were not common in the literature.

Sections 5 and 6 were modeled after Bettez and Lineberry’s (2004) survey instrument that explored both general outcomes of study abroad as well as outcomes that relate specifically to engineering majors, such as the development of hard and soft engineering skills. Their survey contained two sections. The first section measured general outcomes and contained 35 statements with Likert-style responses, from strongly agree to strongly disagree. A sample item is “Study abroad was important to my personal development.” The second section contained engineering-specific questions that intended to measure the development of ABET-specific soft skills. A sample item is “My experience increased my understanding of the impact of engineering solutions in a global and societal context.” No statistical validity/reliability analyses were conducted, but the first section of the survey was reviewed by faculty interested in or committed to international education. Their survey was piloted with six engineering majors.

Sections 5 and 6 in the current study’s survey contain many of the same statements found in Bettez and Lineberry’s (2004) survey but were adapted for this study. In some statements small wording changes were made to the items to better reflect the current context. At other times the order was changed to facilitate ease of survey completion. Several questions were removed that compared students’ skills and abilities before and after study abroad, as these did not fit the context of the study. New statements were also added that were common in the literature.

Section 5: Section 5 is titled “General Impact of Study Abroad” and is divided into six main parts, which will be described subsequently. All questions were again offered on a five-point Likert style scale: strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree.

- The first part, called “Impact on academics,” gave statements related to the academic impact of study abroad. Sample items included “Study abroad gave me second-language competency” and “Study abroad helped me focus better on academics.”
- The second part, called “Impact on professional development” gave four statements regarding professional development, including “Study abroad is important to my professional development” and “Because of study abroad, I will feel comfortable working internationally.”
- The third part, called “Impact on personal development” consisted of seven statements, which have all been postulated as possible through study abroad. Sample statements include “Study abroad increased my self-confidence” and “Study abroad made me more self-reliant and independent.”
- The fourth part, called “Impact on international/intercultural understanding and competence” asked respondents about the influence of study abroad on their understandings of other cultures and familiarity with international events. Sample items include “As a result of studying abroad, I have an increased appreciation for other cultures” and “While studying abroad I made a conscious effort to adjust my behavior to cultural norms and customs.”

- The fifth part, called “Impact on working with people,” asked about students’ interactions with others as a result of studying abroad. Sample items include “Study abroad increased my ability to successfully communicate with people from other cultures” and “Study abroad helped me network with global experts in my discipline.”
- The final part consisted of two statements, “Overall, I was satisfied with my study abroad experience” and “As a result of study abroad, my life was transformed.”

Sections 6 and 7: Section 6 is titled “Global Impact of Studying Abroad Related to Your Discipline” and is relevant to the literature on engineering study abroad. These questions asked students generally about the impact of study abroad on ABET’s Criterion 3 guidelines (see Chapter 1). Statements included “My study abroad experience enhanced my perspective on the value and importance of my engineering discipline on the global engineering community” and “My study abroad experience better equipped me to apply my engineering skills to solve real-world problems in a broader global societal context.” There was also one open-ended question that gave participants the opportunity to describe other ways that study abroad may have changed them. Section 7, called “Other thoughts,” contained just one open-ended question, which asked respondents to describe anything else not asked of them in the survey.

Interviews

The qualitative data collected primarily came from individual interviews (and secondarily from the open-ended questions on the survey). There are several benefits to interviewing as opposed to other methods of data collection. First, “interviewing is necessary when we cannot observe behavior, feelings, or how people interpret the world

around them” (Merriam, 2009, p. 88). Because the purpose of this study was to understand how engineering majors and advisors perceived study abroad, asking questions helped the researcher “get inside their heads.” Second, interviewing is necessary when “we are interested in past events that are impossible to replicate” (Merriam, 2009, p. 88). In this study, the study abroad experience had already occurred and advising sessions with engineering majors were private.

Semistructured interviews (Merriam, 2009) were conducted with two groups: academic advisors and undergraduate engineering majors. The interview guide ensured that each interview participant was asked the same basic questions, but also allowed the researcher to respond to emerging topics and explore new ideas with each participant. While semistructured, the interview protocols used in this study contained pre-written questions that were asked of all interviewees. As Patton (2002) explains, the interviewer is “free to build a conversation within a particular subject area, to word questions spontaneously, and to establish a conversational style but with the focus on a particular subject that has been pre-determined” (p. 343). In other words, the researcher could ask questions according to the protocol but also asked unscripted probes and follow-up questions where needed.

Interview protocols also have other benefits. Murphy (1980) explains that interviewing is appropriate when examining issues of process, like how decisions were made. Because the process undergraduate engineering majors went through when deciding to study abroad was central to this study, interviews were appropriate. Open-ended interviews are helpful when the “intent is to understand informants on their own terms and how they make meaning of their own lives, experiences, and cognitive processes” (Brenner, 2006, p. 357). Additionally, student interviews helped clarify the results of the survey.

While the protocols were devised for two distinct samples (advisors and students), the structure of the interview protocols was similar. As Murphy (1980) suggests, establishing commonalities before the interview begins is important. Thus each protocol began with an introduction where the researcher introduced herself, why she chose the interview participant, and the purpose of the study. Additionally, advisors and students were given time to ask questions about the consent form, and were asked to give verbal consent (for telephone and Skype interviews) or written consent by signing the form. The researcher also reiterated that the interview would be recorded for transcription purposes.

Interview protocol for academic advisors. The purpose of the interviews with academic advisors was to discover what their role was in promoting study abroad for engineering majors. Due to the lack of tradition in the field and the lack of faculty support, engineering advisors play a key role in helping students go abroad. Advisors must have a thorough understanding of academic requirements to ensure that students are making progress toward their degree while they are abroad.

Before beginning the interview, advisors were first asked to give verbal or written consent (see Appendix C). The interview protocol (Appendix J) contained four major themes: advisors' perceptions about study abroad, academic restrictions and requirements for engineering degrees, strategies used to promote study abroad, and other international opportunities available besides study abroad. Perception questions included "What are the benefits of engineering students going abroad" and "What challenges do engineering students face in their attempts to go abroad?" Academic restriction and requirement questions included "Can you give examples of the various requirements and limitations for academics in studying abroad?" Clarification probes (Murphy, 1980) such as "You can only take

certain courses?” and “All of the senior capstone project needs to take place on campus?” were included as well. Questions about promoting study abroad included “In what ways have you or your office encouraged study abroad for engineering majors?” and “What would you say are the most important aspects of your role as advisor in promoting study abroad?” The final question fell into the other opportunities category: “What international or global experiences does the College of Engineering (COE) provide for students who, for one reason or another, do not leave the campus? For example, does the COE offer any global engineering classes or requirements (even requiring a foreign language)?”

Interview protocol for students/alumni. The interview protocol for the undergraduate engineering majors and recent alumni (see Appendix I), hereafter called “student interview protocol,” was developed based on factors common in the literature and other similar studies. As reviewed in Chapter One, Johnson’s (2016) dissertation asked research questions similar to mine: students’ expectations for study abroad, the learning they experienced, and how study abroad influenced their aspirations or career plans. While her study focused specifically on students in creative majors, the interview questions were also appropriate for students in engineering majors. In accordance, her original protocol was adapted for the current study.

The student interview protocol contained four broad sections: an introduction, experiences prior to departure, experiences while abroad, and experiences since return. In the section regarding pre-departure, students were asked to think retrospectively about their pre-departure experiences. For example, the first question asks about their goals and motivations regarding study abroad. This question serves to validate and expand upon findings from the survey, which also asks students to identify their goals and motivations for

studying abroad. As undergraduate engineering majors are underrepresented in study abroad, it is important to know what motivations led them to study abroad.

In the next section, “While Abroad,” questions were aimed at generating responses about important features of study abroad as described in the literature. Students were asked to provide details about the study abroad experience, like courses they took, out-of-class activities they participated in, and suggestions for how to make the experience better. These detail-oriented questions gave the researcher a better idea of the context. Additionally, one question asked about a significant or memorable learning experience students had while abroad that affected the way they think about their major or engineering in general. This question is designed to gauge the impact of study abroad on learning in the field of engineering. Specifically, the researcher wanted to know if study abroad was relevant to their major. Students were also asked to describe how they reflected either while abroad or since they returned, as Mezirow (1991) indicates that reflection is necessary for transformational learning to occur. The last section asked students about the impact of study abroad since they returned and how study abroad may continue to influence their actions in the future.

Data Collection Procedures

Human Subjects Approval

Before data collection commenced, human subjects approval was received from the Institutional Review Board at the researcher’s home institution as well as each of the eight targeted campuses. Both interview and survey participants agreed to the consent forms given to them, which included conditions of anonymity and confidentiality (see Appendices A, B,

and C). Most interview participants gave verbal consent (as opposed to signing the form) as allowed by the Institutional Review Board because of geographical differences.

Sampling Strategy and Recruitment

A purposeful sampling strategy was employed for this study, as the researcher wanted to ensure that both academic advisors and students met the qualifications for the study (discussed below). Because the research questions were specific to engineering majors and their advisors, the sample was accordingly homogenous (Patton, 2015) in that all were undergraduate engineering majors who studied abroad and academic advisors who advise engineering majors. A purposeful, homogeneous sample was not necessarily a limitation; rather, “the logic and power of purposeful sampling lies in selecting information-rich cases for in-depth study” (Patton, 2015, p. 264). Because the purpose of this study was to provide in-depth understanding and insights rather than generalizations, purposeful homogenous sampling is appropriate. The sampling strategy and recruitment for advisors and then students is described below.

Group 1: academic advisors. The first set of participants included undergraduate engineering academic advisors. These advisors are professional staff members, as opposed to faculty members, whose job is to advise engineering majors on academic requirements. Seven advisors were selected for this study (see Table 3.3). Two advisors came from one campus while the other five advisors came from different campuses. Four were advisors for the College of Engineering, while three were advisors in individual departments, such as Computer Science or Chemical Engineering. Most had several years of experience in the role, though Megan and Veronica had less than four years experience in their roles.

Table 3.3
Advisor Participants By Campus

Name	Campus	College or Department	Years in Role
Corey	Campus 1	College	13
Heidi	Campus 2	College	13
Elaine	Campus 3	Engineering Department	13
Megan	Campus 4	College	2
Brenda	Campus 5	College	10
Veronica	Campus 6	Engineering Department	3.5
Kelly	Campus 6	Engineering Department	8

To begin data collection, the researcher sent an email to undergraduate engineering academic advisors at each of the eight campuses included in this study (see Appendix D). The purpose for contacting these advisors was twofold: first, some of the advisors were asked to participate in interviews with the researcher regarding their advising experience and second, all advisors were asked to send out the survey on the researcher’s behalf.

Academic advisors at six of the campuses were asked to participate in interviews (at the other two campuses, advisors were only asked for their help in distributing the survey). At two of the campuses, advisors were chosen specifically because they had been recommended as very knowledgeable in the field of advising for study abroad. At another campus, an email was sent to the Director of Undergraduate Affairs, who then forwarded the email on to academic advisors in each of the engineering departments. From that email, two advisors reached out to the researcher expressing their interest in being interviewed. The other three advisors were randomly selected—they received emails explaining the purpose of the study, and they agreed to be interviewed. As soon as each interview ended, the researcher wrote notes that came to mind. The audio recordings were also uploaded to the researcher’s computer so that the interviews were stored for safe-keeping.

Group 2: student survey participants. Students surveyed were current undergraduate engineering students or recent alumni who studied abroad. The majority of students participated in the system-wide study abroad program; however, this was not a requirement for participation. Participants in the survey were also not limited to location or program type; thus, these students participated in programs that varied by country, length of time abroad, interaction with locals, and more. Participants were either current engineering students or recent alumni (within the past five years), all called “students” in this study.

Participants were recruited either through their academic advisors or their study abroad office (see Table 3.4). Recruitment varied by campus. At each campus, the researcher began by emailing an advisor in the College of Engineering (see Appendix D) to ask them to send out the survey on my behalf. While advisors at each of the campuses agreed, some preferred that survey be sent out through the study abroad office, as that office had more accurate participation information. Thus at some campuses, the education abroad office to distributed the survey.

Each campus also had varying participation data. Some campuses were able to send an invitation email to as far back as five years of past participants, while others only sent the survey to current students (see Table 3.5). The invitation email (see Appendix E) included an introduction to the project, a link to the survey, as well as the offer of a raffle to win one of two \$25 amazon.com gift cards. Assurances of anonymity and confidentiality were included in the email, though students also had to agree to the consent form when they began the survey.

Table 3.4
Survey Distributor by Campus

Campus	Survey Distributor
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1	College Advisor
2	Study Abroad Office
3	Study Abroad Office
4	Study Abroad Office
5	Study Abroad Office
6	Study Abroad Office
7	College Advisor
8	College Advisor

Table 3.5
Sampling Population at Each Campus

Campus	Population	Percent of Population	Timing of Participation in Study Abroad
1	33	3%	2015 to present
2	22	2%	2013 to present
3	317	24%	2015 to present
4	95	7%	2013 to present
5	160	12%	2013 to present
6	529	40%	2012 to present
7	122	9%	2012 to present
8	41	3%	2012 to present
Total	1319	100%	

Recruitment emails at each of the campuses were sent in January 2017. At most campuses, the survey remained open for at least two weeks. Follow up reminder emails were sent at campus 1, 2, 3, 5, and 8 in order to improve the participation rate (see Table 3.6). Campus 4 chose not to send out a reminder email because they did not want to overload students with too many emails. Campuses 6 and 7 also did not send out reminder emails due to timing difficulties. The response rate at each of the campuses varied, with a final response rate of 11%. Most respondents took 10 to 15 minutes to complete the survey. One could argue that only students who were satisfied with their experiences or who felt a strong impact as a result of study abroad responded to the survey. While this may indeed be true, there was still a wide range of responses throughout the survey. Additionally, this study sought to

focus on the impact of study abroad in order to increase participation, so understanding outcomes from satisfied students is also important.

Table 3.6
Participation Rates by Campus

Campus	Population	Participants	Participation Rate	Number of survey email requests
1	33	13	39%	2
2	22	2	9%	2
3	317	34	11%	2
4	95	24	25%	1
5	160	24	15%	2
6	529	24	5%	1
7	122	19	16%	1
8	41	6	15%	2
Total	1319	146	11%	

Once the survey was closed at all campuses, a random drawing was conducted to identify the two winners of the incentives. The winners were notified of their prize and received their gift card through email. Data analysis began immediately upon close of the survey so that interview participants could be selected.

Group 3: student interview participants. The third target sample for this study included 84 survey participants who agreed to participate in a follow-up interview. Creswell (2014) asserts the importance of drawing a sample from the survey sample to help validate the results. From the 84 interested students, a sample based in part on preliminary results from the survey was purposefully selected. The factors considered include:

1. Length and time of year abroad: Students who had studied abroad for at least one academic quarter or semester were chosen. Only students who had studied abroad during the academic year were included because they likely encountered more barriers than students who had gone abroad during the summer.

2. Types of courses taken abroad: Students who had taken at least one upper division engineering course were chosen as they would likely have had the most experience with engineering abroad. It was assumed that these students had the most opportunity to connect their experience abroad to engineering.
3. Campus: While the goal was to include at least one participant from all qualifying institutions, at Campus 2, Campus 6 and Campus 8 there were no students who met the above criteria.

Twenty-eight students met those qualifications and the researcher emailed 18 of them to be interviewed. Each student was individually emailed (see Appendix F) to explain the purpose of the interview, arrange an interview time, and notify them that they would receive a \$5 Starbucks gift card for participating. The consent form (see Appendix B) was included and interview participants were encouraged to read it and ask questions if they had any prior to participating. Eleven of those students agreed to be interviewed. Table 3.7 displays the demographics for the eleven student interview participants. Table 3.8 displays study abroad program characteristics for each student.

Table 3.7
Interview Participants: Demographics

Pseudonym	Which campus do you attend?	What is your current major?	What is your race/ethnicity?	What is your current academic standing?
Andrew	Campus 3	Electrical Engineering	Caucasian/White	Junior
Brandon	Campus 7	Computer Science	Caucasian/White	Junior
Cody	Campus 3	Mechanical Engineering	Khmer / Cambodian-American	Alumnus
Daniel	Campus 5	Civil Engineering	Chinese/Chinese-American	Alumnus

Ian	Campus 4	Computer Science	Caucasian/White	Alumnus
Jeffrey	Campus 1	Electrical Engineering	Black/African American	Alumnus
Jim	Campus 1	Mechanical Engineering	Caucasian/White	Senior
Marcus	Campus 5	Mechanical Engineering	Chinese/Chinese-American	Senior
Michael	Campus 7	Electrical Engineering & Computer Science	Chinese/Chinese-American	Alumnus
Peter	Campus 3	Structural Engineering	Chinese/Chinese-American	Alumnus
Richard	Campus 5	Computer Engineering	Chinese/Chinese-American	Senior

Table 3.8
Interview Participants: Study Abroad Program Characteristics

Pseudonym	In what country did you study abroad?	How long did you study abroad for?	What year in school were you at the time of studying abroad?
Andrew	Sweden	One semester	Junior
Brandon	Hong Kong	One semester	Sophomore
Cody	Sweden	One semester	Senior
Daniel	Singapore	One year	Junior
Ian	Sweden	One semester	Junior
Jeffrey	Chile	One semester	Senior
Jim	Germany	One year	Junior
Marcus	Australia	One semester	Junior
Michael	Singapore	One semester	Senior
Peter	Sweden	One semester	Senior
Richard	England	One year	Junior

The majority of the interviews took place over Skype video calling or by phone, although two interviews took place in person (Jeffrey and Jim) because of geographic proximity. The interviews were conducted from December 2016 through March 2017 based

on the availability of the students. At the beginning of each interview, students were asked for verbal or written consent, and then were informed that while the interview would be audio recorded, it would remain anonymous and confidential. After the interviews, the recorded audio was uploaded to the researcher's computer for safe-keeping. The researcher also added notes to her analysis journal regarding any major themes or questions after the interview.

Data Analysis

Quantitative

Upon the close of the survey, the researcher reviewed the survey data and deleted two incomplete survey responses. All data was then inputted into SPSS and cleaned up the data as needed in order to prepare data for analysis. To examine responses on the survey, descriptive statistics (frequency distributions, mean, and standard deviations) were calculated for all survey items.

Independent *t*-tests were conducted to determine if males and females differed significantly in any of the goals, barriers, or outcomes measured in this study. Previous literature indicated some differences in the motivations and outcomes between men and women: men are typically motivated to study abroad if they feel the program has career benefits (Lucas, 2009), and outcomes for men relating to language growth and intercultural competency are less strong than for females (Vande Berg et al., 2009).

Qualitative

Following the recommendations of Merriam (2009), qualitative analysis occurred simultaneously with data collection. Pseudonyms were assigned to each of the interview participants. Immediately following interviews, the researcher kept track of her thoughts in

an analysis journal (Patton, 2015). This journal not only served as a place to quickly summarize the interview, but also a place to speculate about new and reoccurring themes. Shortly following the interviews, all audio files were uploaded to the researcher's computer to prepare for transcription. Using ExpressScribe, a transcription software that allows users to control the speed of recordings and other features extremely useful in transcribing, all interviews were transcribed by the researcher. Merriam (2009) notes that transcription can actually serve as another form of analysis, as it helps researchers start to generate insights and ideas about the data. Following transcription, the files were uploaded to Dedoose, an online qualitative analysis software. Dedoose was particularly useful for organizing codes across interviews.

Transcripts were analyzed and compared according to Merriam's (2009) open, axial, and selective coding approach, also called content analysis (Patton, 2015). To begin the process, the researcher first read and coded anything that could be potentially relevant, interesting, or important in the study. These codes were largely "in vivo" codes in order to capture the essence of what the participants were saying. Concurrently, the researcher began thinking of common codes that could fall into categories or themes. These categories were not part of the data, but abstractions from the data.

While analysis was originally inductive, eventually it became deductive. The deductive analysis was largely drawn from Kasravi's (2009) findings regarding decision-making. These findings in the current study were separated into common themes and sub-themes, according to Kasravi's findings.

The qualitative findings were displayed using Attride-Stirling's (2001) thematic networks. A thematic network contains basic themes (lowest-order themes present in the

data), organizing themes (categories of basic themes which together form more abstract themes), and global themes (a super-ordinate theme which encompasses the principal themes in the data). The thematic networks not only were helpful for visual display, but also aided in interpretation. It was important to see how each basic theme connected to a more abstract idea in the data.

Chapter Three Summary

Chapter Three described the general methodological design. The survey instrument and both student and advisor interview protocols were also reviewed in-depth. The survey instrument was designed based on the review of literature, and included common themes like goals and motivations of study abroad, barriers to study abroad, and the influence of study abroad on future careers. The interview protocol for students was also designed based on a review of literature, and contained many questions similar to Johnson's (2016) interview protocol.

Data collection began by first emailing academic advisors. Advisors were asked to participate in an interview study and then also to distribute the survey to undergraduate students who are majoring in engineering. The sampling procedure was purposeful: students and advisors were selected who met the qualifications. Following the surveys, 11 students were interviewed. These interviews took place in-person, by phone, or through a video calling service like Skype. Meanwhile, seven academic advisors were interviewed as well.

Finally, this chapter discussed the quantitative and qualitative data analysis procedures. The quantitative portion (the survey) was inputted into SPSS where it was analyzed for descriptive statistics (such as frequency distributions, the mean, and standard deviation) for each question. The qualitative analysis consisted of inductive and deductive

content analysis, in which each interview was read for to identify common themes.

CHAPTER FOUR—QUANTITATIVE FINDINGS

The findings are presented in two chapters, each corresponding to either quantitative or qualitative data. This chapter presents the quantitative findings for each of the research questions below, where appropriate. Note that academic advisors were not administered the survey, so research question four is not addressed here.

1. What are undergraduate engineering majors' goals and motivations for studying abroad?
2. What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?
3. What outcomes do undergraduate engineering majors report as a result of studying abroad?
4. What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

The data for the research questions reported in this chapter come from the surveys submitted by undergraduate engineering majors and recent alumni ($n = 145$). The chapter consists of the following sections: (a) survey demographics, (b) characteristics of the study abroad programs, (c) the survey items that address research question one, (d) the survey items that address research question two, and (e) the survey items that address research question three. Where appropriate, results are presented regarding differences by gender and program duration. This chapter concludes with a summary of the findings.

Survey Demographics

This section describes characteristics and demographics of the survey respondents, who were all undergraduate engineering majors and recent alumni. Originally, 147 students completed the survey. However, two respondents completed less than 50% of the survey and were subsequently deleted from the dataset. Therefore, the total number of respondents was 145.

Table 4.1 presents data related to the respondents' gender, race, international status, language, and first generation status. More than half of the respondents were male (54.48%), while 44.14% were female. One student identified as “other” and reported non-binary, and one other student declined to state. The largest racial/ethnic group was Caucasian/White at 33.10%, with Chinese/Chinese-American a close second at 28.28% of the respondents. Twelve students (8.28%) reported their race/ethnicity as “other or biracial.” Further responses related to "other or biracial" are listed in Table 4.2.

Table 4.1
Demographics by Frequency and Percent

		Frequency	Percent
Gender	Decline to state	1	0.69%
	Other ¹	1	0.69%
	Female	64	44.14%
	Male	79	54.48%
Race/Ethnicity	American Indian/Alaskan Native	0	0.00%
	Pacific Islander	1	0.69%
	Filipino/Filipino-American	2	1.38%
	Decline to state	2	1.38%
	Black/African American	2	1.38%
	Japanese/Japanese-American	3	2.07%
	Vietnamese/Vietnamese-American	4	2.76%
	Middle Eastern	5	3.45%
	Korean/Korean-American	6	4.14%
	East Indian/Pakistani	7	4.83%
	Mexican/Mexican-American/Chicano/Latino	12	8.28%
	Other or biracial ²	12	8.28%

	Chinese/Chinese-American	41	28.28%
	Caucasian/White	48	33.10%
International Student:	Yes ³	4	2.76%
	No	141	97.24%
Language other than English:	Yes ⁴	97	66.90%
	No	48	33.10%
First Generation College Student:	Yes	31	21.38%
	No	114	78.62%
Total		145	100.00%

¹ non binary

² see Table 4.2 below

³ India, Indonesia, Poland, Turkey

⁴ see Table 4.3 below

Table 4.2

Other or Biracial, If Provided

Chinese and German
Chinese and Vietnamese
Filipino and German
Khmer/Cambodian-American
Laotian
Malaysian and German
Mexican and European Descent
Taiwanese American
Vietnamese and Laotian
White and Chinese/Chinese-American
White and Japanese

Less than 3% (4 students) of the respondents identified as international students. These 4 students originally came from India, Indonesia, Poland, and Turkey. Over 66% of students reported speaking a language other than English (see Table 4.3), but the ability in these languages range from beginning to native speaker. The majority of the students (78.62%) were not first generation college students, defined in this study as the first in the family to earn a four-year degree.

Table 4.3

Languages Listed

Language	Frequency
American Sign Language	1
Arabic	3
Bengali	1
Chinese (Cantonese, Mandarin and Teo Chew)	34
Danish	1
Farsi	1
French	6
German	3
Gujarati	1
Hebrew	1
Hindi	1
Indonesian	1
Italian	5
Japanese	11
Khmer	1
Korean	7
Lao	1
Polish	1
Punjabi	1
Spanish	27
Urdu	1
Swedish	3
Tagalog	1
Thai	1
Turkish	1
Vietnamese	3

Note. All levels, from beginning to native speaker

Respondents were then asked to report their academic major. The three most common majors included computer science at 22.76%, mechanical engineering at 15.86%, and civil engineering at 9.66% of the respondents. As shown in Table 4.4, 23.78% of respondents reported also earning a minor. The variety of minors and their frequencies are reported in Table 4.5. In addition, the majority of the respondents (93.06%) reported enrolling at their institutions as freshmen.

Table 4.4
Academic Information

		Frequency	Percent
Major:	Bioinformatics	0	0.00%
	Engineering mathematics and statistics	0	0.00%
	Materials science	0	0.00%
	Network and digital technology	0	0.00%
	Nuclear engineering	0	0.00%
	Technology and information management	0	0.00%
	Biochemical engineering	1	0.69%
	Business informatics	1	0.69%
	Energy engineering	1	0.69%
	Engineering physics	1	0.69%
	Industrial engineering and operations research	1	0.69%
	Nanoengineering	1	0.69%
	Software engineering	1	0.69%
	Data science	1	0.69%
	Biological systems engineering	2	1.38%
	Environmental engineering	2	1.38%
	Electrical engineering and computer science	2	1.38%
	Double major ¹	4	2.76%
	Biomedical engineering	5	3.45%
	Structural engineering	5	3.45%
	Aerospace engineering	7	4.83%
	Bioengineering	8	5.52%
	Chemical engineering	10	6.90%
Computer engineering	11	7.59%	
Electrical engineering	11	7.59%	
Civil engineering	14	9.66%	
Mechanical engineering	23	15.86%	
Computer science	33	22.76%	
Minor:	Yes ²	34	23.78%
	No	109	76.22%

¹ see Table 4.5 below

² see Table 4.6 below

Table 4.5
Types of Double Majors

Double Major	Frequency
Aerospace Science and Engineering and Mechanical Engineering	2

Computer Science and Engineering / Biomedical Engineering	1
Nanoengineering and Chemistry	1

Table 4.6
Types of Minors

Minor	Frequency
Accounting	1
Art & Technology	1
Asian Languages (Japanese)	1
Bioinformatics	1
Biological Sciences	1
Business	2
Chemistry	1
Communication	1
Computer Engineering	1
Computer Science	1
Dance	1
Digital Video and Film Production	1
Earth and Atmospheric Science	1
Energy and Resources	1
German Studies	2
Information and Computer Science	1
Italian Studies	2
Management	1
Math	1
Math/Economics	1
Mechanical Engineering	1
Music	2
Physics	1
Psychology	2
Spanish	3
Sustainability in the Built Environment	1
Technology and Information Management	1
Theater	1

Characteristics of Study Abroad Programs

Respondents were also asked to report program characteristics, including the country they studied in, the language of instruction of their courses, the duration of their program, and type of courses taken. As shown in Table 4.7, the most common country was Japan at 13.8%, followed by Scotland, Italy, and Germany, each at 9%. However, when the United Kingdom countries (Scotland, England, and the United Kingdom unspecified countries) are combined, the total visiting the UK was the largest, at 19%. For the majority of the students, the language of instruction of their courses was English, as shown in Table 4.8.

Table 4.7
Country of Participation by Frequency and Percent

Country	Frequency	%
Argentina	1	0.7
Argentina, Chile	1	0.7
Austria	1	0.7
China	1	0.7
Cuba	1	0.7
Denmark	1	0.7
Greece	1	0.7
Korea	1	0.7
Peru	1	0.7
Thailand	1	0.7
Vietnam, Morocco, and Bolivia	1	0.7
Chile	2	1.4
Taiwan	2	1.4
United Kingdom (unspecified country)	2	1.4
France	3	2.1
Ireland	3	2.1
Hong Kong	4	2.8
New Zealand	4	2.8
Spain	5	3.4
Australia	6	4.1
Iceland	7	4.8
South Korea	7	4.8
Singapore	8	5.5

Sweden	10	6.9
England	12	8.3
Germany	13	9
Italy	13	9
Scotland	13	9
Japan	20	13.8
Total	145	100

Table 4.8

Language of Instruction of Courses by Frequency and Percent

Language	Frequency	%
Chinese	1	0.7
English/Italian	1	0.7
German/English	1	0.7
Korean/English	1	0.7
Mandarin/English	1	0.7
German	2	1.4
Italian	2	1.4
Italian/English	2	1.4
Spanish/English	2	1.4
Japanese	3	2.1
Swedish/English	3	2.1
Japanese/English	4	2.8
Spanish	6	4.1
English	116	80.0
Total	145	100

The majority of students reported studying abroad for either the summer (n = 68) or for one semester (n = 61), as presented in Figure 4.1. Figure 4.2 indicates the types of courses students took abroad; students were asked on the survey to check all the types of courses they took while abroad. While the most common types of courses were “upper division major,” students very likely could also have taken “lower division general education courses” or “language and culture” courses. Courses in the “other” category included student reports of “no courses taken,” “research only,” “elective courses,” and “courses that did not help me graduate.”

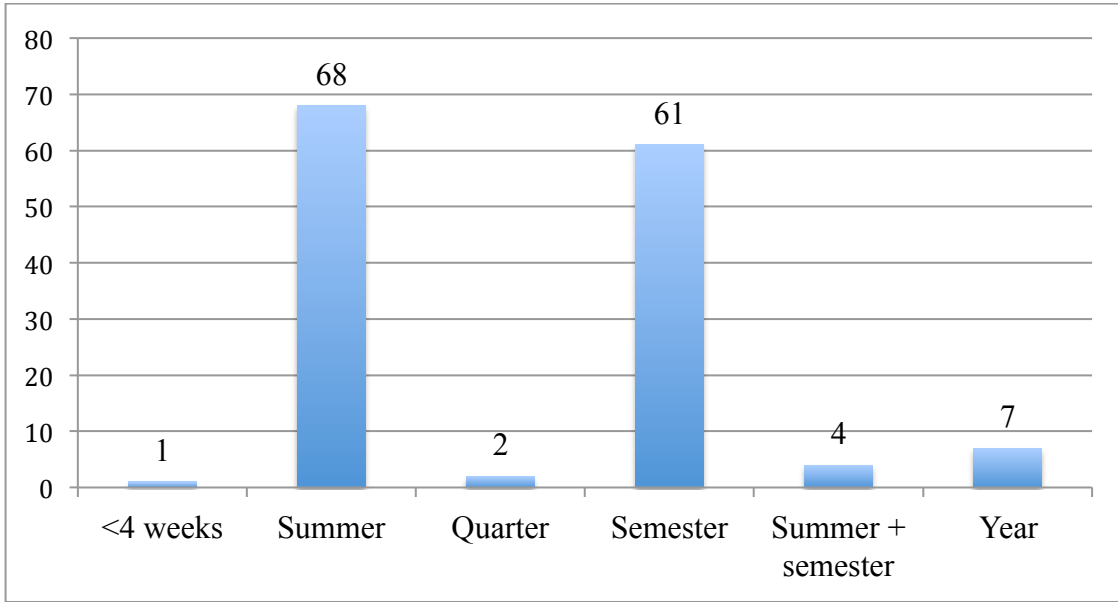


Figure 4.1. Duration of program by frequency.

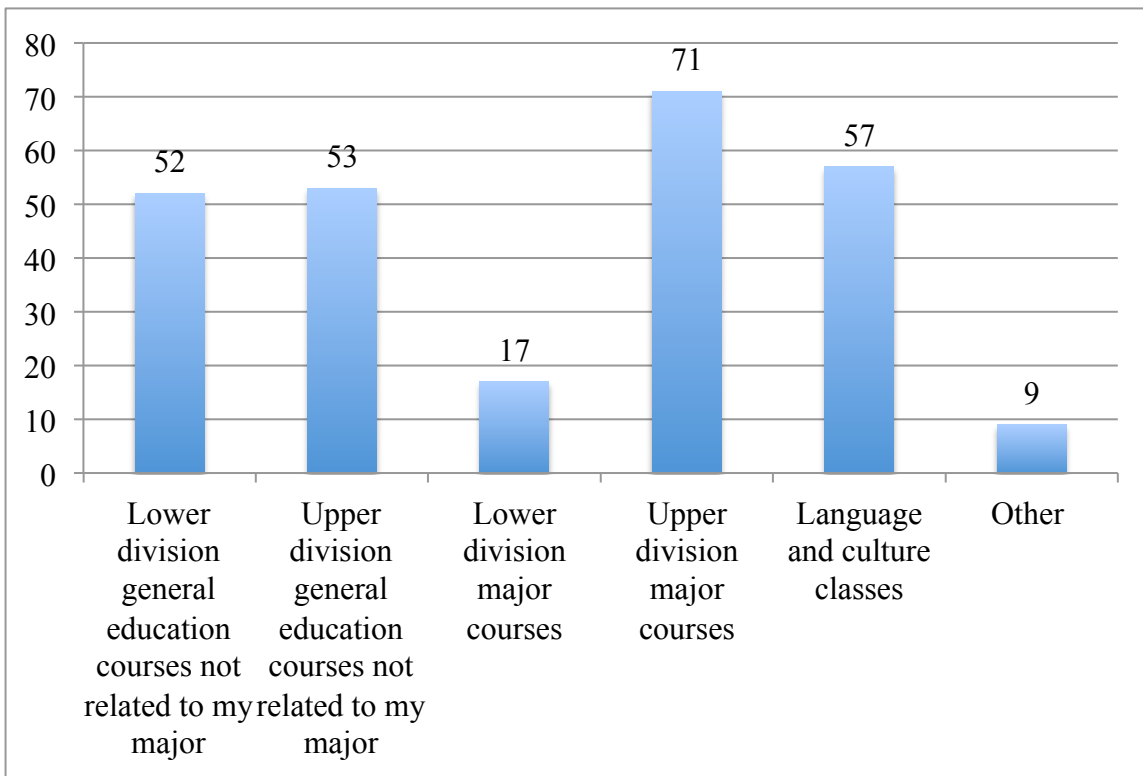


Figure 4.2. Types of courses students took abroad by frequency of course type.

RQ1: What are undergraduate engineering majors’ goals and motivations for studying abroad?

On the survey, 13 potential study abroad goals that were found in the literature were listed. For each goal, students were asked to rate how strong a motivation that particular goal was for them. In this case, the terms “goals” and “motivations” are used interchangeably. In Table 4.9, responses for “very strong” and “strong” motivations are combined, as are responses for “weak” and “not at all a motivation.” This helps to ease interpretation of these goals. The motivations are listed in order from strongest to weakest.

Table 4.9
Students’ Goals and Motivations for Studying Abroad (n = 143)

	Very Strong/Strong Motivation	Neutral	Weak/Not at all a Motivation
It was a good opportunity to travel.	99.31%	0.69%	0.00%
I liked the country the program was in.	94.49%	5.52%	0.00%
I wanted to live in another culture.	84.83%	8.28%	6.90%
It was a good opportunity to develop global competency (knowledge, skills, and abilities to work with other cultures).	82.76%	9.66%	7.59%
I wanted to meet new people.	82.64%	12.50%	4.86%
I wanted to take courses that were requirements for my major.	52.42%	6.90%	40.69%
I wanted to learn or improve a foreign language.	46.21%	19.31%	34.49%
I wanted to take general education or elective courses.	43.45%	26.21%	30.35%
I wanted to improve my engineering skills.	41.38%	20.69%	37.94%
I wanted to learn about my cultural heritage.	20.14%	15.97%	63.89%
I wanted work experience.	10.35%	17.93%	71.72%
I wanted an internship.	9.66%	20.00%	70.35%
I wanted to conduct research in a lab.	9.66%	12.41%	77.93%

The strongest goals and motivations for studying abroad were to travel (99.31%), to

visit a particular country (94.49%), and to live in another culture (84.83%). The top five goals are all related to cultural experience and knowledge. The sixth most common goal was “I wanted to take courses that were requirements for my major,” perhaps indicating that completing degree requirements was of secondary importance to cultural experiences. The goals ranked as a weak motivation or not at all a motivation by 60% or more of participants were “I wanted to learn about my cultural heritage,” “I wanted work experience,” “I wanted an internship,” and “I wanted to conduct research in a lab.”

Another question on the survey was an open-ended question asking students to rank their goals and motivations. They were not limited to the categories as they were in the previous question, so students could conceivably write any goal or motivation they had. Responses were analyzed deductively according to Kasravi’s (2009) themes; however, some themes were changed in order to better explain this data. Kasravi’s six themes consisted of cultural experience and knowledge, practical skills, new views on world and U.S., social skills/experiences, personal growth, and personal/other. By following Kasravi’s classification of study abroad themes, the findings were organized according to subthemes and categories. These themes are not mutually exclusive, as students might have referenced several themes as motivations for studying abroad. The subsequent themes and subthemes indicated in this study are displayed in Table 4.10.

Table 4.10
Goals and Motivations by Theme and Subtheme: Survey Open-Ended Response (n = 139)

Goals and Motivations	Frequency
Cultural experience and knowledge	
Travel	37
Experience another culture	36
Experience a country in particular	12
Take advantage of the opportunity	5

Assimilate into another culture	1
New views on world and US	
Experience education elsewhere	4
Experience engineering education elsewhere	4
Gain a new perspective	1
Personal growth/other	
Develop global competency	7
Explore my heritage	4
Become a global citizen	1
Be more independent	1
Visit relatives	1
Practical skills	
Improve a foreign language	10
Take major requirement courses	9
Take GE courses	3
Conduct research	1
Social skills	
Meet new people	1
Volunteer	1

Goals related to cultural experiences and knowledge (the first category) were the most frequently cited goals for studying abroad. The most common factor within that category was travelling ($n = 37$) followed by experiencing another culture ($n = 36$). The second most cited category was practical skills. Students indicated that their goals were to improve a foreign language ($n = 10$) and take major requirement courses ($n = 9$). Overall, the results show that goals and motivations related to cultural experiences and knowledge were the strongest motivations for studying abroad.

Goals by gender. Data revealed that males ranked “I wanted to meet new people” higher than females (males $M = 4.42$, females $M = 3.97$), $t(140) = 3.17$, $p < .01$, two-tailed. The same was true for “I wanted an internship:” males on average ranked that variable higher than females (males, $M = 2.0$, females, $M = 1.63$), $t(141) = 1.98$, $p = .05$, two-tailed.

Similarly to Lucas' (2009) results, men may prefer to study abroad when an internship is incorporated into the experience, allowing them to build their resume as a professional experience.

Goals by program duration. When reviewed by program duration, the top five goals for each program length remain the same as in Table 4.19. Regardless of program length, goals for going abroad tend to be culturally focused for undergraduate engineering students. While short-term programs have been criticized as a glorified vacation (Bremer, 2008), this study found that the top five goals for students in all program durations did not differ significantly.

RQ2: What barriers and challenges do undergraduate engineering majors face in their attempt to study abroad?

Another question on the survey asked students to rate the challenges they faced in their attempts to study abroad. In this study, the terms challenges, barriers, drawbacks, and obstacles are used interchangeably. Table 4.11 summarizes the responses to this question in order of the strongest barriers/drawbacks. As with Table 4.9, this table combines responses of “very strong barrier/drawback” and “strong barrier/drawback” as well as “weak barrier/drawback and “very weak barrier/drawback” in order to ease interpretation.

Table 4.11
Barriers and Drawbacks to Going Abroad (n = 143)

	Very Strong/Strong Barrier/Drawback	Neutral	Weak/Very Weak Barrier/Drawback
High cost	52.45%	16.78%	30.76%
Too difficult to leave because of course requirements	46.15%	16.08%	37.77%

Lack of applicable education abroad programs	39.16%	18.18%	42.65%
Timing issues (i.e., program offered in fall and you couldn't go in the fall)	32.87%	19.58%	47.55%
Difficulty in transferring credit back to campus	30.99%	14.08%	54.93%
Lack of other engineering majors who study abroad	25.87%	23.78%	50.35%
Lack of support by faculty in the College of Engineering	20.98%	19.58%	59.44%
Language barriers	11.19%	16.08%	72.73%
Study abroad not valued by employers	11.19%	19.58%	69.23%
Study abroad not valued by faculty	9.79%	16.78%	73.43%
Lack of support from study abroad professionals	8.39%	18.18%	73.43%
Lack of cultural preparation (i.e., you weren't prepared to adapt to the norms of another culture)	6.29%	8.39%	85.32%
Study abroad not valued by your parents, family, or friends	4.90%	9.09%	86.01%
You didn't see the benefit	3.50%	6.99%	89.51%

The top two barriers to studying abroad rated as very strong or strong were high cost (52.45%) and difficulty in leaving due to course requirements (46.15%). Barriers rated as very weak included students not seeing the benefit of studying abroad (89.51%), study

abroad not valued by parents, family, or friends (86.01%), and lack of cultural preparation (85.32%).

Similarly to the open-response question for goals and motivations, students were asked to rank the top three barriers to studying abroad. Again, this question was open-ended, so students could conceivably write any barriers they wanted. The results presented here (Table 4.12) include the top barrier that students listed. Once again, themes were used in order to better categorize the data. The subthemes are the types of barriers that students wrote in. The top barrier to studying abroad was cost (n = 44) followed by too difficult to leave because of course requirements (n = 20). These two barriers match the two from the previous question, meaning that cost and course requirements were identified by the largest number of respondents.

Table 4.12
Barriers and Drawbacks to Studying Abroad by Theme and Subtheme: Survey Open-Ended Response (n=126)

Barrier/Obstacle/Drawback	Frequency
Academic/Engineering issues	
Too difficult to leave because of course requirements	20
Difficulty in transferring credit to campus/for major	16
Lack of applicable courses/engineering courses	10
Missing out on year-long projects	1
Personal issues	
Didn't want to leave	1
Homesickness	1
Program characteristics	
Cost	44
Language barrier	7
Lack of applicable education abroad programs	6
Timing	5
Quarter/semester: quarter system school while most programs were semester	2

Paperwork involved/extra effort to plan for study abroad	1
Lack of support	
Lack of other engineering majors who have studied abroad	3
Lack of support by engineering faculty	2
Lack of support by the college	2
Lack of support by parents, family, and/or friends.	2
Professional issues	
Study abroad not valued by employers	1
No barriers/obstacles/drawbacks	2

Barriers by gender. Data revealed that males ranked “You didn’t see the benefit” lower than females (males, $M = 1.25$, females, $M = 1.53$), $t(114.61) = -2.16$, $p = .03$, two-tailed. While both genders clearly saw the benefit of studying abroad, it appears that females struggled to find the benefit of going abroad slightly more than males. Again, this many indicate that males go abroad when they see the clear career benefits, while females do not need to be quite so convinced.

Barriers by program duration. In general, the top five barriers by program duration were not significantly different than the top five overall barriers listed in Table 4.11. However, the order by program duration is telling. For students who studied abroad over the summer, high cost, lack of applicable education abroad programs, and timing issues made up the top three barriers. Cost is a factor for summer students because often times their financial aid does not apply over the summer. The other two barriers (lack of applicable programs and timing issues) may indicate why this group of students chose to go abroad over the summer—for them, it was too difficult to go abroad during the academic year. For students who studied abroad for one semester, their top three barriers included too difficult to leave because of course requirements, high cost, and difficulty in transferring credit back to

campus. Since they went abroad during the academic year, it is understandable that their barriers would relate to course credit and degree requirements. As these are engineering undergraduates, completing degree requirements abroad is notoriously difficult (Grandin & Hirleman, 2009). Finally, for yearlong students, the top three barriers included: lack of other engineering majors who study abroad, too difficult to leave because of course requirements, and difficulty in transferring credit back to campus. It is understandable that the yearlong students would consider not having engineering peers to talk with regarding yearlong experiences as a barrier. Since engineering undergraduates already make up a small proportion of those students going abroad, and because studying abroad for a year is made up of less than 3% of students nationally (IIE, 2016), this group of students is unique. Social supports may be lacking for yearlong students.

RQ3: What outcomes do undergraduate engineering majors report as a result of studying abroad?

Outcomes were assessed through six categories: impact on academics, impact on professional development, impact on personal development, impact on international/intercultural understanding and competence, impact on working with people, and impact on engineering. Each category was assessed by a Likert scale, from strongly agree (5) to strongly disagree (1), with a neutral option (3) as well. Tables 4.13 through 4.18 show the mean (*M*) and standard deviation (*SD*) for each category. Additionally *t*-tests were run to detect significant differences between genders. When significant differences were found, they are noted below.

Table 4.13
Impact on Academics: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 143)

	<i>M</i>	<i>SD</i>
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Study abroad has been an important part of my overall college experience.	4.77	0.50
Study abroad increased my interest in global current events.	4.34	0.86
Study abroad increased my understanding of global economic and/or political trends.	4.01	1.01
Study abroad increased my second-language competency.	3.33	1.44
Study abroad helped me focus better on academics.	3.25	1.14
Study abroad helped improve my research skills.	2.76	1.19
<hr/> Category Mean	<hr/> 3.74	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

In general, the category mean for *impact on academics* (Table 4.13) was close to 4 (agree) at 3.74. With respect to individual items, engineering students strongly agreed (4.77 mean score, where 5 = strongly agree) that “Study abroad has been an important part of my overall college experience.” By contrast, “Study abroad helped improve my research skills” had a mean score close to neutral (2.76, where 3 = neither agree/disagree).

Males and females tended to rate each of the statements similarly, with both rating “Study abroad has been an important part of my overall college experience” and “Study abroad increased my interest in global current events” as first and second in this category, respectively. An independent *t*-test was run to determine significant differences. The results of the *t*-test indicated that men were more likely to indicate that study abroad helped increase their second-language competency, $t(139) = 2.19, p = .03$, two-tailed). The mean result for men ($M = 3.58$) was .53 points higher than that for women ($M = 3.05$). When reviewing the

language of instruction (LOI) by host institution, 87.5% of females indicated the LOI was English compared with 73.4% of males indicating the LOI was English. The lower percentage of males taking courses in English indicates that they had more of an opportunity to practice a second language than females. Data also revealed males ranked “Study abroad has been an important part of my overall experience” at 4.86, which is significantly higher than females ($M = 4.67$), $t(101.69) = 2.22$, $p = .03$, two-tailed.

Table 4.14
Impact on Professional Development: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 143)

	<i>M</i>	<i>SD</i>
Because of study abroad, I will feel comfortable working internationally.	4.34	0.81
Study abroad is important to my professional development.	4.13	0.91
Study abroad will enhance my lifelong career opportunities.	3.90	1.06
Study abroad will help me in my search for my first job after graduation.	3.42	1.16
Category Mean	3.95	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

The category mean of *impact on professional development* (Table 4.14) was close to 4 (agree) at 3.95. Students strongly agreed that “Because of study abroad, I will feel comfortable working internationally” with a mean of 4.34. Students also agreed that “Study abroad will help me in my search for my first job after graduation” although this was the lowest mean in this group at 3.42.

Males and females generally tended to rate each of the statements equally, but one interesting difference is with the statement “Study abroad will enhance my lifelong career opportunities.” For males, the mean was slightly higher ($M = 4.01$) than for females ($M =$

3.79). These findings indicate that for male study abroad participants, they generally believe that study abroad will be important to their career potential.

Table 4.15

Impact on Personal Development: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 142)

	<i>M</i>	<i>SD</i>
Study abroad was important to my personal development.	4.72	0.51
Study abroad made me more self-reliant and independent.	4.54	0.68
Study abroad increased my self-confidence.	4.46	0.81
Study abroad increased my tendency to take risks.	4.30	0.83
Study abroad increased my self-confidence when working or socializing outside my comfort zone.	4.30	0.80
Study abroad increased my patience and flexibility when dealing with other people.	4.18	0.87
Study abroad increased my leadership abilities.	3.87	1.00
Category Mean	4.34	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

The category mean of *impact on personal development* (Table 4.15) was close to 4 (agree) at 4.34. With respect to individual items, engineering students strong agreed ($M = 4.72$, where 5 = strongly agree) that “Study abroad was important to my personal development.” By contrast, “Study abroad increased my leadership abilities” was close to agree ($M = 3.87$, where 4 = agree).

Table 4.16

Impact on International/Intercultural Understanding and Competence: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 141)

Field	<i>M</i>	<i>SD</i>
Study abroad gave me increased insight into other cultures.	4.67	0.54
As a result of studying abroad, I have an increased appreciation for other cultures.	4.55	0.7

Study abroad made me more aware of differences in peoples and cultures.	4.48	0.74
Study abroad made me more aware of how the international community views Americans in general.	4.38	0.83
Study abroad gave me familiarity with international issues and affairs.	4.30	0.82
Study abroad made me more aware of other norms and taboos.	4.27	0.70
Study abroad made me more aware of how other people view me.	4.21	0.79
While studying abroad I made a conscious effort to adjust my behavior to cultural norms and customs.	4.20	0.89
Category Mean	4.38	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

The category mean of *impact on international/intercultural understanding and competence* (Table 4.16) was the highest at 4.38, making it close to agree. Respondents most strongly agreed with “Study abroad gave me increased insight into other cultures” at 4.67 average, but also agreed with “While studying abroad I made a conscious effort to adjust my behavior to cultural norms and customs” at 4.20.

Table 4.17

Impact on Working With People: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 141)

	<i>M</i>	<i>SD</i>
Study abroad increased my ability to communicate successfully with people from other cultures.	4.30	0.82
Study abroad improved my ability to work in teams of ethnic and/or cultural diversity.	4.19	0.93
Study abroad helped me network with global experts in my discipline.	3.35	1.29

I have increased contact with international students on campus as a result of my experience abroad.	3.26	1.20
I have increased contact with international students in my community as a result of my experience abroad.	3.21	1.20
Category Mean	3.66	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

The category with the lowest mean (indicating perhaps the least impactful category) was *impact on working with people* (Table 4.17). The question “Study abroad increased my ability to communicate successfully with people from other cultures” was ranked close to agree with a 4.30 average, while the question “I have increased contact with international students in my community as a result of my experience abroad” was ranked close to neutral with a 3.21 average. When looking at gender differences for this category, the rankings for “I have increased contact with international students on campus as a result of my experience abroad” differed significantly. The mean result for men ($M = 3.47$) was .45 points higher than for women ($M = 3.02$), $t(138) = 2.24$, $p = .03$, two-tailed.

Table 4.18
Impact on Engineering: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 141)

	<i>M</i>	<i>SD</i>
My study abroad experience enhanced my perspective on the value and importance of my discipline on the global community.	3.98	1.00
I have a deepened interest in pursuing an engineering career in a multi-national organization because of my experience abroad.	3.94	1.00

My study abroad experience enhanced my ability to deal with ethical issues arising from cultural and/or national differences.	3.84	0.95
My study abroad experience increased my understanding of the impact of engineering solutions in a broader global and societal context.	3.51	1.14
My study abroad experience better equipped me to apply my engineering skills to solve real-world problems in a broader global and societal context.	3.47	1.14
I returned to campus with more confidence in my engineering talents and abilities than I had prior to the study abroad experience.	3.35	1.19
Category Mean	3.68	

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

In general, the category mean for *impact on engineering* (Table 4.18) was close to 4 (agree) at 3.68. With respect to individual items, engineering students agreed ($M = 3.98$, where 4 = agree) that “My study abroad experience enhanced my perspective on the value and importance of my discipline on the global community.” By contrast, “I returned to campus with more confidence in my engineering talents and abilities than I had prior to the study abroad experience” had a mean score close to neutral ($M = 3.35$, where 3 = neither agree/disagree). Overall, when looking at all six categories, it appears that the impact was strongest in *intercultural understanding* and the least strong in *working with people*.

Table 4.19
Overall Impact: To What Extent Do You Agree with the Following Statements about Studying Abroad? (n = 142)

	<i>M</i>	<i>SD</i>
Overall, I was satisfied with my study abroad experience.	4.73	0.60

As a result of study abroad, my life was transformed. 4.28 0.87

Note. Likert scale response: 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree

Overall, students were extremely satisfied with their experiences, and they also strongly agreed that their life was transformed as a result of studying abroad (Table 4.19). Regardless of goals, challenges, and outcomes, students felt that studying abroad was a satisfying experience. Details of what made study abroad satisfying and transformative (Mezirow, 1991) are discussed more in Chapter Five.

Of the 145 survey respondents, 42 (29%) answered the question “Are there other ways in which you feel studying abroad changed you?” These answers include a wide range of outcomes from studying abroad, as seen in Table 4.20. Most students chose to expand on similar themes as were asked about in the survey. Some participants listed more than one factor, and all factors that students reported are included here. The most common factor was *personal development*. Common terms to describe this included “more well-rounded,” “more open-minded,” “more independent,” “more confident,” and “more self-reliant.” One student described his new perspective at dealing with hurdles in life:

[I] became very relaxed about my pace in life compared to others, felt more independent and didn't compare myself to others as much, and became very unafraid of new things, including classes. Every challenge became just another hurdle that I knew I had the ability to cross. I gained confidence that I am capable of doing anything and everything I want to do, given time and effort.

Table 4.20

Thematic Groupings of Responses to the Question: Are There Other Ways In Which You Feel Studying Abroad Changed You? (n = 42)

Personal development	18
Intercultural development	15
Academic development	10
Professional development	7
People	6
Not engineering	6
Engineering	2
Negative academic development	1
Difficult personal development	1

The second most common factor was *intercultural development*. This theme expressed itself as a newfound appreciation for other cultures and as development of skills and abilities to interact with people from another culture. One student described:

I intend to travel more now. I also realized travelling abroad is really important for empathy. Try as you might, the understanding and appreciation one has of a culture and peoples will never be adequate unless one actually travels there. I think it is not only beneficial but imperative that we send students abroad. Otherwise one cannot help to be close-minded, not at any fault of their own, but because one cannot even come close to understanding the world if they've lived in the same state or even country their whole lives.

Another student mentioned the deep impact studying abroad had on his understanding of racial difference:

Studying and living in a place where I was part of such a minority group gave me some understanding of what that is like. As a heterosexual, middle class, white male I have never had to deal with being a minority in America. In Japan I was treated like an outsider at times, simply because of who I was, and not because of what I did or

said. This helped me to understand better what minority groups in America go through. That experience is so valuable to me.

Perhaps very importantly, students developed more empathy for other cultures. One student explained “I am much more willing to make the effort in understanding someone else rather than allowing first appearances to guide my judgments.”

Ten students discussed *academic outcomes* as a result of studying abroad. This theme expressed itself as more interest in world news and politics, new perspectives on teaching and education, as well as new perspectives on both engineering and general education courses. One student studied thermodynamics in Iceland, and explained that the location itself was important for academic growth:

My study abroad program was quite unique in that Iceland is the ideal location to study thermodynamics. Therefore the location itself had a very real impact on my study abroad experience as I was able to see everything I learned in the course play out in nature and in the various machinery and power plants we were able to tour. The first hand experience (seeing thermodynamic principles in action) helped me to learn and retain (long term) the lessons of the course.

Another student explained that working in a lab was important for a new perspective as well. Working in a lab has the important benefit of helping students *work with people from other cultures*.

The other factors mentioned were more rare. Overall, it is apparent that personal and intercultural development were the most important outcomes from studying abroad. Additionally, students cited academics as an important outcome, though few students mentioned engineering-specific outcomes as a result of studying abroad.

Outcomes by program duration. Many studies have attempted to determine if there is a difference in outcomes for students who studied abroad for varying durations. They question whether short-term programming is too short in order for real benefits to occur. Tables 4.21 – 4.23 show the top five outcomes by program duration (summer, semester, and yearlong, respectively). The top two outcomes, while the mean score is different, were the same: study abroad was important to students’ personal development and gave them increased insight into other cultures. The magnitude is slightly stronger for semester and yearlong students, but all durations strongly agreed that study abroad contributed to these outcomes. The remaining three outcomes differ somewhat based on program duration, but generally outcomes did not differ significantly based on program duration.

Table 4.21
Top Five Outcomes by Summer Duration (n = 68)

Rank		<i>M</i>	<i>SD</i>
1	Impact on personal development: Study abroad was important to my personal development.	4.66	0.54
2	Impact on international/ intercultural understanding and competence: Study abroad gave me increased insight into other cultures.	4.57	0.61
3	Impact on personal development: Study abroad made me more self-reliant and independent.	4.57	0.59
4	Impact on international/ intercultural understanding and competence: As a result of studying abroad, I have an increased appreciation for other cultures.	4.48	0.77
5	Impact on personal development: Study abroad increased my self-confidence.	4.48	0.71

Table 4.22
Top Five Outcomes by Semester Duration (n = 61)

Rank		<i>M</i>	<i>SD</i>
1	Impact on international/intercultural understanding and competence: Study abroad gave me increased insight into other cultures.	4.77	0.46
2	Impact on personal development: Study abroad was important to my personal development.	4.74	0.51
3	Impact on international/intercultural understanding and competence: As a result of studying abroad, I have an increased appreciation for other cultures.	4.62	0.58
4	Impact on international/intercultural understanding and competence: Study abroad made me more aware of how the international community views Americans in general.	4.54	0.65
5	Impact on international/intercultural understanding and competence: Study abroad made me more aware of differences in peoples and cultures.	4.51	0.62

Table 4.23
Top Five Outcomes by Yearlong Duration (n = 7)

Rank		<i>M</i>	<i>SD</i>
1	Impact on personal development: Study abroad was important to my personal development.	5.00	0.00
2	Impact on international/intercultural understanding and competence: Study abroad gave me increased insight into other cultures.	4.71	0.49
3	Impact on international/intercultural understanding and competence: Study abroad made me more aware of differences in peoples and cultures.	4.71	0.49

4	Impact on personal development: Study abroad increased my self-confidence.	4.71	0.49
5	Impact on international/intercultural understanding and competence: Study abroad made me more aware of how the international community views Americans in general.	4.57	1.13

Chapter Four Summary

This chapter presented the findings from the survey, which was completed by 145 students. Goals for going abroad typically fell into the category of “cultural experience and knowledge” which included travel, experience another culture, and experience a country in particular. Practical skills and academic learning were of less importance. The two strongest barriers were related to course requirements and the high cost, but because this group of students actually did study abroad, they were able to overcome these barriers. Outcomes of study abroad were assessed in six categories. The category with the highest mean, indicating the strongest impact of study abroad, was “impact on international/intercultural understanding and competence” followed closely by “impact on personal development.” While the results are still close to “agree,” the category titled “impact on engineering” had one of the lowest means, indicating it had less of an impact than other categories.

In some cases, *t*-tests detected significant gender differences. However, these results indicate that most goals, motivations, and outcomes do not differ significantly based on program length or gender. The conclusions based on these results are presented in Chapter Six.

Results generally did not differ based on program duration. The top five goals for each program length remained the same, although there were some differences in the order

students ranked the barriers. For students who studied abroad over the summer, high cost, lack of applicable education abroad program, and timing issues made up the top three barriers, whereas for students who studied abroad for one semester, their top three barriers included too difficult to leave because of course requirements, high cost, and difficulty in transferring credit back to campus. For yearlong students, the top three barriers included lack of other engineering majors who study abroad, too difficult to leave because of course requirements, and difficulty in transferring credit back to campus. Regarding outcomes, the top two outcomes are the same: study abroad was important to students' personal development and gave them increased insight into other cultures.

CHAPTER FIVE: QUALITATIVE FINDINGS

This chapter presents the qualitative findings for each research question:

1. What are undergraduate engineering majors' goals and motivations for studying abroad?
2. What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?
3. What outcomes do undergraduate engineering majors report as a result of studying abroad?
4. What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

The data presented in this chapter come from the individual interviews with both the seven academic advisors and the eleven undergraduate engineering students. While the student interview participants included both recent alumni and current students, they are all called "students" here.

Rather than organizing the findings by each research question, the findings for the qualitative data are organized under two global themes that emerged: *Decision-Making Regarding Study Abroad* and *Impact of Study Abroad*. Each global theme will be discussed, as well as the accompanying organizing and basic themes.

Decision-Making Regarding Study Abroad

The first of the two global themes, *Decision-Making Regarding Study Abroad*, addresses important factors that students and advisors described as students planned to study abroad. Using Kasravi's (2009) conceptual model as a lens, the facilitators and challenges

each serve as organizing themes, and the personal, social, and institutional factors serve as basic themes. Figure 5.1 below gives a visual representation of this theme.

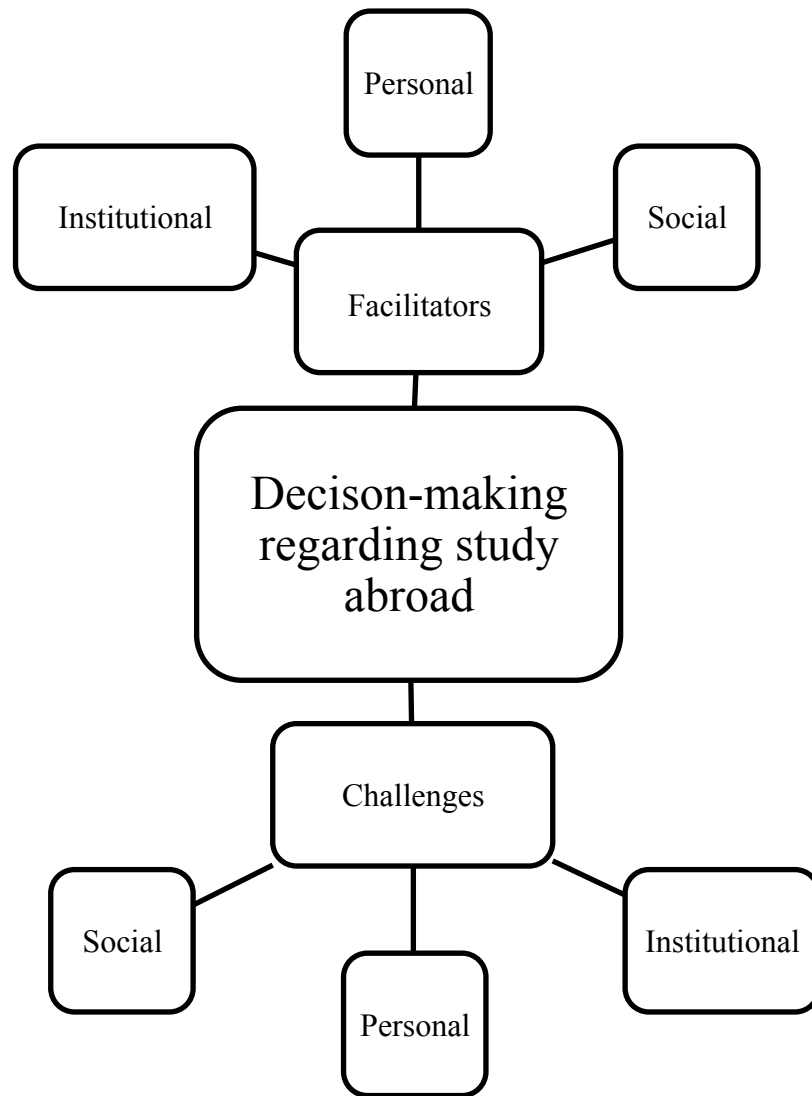


Figure 5.1. Decision-making regarding study abroad – organizing and basic themes.

Facilitators and challenges, as organizing themes, were not always easy to classify; something that may be a facilitator to some students might be a challenge to others. In order to ease interpretation, facilitators or challenges that were mentioned by more than half of the student interview participants (six or more) are included in the analysis. For advisors, facilitators and challenges mentioned by at least four advisors are included here.

This section contains the findings for research questions one, two, and four:

RQ1: What are undergraduate engineering majors' goals and motivations for studying abroad?

RQ2: What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?

RQ4: What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

Facilitators

Facilitators, as an organizing theme, encompass the personal, social, and institutional factors that were important in students' decision-making regarding study abroad. These factors emerged from students' descriptions of their own attitudes and behaviors as well as advisors' descriptions of their own or students' attitudes and behaviors. Some factors were outside the control of students and academic advisors, things like program characteristics and program cost.

Facilitator: personal factors. While personal factors appear as a basic theme, it is clear that personal factors can be further defined in order to improve interpretation. In interviews, students described personal factors related to personal characteristics and

perceived outcomes. Advisors also noted the importance of students' personal characteristics to facilitate study abroad.

Students: personal characteristics. The theme personal characteristics encompassed any quality that students mentioned that seemed to facilitate study abroad. Two subthemes emerged: internal drive and advanced planning. The subtheme of internal drive is similar to one in Kasravi's (2009) study. Internal drive is related to students' internal motivation and strong desires to study abroad. For engineering students in particular, incorporating studying abroad within an already packed curriculum meant that they had to make an extra effort to plan for study abroad. Andrew noted:

I knew from the beginning it was going to be difficult with courses, and being an engineer is difficult to take courses elsewhere. ... I tried not to think about it too much and accept the fact that it was difficult and I just went for it.

Ian described a similar situation. When explaining how he managed to find courses that were equivalent to his campus' courses, he said: "I had my mind set that I was like ok I want to do this so I'm going to put in the work and make it work somehow." Ian explained:

once I realized it was something that was doable and did some research, I was like 'why not?' It's only 5 months. When I come back it really will be right back to normal. It just seemed like an experience that if I didn't do that I would be missing out on.

Internal drive also expressed itself by students' desires to study abroad above all other campus activities. They knew that they would be missing out in jobs, internships, or clubs, but they felt that studying abroad was worth the few months lost. Jeffrey explained:

I did not have an internship at the time [of decision-making] so ... I remember debating that, should I get an internship or should I go abroad, and I was just like you know what, which one of these is much less likely to happen? One thing about study abroad that's great is when you go somewhere you get to live there for six months. You don't just get to visit for a week or two or month, you get to live there and really, really know what it's like. And you don't have to worry about things like rent at home.

Daniel had a similar experience: "there were some organizations I was involved in, and I would be missing out for a year, and there were some opportunities I missed out on but there were definitely a lot opportunities in Singapore as well." Brandon wanted to study abroad during the school year so that he could still intern full-time over the summer.

Jim even turned the potential drawback into an opportunity. He knew that by staying at Campus 1 he would be able to work with the professors and get recommendation letters from them. But "then I realized I could just ask the professors in Germany, which I feel that getting a recommendation letter from one of your abroad professors means a lot so I was pretty excited about that one."

Advanced planning was also an important characteristic that several students described. Brandon was the only one of the interview participants to project graduation in three years, and he was also the only of the interview participants to study abroad during his sophomore year. When asked why he decided to go during his sophomore year, he reflected:

No one told me sophomore year was the best. It worked out really well. I think I had been deciding between ... going to go the spring of sophomore year or the fall of junior year. But I think the reasoning was I was considering graduating early. I was

going to be graduating a year early and I knew if I went abroad my second semester junior year that would actually be ... my last semester.

Marcus studied abroad for a full year and explained how he chose when to go abroad:

I purposefully picked that semester for a reason, like if I [studied abroad] during the summer maybe I'll miss an opportunity do some kind of research or some kind of internship. I knew that semester I was going to be really busy with courses and I wouldn't have time to do any outside activities. Also I picked it my third year instead of my fourth year because I know fourth year mechanical engineers ... do really big student projects, so I knew I had to do third year semester two for sure so that I wouldn't miss opportunities.

Students: perceived outcomes. When asked what their goals and motivations for studying abroad were, it was clear that students also considered these goals as perceived outcomes. For the sake of this section, goals and motivations are called “perceived outcomes.” Three subthemes emerged regarding perceived outcomes: cultural experiences and knowledge, personal growth and outlook, and practical outcomes.

Cultural experience and knowledge. Similarly to the survey results, students in interviews discussed their desire and excitement to leave the United States to learn about other cultures. Many students discussed a desire to “take advantage of the opportunity abroad.” Peter had participated in a study abroad program while in high school, and it was that experience that served as an impetus to go abroad again. As he explained it, “after that trip I thought it was really nice to meet people from all over the world, so that’s what started this study abroad motivation I guess. Once I was in college I was like ok I have to do this, and I managed to do it eventually.” He repeatedly expressed his excitement to meet people

from all over the world.

Students also described their desires to learn about another culture. Brandon, who studied in Hong Kong, explained that he wanted a culture that was very different from the United States:

I wanted to spend an extended period of time in a very different culture. One of the things I definitely wanted to do was a culture that I think people would consider a little more challenging to spend an extended period of time in. I felt like if I went to the UK I would just show up and everyone would speak English and it wouldn't be that different or that unique from an experience in the United States.

Even for students who had travelled abroad before, living in a new culture was important to them. Marcus explained "I wanted to see what it's like to live in a different country. I've lived in Taiwan before ... and I just wanted to live in a new country where I can experience something different."

Travelling was also a common subtheme in this category. Michael, who did not need the courses taken abroad in order to graduate, cited travelling and living in a new culture as big motivators. He had known since high school that he wanted an international experience, so with Singapore's proximity to other South Asian nations, he could not let the opportunity pass.

Personal growth and outlook. The desire for personal growth and a new outlook expressed itself in various ways. For some students, going abroad meant the chance to be independent. Marcus explained:

I wanted to see what it's like to be completely independent. I basically wanted to test myself, what it would be like to have no one by me, go to a country where you know

no one and you don't really even have contact with your family, just be completely cut off kind-of-feeling. I just wanted to see if I were in that situation how would I handle it.

While some students expressed the desire to be independent, others discussed wanting to get out of their comfort zones. Brandon said "Get out of your comfort zone ... experience stuff that is not the typical suburban life." Richard explained that he was looking for "a breath of fresh air:"

I was actually looking for a new perspective, that was what I was hoping to learn. I was hoping to see how other people in the world viewed similar challenges, what do they see differently, what do they see similarly, in the engineering side but also in the larger picture of other aspects of life.

Practical outcomes. Practical outcomes were related to language learning and engineering. Three students (Jeffrey, Jim, and Michael) had language learning goals. Jeffrey and Jim both studied abroad at universities where the language of instruction was not English. They had both been studying their respective second languages for years and were eager to improve their language skills. Jim had very specific motivations:

The reason was because since I grew up speaking German I really wanted to improve my language skills, that was really the driving force. And I wanted to be able to say "oh I can speak engineering in German," which is a whole different beast of its own. And then I've been to Germany a couple times but always on vacation for a couple weeks at a time, and I wanted to be there for an extended period. Those two were the main motivations, language and wanting to live there and really understand how it

works and be able to leverage that into a job or a career where I would be able to use my language skills.

Michael's family was Chinese and he wanted to practice Chinese, but the language of instruction of his classes was English.

Four of the students (Cody, Daniel, Marcus, and Richard) referenced wanting to experience engineering education elsewhere. This was reflected both inside and outside of the classroom. Cody noted:

One of the reasons I wanted to study at an engineering school abroad was to see the differences in the coursework. I've always been told that American schools are more based on theory, it's less hands on, and so I wanted to see also what different teaching styles for engineers, what different courses are offered, definitely a lot of subjects taught in Lund that you wouldn't get at Campus 3. So it was nice to have that variety.

Marcus considered the extracurricular activities that he could be a part of, particularly the student organizations:

I started reading into [the university abroad] and I was like oh my gosh this is an incredible engineering university. And then I started looking at the different student organizations and I realized there were a couple of organizations that Campus 5 doesn't have, so I was more interested in going to [the university abroad] so that I could join these organizations as well.

Richard chose his university because it was known as one of the "pioneers of computer engineering." Daniel chose his location based on the faculty and type of courses available at his host institution. He explained:

There were classes that seemed interesting to me and some of the professors did some interesting research. I wouldn't be able to do research while I was there but it was something that motivated me to choose Singapore. ...It was some coursework I was really interested in, and that was one of the big motivating factors for me.

Advisors: students' personal characteristics. Advisors shared views on students' personal characteristics that facilitated study abroad for their students. These personal characteristics encompass qualities advisors saw in their students, not themselves. Some advisors noted that personal characteristics developed before students entered university paved the way for a study abroad experience. Heidi suggested that a previous international experience was a strong indicator of a student's willingness to go abroad: "Students who are most likely to study abroad in my experience are students who are already international students or have already spent some time someplace else, and so they're more open to the idea of going somewhere else." In addition Elaine noted that student interest in study abroad may have developed in high school. She described that students are now coming into college asking about studying abroad, which is a new trend in her department. Brenda at Campus 5 confirmed this initial excitement: "We ask them at the beginning of the year how many are interested and a whole bunch of hands go up. ... At least initially they are very, very interested in it." Other advisors suggested that students in a particular major may be more inherently interested than students in other majors. Kelly pointed out that students in her department, biomedical engineering, tend to have a different mindset than in other engineering majors:

[Biomedical engineering] students are more interested [in studying abroad], that would be my analysis of the difference between them and other engineering students.

They tend to be more interested in that type of thing. ... Our students can be fairly different from other engineering students.”

Interestingly, her department has roughly 50% women, which is far more than other engineering departments at Campus 6.

Facilitator: social factors. The social factors displayed in Figure 1.2 include perceived social pressure, primary sources of information, experiences and recommendations of others, advising, and faculty engagement and support. Not all factors came out in the interviews, either because students did not find them important or because they were not asked about them in the interviews. From the students’ perspectives, social factors included experiences and recommendations of others and advising. Advisors described faculty engagement and support as well as advising as influential facilitators. Faculty engagement was considered a social factor when it related to their attitudes and encouragement of study abroad.

Students: experiences and recommendations of others. Six of eleven students (55%) indicated that the experiences and recommendations of others were positive influences for studying abroad. This theme expressed itself in several ways, whether it be through friends, family, social media, or peers. Friends exerted a strong influence on studying abroad for Cody, Peter, and Brandon. Cody studied abroad with three friends (they all went to Sweden together) which helped him feel more comfortable with studying abroad. Peter indicated that he was not aware that study abroad was an option until his friends brought it up. Brandon also had friends that were from Hong Kong, so “I could grill them on things about the city and stuff like that.”

Another social influence was the use of social media. Some campuses offered prospective study abroad students the option of connecting with returnees through email. Marcus explained that “was pretty nice to email someone about any questions or concerns you have ... so that when you go to that country you expect something ... it just made it nicer to have someone to talk to and get to know what you’re getting into.” Brandon also referenced a Facebook group for studying abroad at his campus, where he could ask questions if he had any. Notably, students did not mention faculty or peer mentors as a source of influence in study abroad.

Students: advising. Advisors, both academic and those in the study abroad office, were considered social influences because they were sources of information and encouragement. Some of the students met with their academic advisors prior to studying abroad, mostly to determine course transferability and to plan out appropriate classes while abroad. Brandon explained: “I did use my academic advisor for making sure courses would transfer back. She was very helpful with helping me to get the forms to get things approved, to look at syllabi, things like that.” Peter’s advisor specifically encouraged him to take five years to graduate so that he could study abroad and not be stressed about missing course sequences.

Some students also utilized the study abroad office on campus: “Midway through my second year when I was like ‘ok, I should probably start looking into study abroad,’ I just wandered into the office and I said ‘hi, I’d like to talk to someone about an engineer studying abroad’” (Andrew). Peter also referenced the study abroad office:

The biggest resource was my study abroad advisor from Campus 3. He was the one that would tell [me] where to go for more information. He brought up a few

suggestions of what I should do he was like “ok, look at these countries, look at these programs, and then engineers typically go here” is what he told me. So that’s how I found out about Sweden.

Not only was the office useful for trying to find a program, Andrew also noted that they continued to be helpful right up to when he left:

Whenever I had questions or whenever I needed help with something or something needed to be explained, I would go to the study abroad office. The study abroad office is definitely what got me there and got me on the right track, that’s the only reason I managed to make it.

Advisors: faculty engagement and support. Five advisors referenced instances when faculty attitudes promoted study abroad. Elaine gave one example:

And I think one of the examples that was really eye-opening for ... computer science and computer engineering: our department is very popular abroad and gets many graduate applications for students who are, for example, coming from those host institutions that we try to send our undergraduate students to. If they are good enough for us to be accepted into our graduate programs, why isn’t that school enough for our undergraduate students to attend? Putting things into perspectives or using analogies was quite helpful and I think it opened doors. Plus many faculty have colleagues with whom they collaborate abroad and exchange ideas and visit them and are visited by them, so there is an international exchange. Why would that not be something we want our students to experience?

Megan pointed out that when faculty have connections to colleagues abroad, they are likely more supportive of study abroad as well. Corey also noted “I think that our

engineering faculty are very pro-[study abroad program] and understand the value of learning about yourself situated in a different culture because even students that go abroad during the summer for a language and culture institute or GE courses, they find that there's value in that as well.”

Advisors: advising. Academic advisors themselves served as social supports. Their belief in the benefits of studying abroad, their knowledge of specific programs, and their planning sessions with students all contributed positively to decision-making regarding study abroad. All advisors noted that their own beliefs in study abroad serve as facilitators.

Veronica summed up her responsibility nicely:

To be encouraging to students when they bring it up in our advising appointments, that's what I view the most that I could do. Because if I said “oh yeah that's not a good idea” that would really deter them. [I am] positive and encouraging about it, [and I] brainstorm with them what makes the most sense, what are some of their options.

Several participants (six of seven) said that advising sessions were important times to help dispel the perceived barriers of study abroad. Corey believed that students:

hear too much “engineers can't go abroad.” They hear it occasionally from faculty within the College of Engineering that haven't been a [study abroad course] evaluator and they just don't even know that their students are going abroad.

She added that her role was to affirm “you can study your major or other things related to your degree abroad and graduate in four years.”

Elaine further expressed that advising sessions were important times to:

debunk, demystify, and educate. Debunk those misconceptions about “oh it’s too expensive I cannot afford it,” “I don’t have money,” and “it will delay my graduation” and those kinds of things. It is my job to tell them that those are not the facts, there is just misinformation that is out there. [My job is also] to educate them and to provide information about the benefits that they will experience and gain from studying abroad.

Advising was not a practice limited to staff advisors. At Campus 5, a new advising program run by the study abroad office hired two peer advisors who were engineering majors who had studied abroad. As Brenda noted, the peer advisors were effective for helping students and often had longer lines for advising sessions than advisors did.

Some advisors had knowledge of specific programs that could benefit engineering majors. Megan was able to go on a site visit to help encourage her students to study engineering in specific locations. As she explained it:

I went abroad to do a site visit for two of the new programs that we have, and so ... when students come in and say “oh you know I’m interested in maybe getting this type of credit” then I usually recommend those types of programs to them just because I know a little more since it was a first-hand experience.

Three of the participants referenced a professional development conference put on by the system-wide study abroad office in which they were able to connect with advisors at other campuses and learn about how to facilitate study abroad for engineering students.

Long-term planning also facilitated study abroad. Elaine emphasized that encouraging study abroad as early as students’ freshmen year gives them time to plan study abroad into their curriculum: “Planting the seed early on is really important because then

[students] have enough time to get used to the idea and the more often they hear about it the more acceptable it becomes.” This also ensured that students met important deadlines for the study abroad application.

Facilitator: institutional factors. The basic theme of institutional factors included the home university context and how it influenced study abroad participation. When students or advisors referenced faculty as evaluating coursework, faculty were considered an institutional factor. From the students’ perspectives institutional factors include study abroad program characteristics. From the advisors’ perspectives, institutional factors include academics and curriculum, recruitment and marketing, program characteristics, and the study abroad program office.

Students: study abroad program characteristics. The theme of study abroad program characteristics encompassed any instances where students describe how the program itself facilitated study abroad. Choosing classes to take abroad was often a challenge (to be described in the section on challenges). However, when courses were easy to find abroad, it facilitated studying abroad. Cody, Marcus, and Ian discussed the system-wide course database as a facilitator. Ian explained how the course database was useful not only for him but for his advisor as well:

There was some [system-wide] guide online that I found that [contained] all the courses that had been approved before, so I based a lot of my [courses] off of that just because I knew that it’s been approved before. I don’t have to worry too much about trying to get it approved. Counselors will see that it’s been taken before, approved before, so it will be a lot easier to get classes [that satisfy academic requirements].

Marcus had a different view. For him, the course database was not particularly helpful for engineering courses, but it was for general education (GE) courses:

they were all GEs and not engineering courses, but it was nice to look at them because in the end I was able to pick one GE from that, which was Australian History, and I had a lot of fun in that class, so it was nice to have that tool to use.

Richard chose his university abroad because it was one of the pioneers for computer engineering. Ian, Peter, and Brandon noted that their universities abroad offered “the perfect combination of English-speaking and ... engineering courses” (Brandon). Ian noted too that he had to choose a program in English because he did not speak a foreign language:

I was looking for the technical school, a lot of places only taught their technical courses in the home language, so some of the German schools that are really good, the computer science courses were all taught in German, and I obviously can't do that I don't speak a single word of German and there's no way I can learn it in time to do well.

Program cost served as a facilitator in various ways. Brandon and Ian both discussed how studying abroad was not much more expensive than staying on campus, so money was not a barrier. Brandon noted that:

For some people I'm sure money comes into play, wasn't personally an issue but I honestly think you can kind of save money by doing this because you're paying tuition but you're living in a much lower cost of living area, but you kind of want to make the full experience. Most people travel a lot, so you want to have some discretionary funds for plane tickets, eating out, and all those things.

Ian noted that his parents were supportive: “My parents were willing to pay for it so ... as long as it’s not absurd and it’s somewhat comparable then they were open to it. The experience of it was worth the extra little money that maybe it would cost.”

Students who studied abroad through the system-wide study abroad program (all students in this study) have the added benefit that their financial aid applies also to studying abroad. This was particularly helpful for Marcus in his decision to study abroad. Andrew also credited financial aid to being able to go abroad. He noted without financial aid covering most of his expenses, studying abroad would not have been possible. Similarly, Peter also credited financial aid:

The cost is really reasonable but it’s still a lot. A lot of my trip was paid for by my grants first of all, and then the rest of it, especially the money I used while I was abroad, some of it was scholarships and a lot of it just came from my family.

Cody and Jeffrey both received scholarships.

While some students may have originally considered cost as a barrier, the data showed that through scholarships and financial aid, cost was actually a facilitator. Surprisingly, only three students (27%) mentioned cost as a barrier to participation. However, all three noted that the experience abroad was worth the added cost. Jeffrey noted receiving both national scholarships and system-wide scholarships. As he explained:

I’m low-income, I’m first generation as well. I remember on my scholarship I checked four out of six boxes, transfer student, minority student, first generation college student, even engineering. I didn’t check like veteran and over 25, those were the two that I didn’t check.

Advisors: academics and curriculum. Academics and curriculum served as positive influences of studying abroad in various ways. First, planning could help alleviate two common issues with the curriculum: course offerings only once a year and the sequential nature of the courses. For example, Kelly expressed that in her department:

[Advisors] made a specific point of giving [students] a time in the year that they could go so that they weren't limited to summer only. Junior year fall quarter is when they can leave, that's the only time they can go during the school year. We set it up so that we were willing to allow course substitutions for the courses they would be missing –we have a way to work around that. So basically we were saying “We're going to make it so this quarter works for people, and so long as you plan it and you work with us this is something we're going to approve.” That's a way that we make that work for our students.

The engineering curriculum is notoriously rigid, which may be further compounded at small schools where courses are only taught once a year. Elaine described her campus' (Campus 3) efforts to facilitate study abroad by offering core courses frequently and not in sequential order, so students were not limited to completing courses in specific academic terms. But even at schools where the courses are not offered as often, advisors and faculty have opportunities to promote studying abroad. Corey pointed to flexibility in the curriculum as assisting students' study abroad efforts: “Even though [the curriculum] seems really rigidly structured there [are] little tricks where we can move things that advantage the courses that are available to them” (Corey, Campus 1).

Additionally, determining course applicability to the major in advance was a key facilitator to studying abroad. As Corey described:

We carefully screen the courses they're going to take before they go. There are certain classes they absolutely need matches for before they go and we help them identify them. We document that if you complete this course with a C or better while you're abroad we'll apply it to your major in this way. We figure it out so they don't add time to their degree.

Course evaluation, a process taken on by the faculty, tended to ease students' worries about delaying graduation since they knew ahead of time which courses would count. Corey praised her campus for its commitment to pre-approving coursework:

Not all of the [the other campuses] pre-assess courses. Being able to tell students that ... we'll tell you before you travel how the foreign coursework will be applied. And we're very strict about not adding time to degree so we can say that you can study your major abroad and still graduate in four years.

Advisors: recruitment and marketing. Advisors referenced recruitment and marketing as important institutional factors that facilitate studying abroad. The first practice was using study abroad as a recruiting tool for recently admitted students. Three of the advisors (Brenda, Corey, and Elaine) all mentioned specifically using study abroad as such a tool, both at prospective freshmen open house days on campus and at new student orientation. Bringing up study abroad early on, according to these interviewees, may convince both parents and students that study abroad is possible as an engineering major.

Brenda identified talking about study abroad at orientation:

We have an orientation for students and then there is a separate parent orientation, we talk about it there too to get it in their heads. I think it's just reminding them that it's

doable and that it's not going to cost them some crazy amount of time or money. It's hard to convince them of that part though.

Advisors also referenced marketing strategies to promote study abroad. Several participants described forwarding emails from the study abroad office and creating bulletin boards regarding study abroad, with some also placing literature in their waiting areas. Still others also referenced bringing student returnees to give testimonials about their experience.

Advisors: study abroad program characteristics. Advisors mentioned several program characteristics that facilitated studying abroad for engineering majors. With program choices expanding rapidly, there were multiple opportunities for engineering majors to go abroad not only at times other than their junior year but also to study a variety of subjects.

Timing. Timing, related to not only the time of year that students went abroad but also the level in school (i.e., junior year), served as a facilitator. One option was summer session. As previously described, some advisors identified the challenge of students attempting to complete major requirements abroad, as many courses are sequential or unique to each campus. One way around academic requirements is by studying abroad during the summer break. As Corey explained:

Summer programs are a little less intense because they're generally internships or special program or language and culture or GE [general education], and so they're easier to assess. And some of the summer programs, the student's going to go whether they get any credit toward their degree or not.

While many students choose to go abroad during their junior year, some advisors cited benefits to going abroad earlier. Brenda expressed:

One of the reasons we've been considering sending students a little bit earlier [is that] there's a little bit more flexibility in their sophomore year when they are just starting to take the "baby" classes that everyone teaches. One of our student mentors went to Scotland and did her Physics requirement. Why don't we start pushing people toward those kinds of programs as well? We know that they're good and it still gives them the experience and if they want to go later they can, but at least it gets them out early so they can see what's out there.

Course offerings. A second program characteristic was offering the ability to take general education or elective courses. When students are not focused on completing major requirements, they have more options in the location and the types of programs. Veronica explained:

I say if you want to go abroad, go study humanities and social sciences abroad. Not that engineering is not interesting to be studied abroad as well, but if you're going to take the time to go to Japan why don't you get your world cultures and humanities core units done there?

Taking major elective courses abroad has benefits as well. When students are able to take elective courses abroad, they benefit by not only making progress in their major but also taking courses that may not be offered at their home campus. These courses may help students prepare for a graduate program or career in those related fields. For example, Corey described a student who was interested in game design but game design was not offered at Campus 1:

We had a computer science student a number of years ago that was going to be the next big game designer ... we don't teach animation. It's just not a regular thing, it's

not part of our program, although it's a very viable computer science topic. [While abroad] he took two animation classes during fall term, so a year of coursework. And he went to work at a gaming company when he graduated, and he hated it, but he's working at DreamWorks now, and he's working on animation for films. He's pursuing something along the lines of his dream, but he wouldn't have gotten either of those jobs had he not had an artifact showing that he really understood computer-generated animation.

Related to course offerings is the language of instruction of the courses. Due in part to the rigid nature of the engineering curriculum, many engineering students are not able to enroll into a foreign language course in college, even if they are already fluent in another language. Offering programs in English, even in non-English-speaking countries, reduces barriers to participation. Corey explained that there is "a misconception out there that ... if you aren't fluent in 100 different foreign languages that you can't go. English is the international language of engineering and all but a small handful of our destinations teach their courses in English."

STEM-specific programs. Some campuses offer STEM-specific faculty-led study abroad programs or encourage students to choose summer programs that include internships in their discipline. Kelly described a faculty-led study abroad program that was offered at Campus 6:

This class that's super popular, Thermodynamics in Iceland, it is brilliant. I can't think of a better program because Iceland is a thermodynamic country so they are studying a subject that ties into the geothermal nature of Iceland ... and a

combination of having an amazing professor who is super engaged and most engineering students have to take that class [as part of the curriculum].

Study abroad program office. Another institutional factor that positively influenced students to go abroad was the study abroad program office (SAPO). Some advisors described collaborating with the SAPO by putting on information sessions for current students. These information sessions were characterized as advising events that brought prospective students out to hear about study abroad. In some cases, information sessions were not put on through the department, but through the study abroad program office in general.

In addition to campus study abroad program offices, there is also a system-wide office that coordinates the study abroad program. According to advisors, the system-wide office website has improved considerably. Kelly explained that when she was trying to advise a student, the website was very helpful:

A summer abroad program in Ireland, everything was there, it was hard to believe. They had the cost, the deadlines, and a huge bio on the instructor that's teaching the course. ... It's just hard to believe how much it's improved over the last few years. That's phenomenal. It gives me a lot of opportunity to really be able to have this discussion with the students if they want to discuss something specific, but also when I'm telling a student to go through all that stuff they can really do a ton of research before they even need to meet with a study abroad advisor.

Advisors at Campus 6 (Kelly and Veronica) did not put on information sessions. When asked about her office's promotion of study abroad for engineering majors, Veronica acknowledged "I don't think we've done a very good job, to be quite honest." She suggested

that by putting on more information sessions and partnering more with the SAPO they could perhaps increase their enrollment in study abroad. Kelly's department also does not put on information sessions, but she felt that she would not get a very good turnout from students.

Challenges

This theme encompasses the personal, social, and institutional factors that were challenging to students in their attempts to study abroad. Challenges, barriers, drawbacks, and obstacles are all used interchangeably here. As in the previous section, the data for this section come from the individual interviews with both advisors and students.

Challenge: personal factors. In order to shed light on the personal factors that were challenging to students, this basic theme is further broken down. From the students' perspectives, personal challenges included perceived barriers. Advisors also noted students' perceived barriers.

Students: perceived barriers. Of all perceived barriers, the only one that emerged as a theme from students was the potential impact of study abroad on their career development. This theme expressed itself in several ways: students felt they missed research/internship opportunities, they missed job fairs and hiring events, or they missed leadership positions in home campus organizations. Andrew noted that he could not get an internship in Sweden because most internships that were available required that he spoke Swedish, which he could not do. Additionally, because he was only there for one semester, he felt that the time was too short for a meaningful internship experience. Peter felt that he missed a big hiring event that took place while he was abroad. He noted:

I was invited to a TESLA hiring event, which I really wanted to go to and even now it's still a company I would like to work for, but it took place in October, I was

already gone by then, so I couldn't go. ... While I was abroad there were a lot of job searching opportunities, and this was also my last year of college, so it was the time to start looking for jobs but I just didn't really have any chance to do so while I was in Sweden.

Ian described not being able to hold a leadership position in his fraternity as a potential professional drawback. Leaders are required to hold the position for an entire academic year, but he was not eligible because he studied abroad during the fall semester. However, Ian also noted that study abroad "was just as much as a resume booster" as holding a job in his fraternity.

A major theme as students were describing the barriers was "no regrets." Students were either able to overcome their barriers, or even if they did feel like they missed out on something, study abroad was still worth it. Andrew was even willing to forego an entire academic term for study abroad: "Having gone now of course if I knew I was going to get no courses I still would have gone just because I figured it's worth it 100% no matter what." Many students described encountering no barriers in their attempts to study abroad. It is clear that regardless of the barriers, students worked to overcome them in order to go abroad.

Advisors: students' perceived barriers. As the advisors described, students are reluctant to study abroad because of perceived, not real, barriers. They find that many students come in as freshmen already believing they cannot study abroad as an engineering major. Current students worry about their time to degree, yet advisors all mentioned that with careful planning studying abroad is a viable option. Additionally, advisors also generally mentioned that it was acceptable for students to take an extra quarter, or even an extra year, to graduate, but students "shied away" from programs that delayed graduation.

Career preparation also interfered with the decision to study abroad. Corey, Elaine, Kelly, and Veronica noted that students might be deterred from studying abroad because of their belief that doing research on campus or getting an internship locally is more important than studying abroad. Elaine explained that when students go abroad during the fall they are missing the important recruitment period and job fair: “the job fairs are for internships as well as jobs, so if they feel they cannot miss that opportunity ... that would be a reason why they opt for not going abroad.” However, advisors felt that these obstacles could be turned into opportunities. Corey explained:

Even students that go abroad for their entire junior year who miss out on fall and winter recruiting for internships for that coming summer, many of them work remotely with career services or directly with company recruiters. They need to be more responsible in terms of making sure that their resume or their cover letter or their emails really convey who they are in lieu of a personal interview.

While students may feel that employers value internships over studying abroad, Veronica at Campus 6 made sure to give students advice on how to reframe their experience so that employers see the value:

It’s how they sell their experience. Maybe you went abroad instead of doing an internship ... how do you talk about that experience? how do you sell yourself? how do you put it on your resume? I think reframing their experience and not discounting it. Sometimes they just need a little bit of a pep talk to figure that out, to recognize that hey studying abroad is about experience and maybe it wasn’t an internship at Google but you learn these skills, you translate those to this kind of job, here’s how you put it on your resume. I think they might not inherently see that that’s something

they can talk up in an interview if they decide to go abroad versus an internship but hopefully we help them connect those dots.

In general, there were no student attitudes that advisors thought could not be worked around.

Challenges: social factors. In this study, only a few social challenges emerged. For students, social challenges included their fears of missing out on friendships and their academic cohort. For advisors, social challenges included lack of faculty support.

Students: missing friends and cohort. The social challenges that students faced manifested themselves in two different ways: missing friends and falling behind the academic cohort. Some students felt peer pressure *not* to study abroad. They did not want to miss out on events on campus. Brandon explained “It kind of sucks socially because you leave and some of your friends graduate or you’re not keeping touch that much and then you come back and you’re kind of out of the loop socially a little bit.” Ian had logistical issues with studying abroad: “obviously you’re going away for a couple months, so my living situation back at Campus 4 was something I had to figure out because I either had to take someone else’s spot that was going to be on study abroad when I came back.” He further explained “you’re going to be away from all your friends and family so if you’re willing to take that risk and can handle it then you’ll be ok, it’s not that long in the grand scheme of things.” Michael’s views matched Ian’s: “there was a bit of hesitance, it’s a semester there where you’re not at school with your friends, making connections to people”

Peter discussed a “fear of missing out” when seeing what friends back home were doing through social media: “The minor things would be most of my friends are still back in the states, you obviously will miss your friends, your family. ... On Facebook and other types of social media you’ll see people posting about things in [campus town], and things

happening elsewhere in the world and you're like I can't go to that because I'm in Sweden. It's more of a fear of missing out kind of feeling, but in the end those are pretty minor."

While happy to be independent, Marcus explained that "I was kind of scared of being by myself, but I was also really interested too so I guess that was ok." Richard also explained the difficulty of starting over: "Studying abroad is like starting over freshman year, so all those same concerns came back again and there's always that thing where you don't feel really like a student there not because they don't welcome you at all the events but because you know you won't stay there long enough."

While not all programs are designed to in a cohort model, many students form study groups with their peers. Richard described the difficulty of being away from his cohort: "My cohort of engineering friends, they all had these classes, I missed all of them, I had to retake them in my fourth year, and then they're moving on to their fourth year, there's that mismatch. I see them in some classes I don't for others."

Advisors: lack of faculty support. While faculty who encourage study abroad are facilitators, faculty who discourage study abroad serve as challenges. As Elaine described, "One challenge that we have, and this really is occasionally, when we deal with a faculty who is not in favor, not well educated, doesn't understand the principles of studying abroad and would not approve the classes." Elaine indicated that she has had to convince faculty of the importance of studying abroad: "I have experienced chairs that were I guess uneducated or not in favor of [study abroad]. I went to battle with them about trying to educate them and explain how important it is for students to have that international experience." Ensuring faculty support of study abroad can be a major challenge to study abroad.

Challenge: institutional factors. Institutional challenges from the students' perspectives included academics and curriculum as well as program characteristics. For advisors, challenges included academics and curriculum and program characteristics.

Students: academics and curriculum. Seven of eleven participants (64%) communicated academic issues as a challenge they faced. These students felt pressure to make progress in their major, and they felt that studying abroad could interfere with their degree progress. Peter explained "I feel like it's really hard for engineers to study abroad, especially if you want to graduate in four years. So for me I took five years, and a decent amount of it was because this way I can actually study abroad." Marcus described the pressure of graduation: "I didn't want to go study abroad and come back and behind a year, to me that's kind of scary, and not worth it, so I was really cautious when I was picking the courses, making sure ok this one looks ok, I think I can do this." While at times the fear of delaying graduation came from the student's internalized expectations or pressures, for Jim the pressure to graduate in four years came from his department. His department had a strict policy that students must graduate within four years even if they study abroad. This served as an obstacle to Jim, who studied abroad for a full academic year, because he had to be particularly sure that his program abroad would offer the courses that he needed.

Along the same vein, many students expressed fulfilling major requirements as a barrier to study abroad. In some instances, required courses were unique to the home university and could not be taken abroad. Brandon explained "One of my course requirements is a course called Electrical Engineering 16B, I had asked well can I take this course abroad? They were like there is essentially no other school that offers a course that we would consider to be equivalent to this course." Some students thought that the courses

they took would count as major requirements, but in the end they did not. Peter said “getting the credits was pretty hard too. I only managed to get the credits for one class, one elective, and the other two I took just didn’t count for anything. That’s all I needed then thankfully but that was probably one of the hardest things.”

A huge issue for all students was the ability to find applicable courses to take while abroad. While the system-wide study abroad office does provide an online course finder to help students choose courses, there were not many engineering courses to choose from. Jim explained that he had to find a program that offered particular series courses that were being taught the year he was to be abroad. For Jim and Jeffrey, the two students who chose to take courses in a language other than English, they had to translate course descriptions from the host university website.

Students: program characteristics. Some students noted that program characteristics were a barrier to participation. For two students, Jeffrey and Jim, their programs contained instruction in a foreign language. Thus, language requirements were considered an obstacle for them. Jeffrey noted that he needed six quarters of Spanish to participate in his program, so he was limited with what schools he could choose. Additionally, he had to choose a program that offered engineering courses, which according to his findings meant he had three program locations to choose from. In addition to the language requirements, Jim noted that because of the academic calendar in Germany, he had to stay the entire year. He found that if he studied abroad for less, he would have fallen behind an entire school year.

Advisors: academics and curriculum. Engineering curriculums are notoriously rigid, and the curriculums at each of the six campuses were no exceptions. Curricular challenges included:

- Senior capstone/design projects that had to be completed at the home campus.
- Campus requirements or pressure to graduate in four years.
- Courses that are only offered once a year.
- Courses that are unique to a particular campus, including those that are degree requirements.
- The need to take at least one degree requirement course per quarter in order to make timely progress on their degree.
- The amount of coursework.
- The cohort nature of the programs, where students felt by being away they would miss out on forming study groups.

While courses taken through the system-wide study abroad program are pre-approved to earn academic credit, not all courses will satisfy major requirements. Throughout the system, the faculty determine whether or not courses taken abroad fulfill major requirements. In the case of engineering, not enough engineering courses have been taken at foreign universities to be pre-approved by faculty. While faculty are in charge of course evaluation, Megan noted that sometimes it can take faculty months to approve courses, delaying students' progress in their major. Brenda took a more negative view:

You ask why people don't do it, I think because it can be such an onerous process.

You have them all excited about going and potentially learning a new culture. Then you start going down the road of "ok, now we got to get all these courses approved" and that takes a lot of time because some faculty are on it and others drag their feet about it and it kind of takes the excitement out of it.

Some advisors suggested that a course articulation agreement could ease concerns about the courses. Course articulation means that faculty have pre-approved courses from the university abroad to fulfill degree requirements at their home campus. Due to the lack of course articulation, students cannot find courses that meet requirements for their major. As Megan explained:

there are a couple of courses that are really hard to find equivalent courses. For example, within the mechanical department we have a course that [contains both] statics and dynamics, and colleges, community or four year, only offer statics *or* [emphasis added] dynamics. So that's one small example but that type of thing might make it a little bit difficult for a student who is trying to go abroad.

Corey at Campus 1 also noted that student attitudes are more likely to be positive when they know their courses are pre-approved to meet major requirements:

It also helps their head if they know it's documented in the college and the department and they have a copy of the promise. That helps them have a better time and follow through on actually going because they don't want to add time to their degree and they want the value added. They want the experience but they want the expense of the experience to be justifiable.

Advisors: study abroad program characteristics. Program characteristics can be challenging for several reasons. Corey and Elaine noted timing challenges:

The other disadvantage is some institutions in New Zealand, Australia, Japan, Singapore, South America, South Africa, they're on a reverse school year. If it's a small college of engineering and the first half of the class is taught from January to May and the second half is taught from August to December, our students can't go

there because they'd be there during the second half of courses not the first half.

(Corey)

Each of the programs offered through the system-wide education abroad program have certain eligibility requirements. Heidi, Brenda, and Corey noted a few challenges that occur because of the eligibility requirements. Heidi at Campus 2 discussed the GPA requirement as a challenge: "Many of the engineering programs require a 2.8, they require a 3.0, and so our average GPAs for engineering students hover around a 2.45." Heidi and Corey also noted timing issues with the application: Heidi mentioned that some students do not realize that the process to study abroad can take six to nine months, so by the time they ask about it it is too late to study abroad. Corey noted that "Part of the challenge is between late October and finals week is when they need to be really finding the class matches and it's a really hard academic time for them." Finally, Brenda mentioned that it is tough for transfer students to participate because they have such a limited time on campus.

Impact of Study Abroad

The second global theme, *Impact of Study Abroad*, addresses the outcomes students described as a result of studying abroad. The four organizing themes include *Career Impact*, *Engineering/Academic Impact*, *Personal Impact* and *Reflection*. Reflection is included in this global theme because transformational learning theory (Mezirow, 1991) indicates that true perspective change is not possible without critical reflection on assumptions. The figure below (Figure 5.2) gives a visual of the global theme and the basic and organizing themes. First, the organizing and basic themes will be defined. Then examples from the data will be presented as evidence for the themes. This theme addresses research question three: What outcomes do undergraduate engineering majors report as a result of studying abroad?

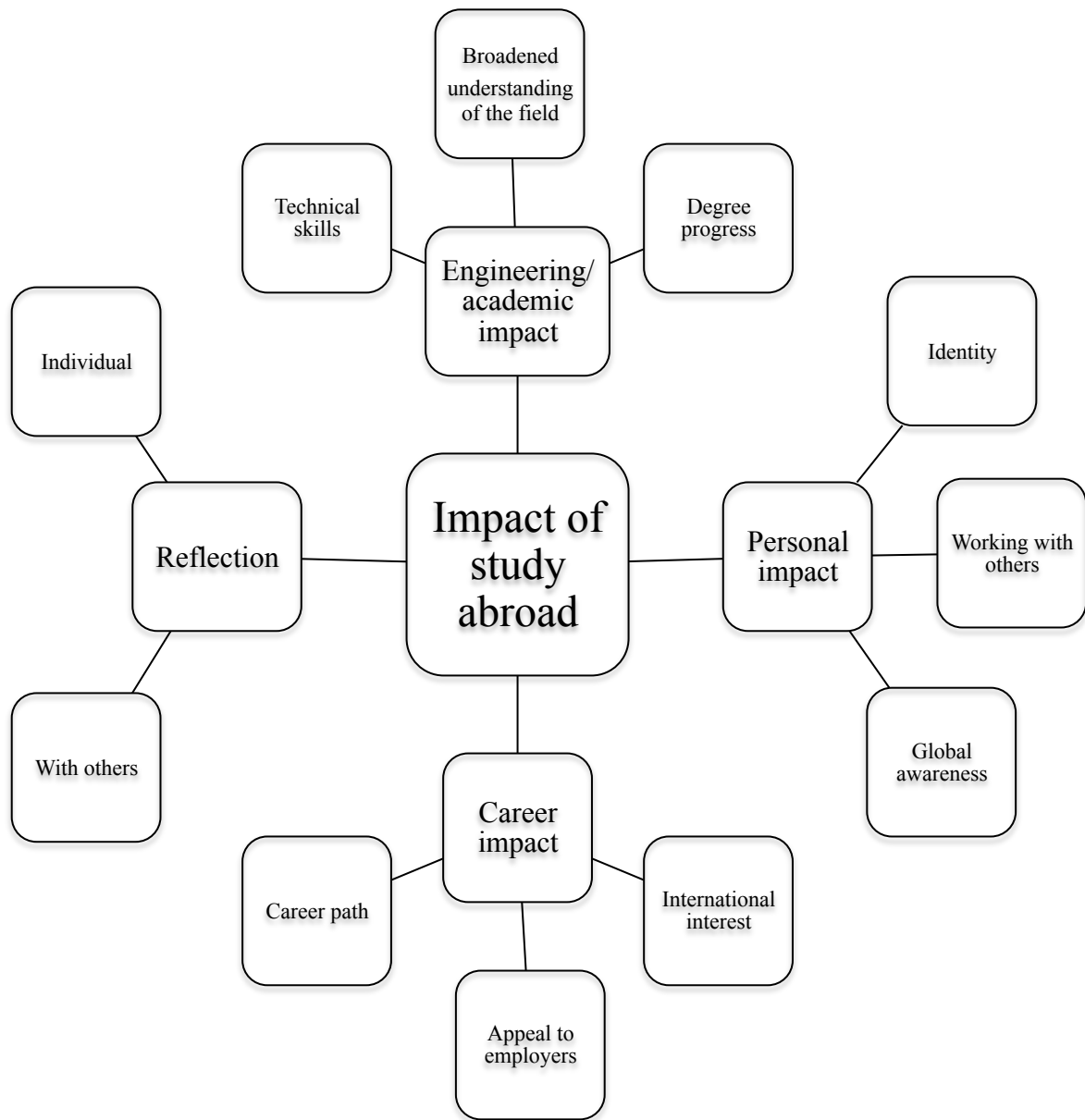


Figure 5.2. Impact of study abroad – organizing and basic themes.

Career Impact

All eleven of the students (100%) who participated in the interviews felt that study abroad impacted their careers in some way. Six of the eleven students who participated were alumni. Table 5.1 displays the current occupation of each of the alumni. Four of the six

alumni were currently employed; as far as the other two, Daniel had recently quit his job in order to move back to California from Louisiana, and Jeffrey was a graduate student.

Table 5.1
Current Occupation For Each Participant Who Has Graduated

Name	Major	Current Occupation
Cody	Mechanical Engineering	Engineer at an aerospace manufacturing company in their quality department
Daniel	Civil Engineering	Unemployed but was working as a transportation engineer in Louisiana
Ian	Computer Science	Software engineer
Jeffrey	Electrical Engineering	Graduate student
Michael	Electrical Engineering and Computer Science	Software engineer
Peter	Structural Engineering	Biomedical engineer

There were three primary ways in which participants felt that their careers were influenced by studying abroad: (a) altering or confirming their career paths, (b) increasing appeal to employers, and (c) creating or confirming interest in working internationally. Responses to describing the career impact varied considerably for the students. While many students thought that the experience would positively influence their careers, in some cases having an international experience showed students they did not want to work internationally.

Career impact: altering or confirming their career paths. Five of the interview participants reported that studying abroad either altered their career paths by giving them newfound interests or confirmed their career paths by reaffirming what they already knew they wanted to do. Cody, Ian, Jim, and Richard credited the change in their career plans to study abroad. Cody described that while abroad he worked with a team that created biomedical devices, and he credited the experience for giving him the idea of working in the

biomedical sciences in the future. Ian, who originally thought he might want to work in computer graphics, crossed that option off his list after taking courses in that area in Sweden:

The Computer Graphics course I was taking was something that interested me when I was going through my degree. When you take your degree courses you realize oh this is something that I enjoy more than the other parts, so I was looking forward to that course just to see if that was something ... that maybe I thought I would take when looking for jobs. When I actually took the course I realized ... that that wasn't what I wanted to do. I guess it's just as good as realizing what I do want to do, because it crosses something off.

Jim and Richard both found themselves understanding “what they want out of life” after studying abroad. For Jim, who had an internship in Germany prior to starting school there, he realized that he wanted more work-life balance. Richard explained that in his future career, he wants a consulting job where he can travel and work with other countries and cultures.

Daniel was the only participant to describe ways that studying abroad confirmed his career path. This does not mean that other students did not confirm their interests while abroad; instead, these engineers did not reference these instances in their interviews. For Daniel, the large number of civil engineering courses he took abroad “reaffirmed my decision to be a civil engineer.” Understanding civil engineering codes at the international level gave him “a leg up when I moved to Louisiana because I was exposed to different standards of construction, of design. ... There were some things in [home state] which don't occur in other places, that's something I realized while abroad and was made more aware of.”

Career impact: increased appeal to employers. There were mixed feelings regarding the appeal of study abroad to employers. While three students described the value that future employers would place on their study abroad experience, three others felt that study abroad was less important than their academic and work experience. Brandon, Jim, and Michael fell into the former group. Brandon, who is in his last year of college, stated that “I think from like a hiring perspective [study abroad is] something companies like to see.” He explained that study abroad not only proves that he is willing to move abroad, but also that he has had experience working with people from different cultures: “I think having that experience a priori is a big benefit to me in (a) getting hired and (b) dealing with that kind of job.” Jim also felt very positive about having study abroad on his resume. As he explained, study abroad “boosts your chances of employment” and by participating in study abroad you are “almost guaranteed an interview.” Michael also was glad he had study abroad on his resume because “it all helps.”

Some students were more hesitant about the appeal of study abroad participation to employers. Peter, who is currently employed, felt that having study abroad on his resume ultimately did help, but it depended on the person in the company that he talked to. Ian, who is currently employed, and Jeffrey, who is in graduate school, felt that employers do not value study abroad. Ian acknowledged that perhaps it helped him to say that he is willing to move around more, but in the end he said “I don’t know if it contributed that much to me obtaining a job to be honest.” Jeffrey described his experience:

I’m not sure if I want to [move abroad] nor am I sure it’s valued by employers here. I have come to notice that in all of my interviews where that’s on my resume it’s either

overlooked or it's talked about for like 2 seconds. "Study abroad experience, fluency in Spanish, blah blah." They just kind of skim over it or don't acknowledge it.

However, Jeffrey also explained that he would be a "valued asset" because he is comfortable speaking in Spanish and travelling for work to Spanish-speaking countries. Perhaps it is only a matter of time before he finds a company that is looking for the type of skills he can offer.

Career impact: interest in working internationally. Five students described a newfound or deepened interest in having an international career or going to a graduate school internationally. Andrew, Jim, Marcus, Michael, and Peter explained that as a result of studying abroad they "would be open to working abroad" (Peter). Jim, who studied in Germany and took all of his classes in German, explained that:

I'm really looking for an international career. At least in my youth, I'd like to try and figure out a way to use these language skills because it's a use it or lose it sort of a thing, and if I can work in a way that I'm able to speak German while working either in the U.S. or with an American company, that would be ideal for me.

Three students (Brandon, Daniel, and Ian) both confirmed that they would not like to work abroad. Daniel, who studied in Singapore, explained, "I was thinking about working abroad when I was planning to study abroad and afterwards the urge died out. I saw how expats were treated abroad and it just didn't seem like the pros outweighed the cons in this scenario." Brandon had a similar attitude, saying that "their pay is horrific" so if he were to work abroad, it would need to be for an American company.

Engineering/Academic Impact

The organizing theme engineering/academic impact is related to any outcome students described related to skills, knowledge or understanding of engineering in particular or academics in general. The outcomes students described fell into three main categories: technical skills related to engineering, broadened understanding of the engineering field, and degree progress. The chart below (Table 5.2) indicates each participant’s length of time abroad, year in school at the time of study abroad, current academic year, and his time to degree.

Table 5.2
Demographics of Students who Participated in Interviews

Name	Length of Time Abroad	Year in School at time of Study Abroad	Current Academic Year	Time to degree
Andrew	One semester	Junior	Junior	4 years 1 quarter
Brandon	One semester	Sophomore	Junior	3 years
Cody	One semester	Senior	Alumnus	5 years
Daniel	One year	Junior	Alumnus	4 years
Ian	One semester	Junior	Alumnus	4 years 1 quarter
Jeffrey	One semester	Senior	Alumnus	3 years (transfer)
Jim	One year	Junior	Senior	4 years
Marcus	One semester	Junior	Senior	4 years
Michael	One semester	Senior	Alumnus	4 years
Peter	One semester	Senior	Alumnus	5 years
Richard	One year	Junior	Senior	5 years

Engineering/academic impact: technical skills. Six students described the useful aspects of taking engineering courses abroad. Some students (Cody and Jeffrey) took courses in engineering that taught new technical skills (C programming and circuits, respectively). Richard benefitted from a course in microcontrollers that was not offered on his home campus (Campus 5). Marcus in particular liked how hands on the courses abroad were. He appreciated the connection to real-life examples, something he did not get as often at his home campus: “they like to talk about how it’s applied in real life, they use examples

... it kind of ingrains in your mind or makes it easier to remember because it's related to real life events." Peter was able to participate in a student project where he worked in a team that created a Formula One racing car. He also appreciated the hands on aspect:

The classes I took at Campus 3, you also learn a lot of course, but it's a lot of textbook work: you have a few formulas, you read a few concepts, and then you do homework. There's some of that in the classes I took [abroad] as well but it would usually be projects that let us actually learn, hands on experience. I guess one example would be we had a lab where we didn't have to write a report, we didn't have to do any sort of pre-lab test, we just went into a room with a car engine, we took it apart, and we put it back together, and that was it. And just from that one hour or so I learned more about a car engine than I probably ever could from reading a book or writing reports. There's a lot of that in Sweden engineering courses.

But while some students felt their technical skills improved through the courses taken abroad, others felt like their technical skills were not necessarily improved simply by virtue of studying in a foreign university. Michael (electrical engineering and computer science major) said that "I don't think there's engineering-specific skills that are particularly enhanced by studying abroad" and "I don't think it makes you a better engineer." That's not to say that he did not describe other benefits, just not on the technical skills side. Ian took computer graphics courses but he felt these courses did not necessarily improve his technical skills.

Engineering/academic impact: broadened understanding of the field. Five students (Brandon, Daniel, Jeffrey, Marcus, and Michael) gave examples of how studying abroad broadened their understanding of engineering in a global setting. Brandon described

that the teaching was the same abroad as at his home university, but he found the business aspect to be different. He gave examples of American companies that failed in China but were successful elsewhere. As he noted, in China “they have their own unique cultural design appeal and the way their products work.” Studying abroad helped him understand that they cannot simply import American products and expect them to be successful. Jeffrey described how one class “opened my mind up a little bit because ... [it] was a different spin on something important.”

Before Michael went abroad, he “had more of an American-centrism about the superiority of the field.” While abroad, he worked with classmates from other countries and found them to be equally as qualified as his classmates at Campus 7. As a result, “it really opened me up” and he realized “how this field is so open and accessible.” In his current job, he has noticed that the engineers from all over the world are as good as his colleagues from the United States.

Daniel and Marcus both gave examples of specific courses they took abroad that they could not take at their home campuses. For example, the variety of civil engineering courses at this university abroad was far better than at Daniel’s home campus. Marcus took classes that were more hands-on than those in the United States, and from those experiences he realized “there’s more than one way to solve a problem.” Without the experience abroad, he may have thought that the American solution was not only the only solution, but perhaps even the best one.

Engineering/academic impact: time to degree. While not related to engineering or academic learning, studying abroad did impact degree progress for some students. Four students (Daniel, Jim, Michael, and Marcus) were planning to or had graduated in four years.

Brandon, who entered his campus as a freshman, was planning on graduating early, in three years. These four students minimized the difficulty of completing degree requirements through studying abroad. Some described how the courses taken abroad were in excess of degree requirements. Others described that while there may have been a few courses taken abroad that did not ultimately satisfy degree requirements, they were able to make up the missing requirements relatively easily.

For the students who did take longer than four years, only Richard described challenges with course approval for degree requirements. The other students tended to say that taking longer than four years was a conscious choice (Cody, Jeffrey, and Peter) or that studying abroad was not a significant factor in taking longer than four years. Every student explained that they had no regrets in taking longer than four years. While colleges of engineering stress that students can major in engineering and graduate in four years, the students who took longer than four years did not feel that this was a bad thing.

Personal Impact

The theme of personal impact emerged as students described how they seemed to change as a result of studying abroad. Leaving their comfort zone and being largely independent had a great impact on students' personal growth. They described impact on their identity, social skills, and global awareness.

Personal impact: identity. The impact on identity emerged as students described new personal characteristics as a result of going abroad. Traditional impacts of study abroad, like becoming more empathetic, more open-minded, and more flexible, were true here as well. Andrew described “the opportunity to be away from everything I’ve known my entire life for the first time, it really challenged what I think about myself.” He is “way less

worried about the future” because he got out of his comfort zone and realized that he can succeed in a different culture. Cody, like others, described that he is now “more open-minded and flexible.”

Due in part to successfully navigating a new culture, Jim explained how “you develop a different type of confidence in yourself.” This confidence expressed itself through speaking a foreign language (Jim and Jeffrey), successfully using the public transportation system (Ian and Brandon) and managing the stress of being alone in a foreign country (Ian and Marcus). Upon return, students generally felt that because of their time abroad, they would be confident working abroad as well.

Michael explained that his new identify also made him a better engineer:

I think being a more well-rounded individual, human being, whether it’s communication abilities or social skills, or just having a better sense of self, I think that kind of impacts everything you do. And that sounds super fuzzy and vague but I really do think there’s an impact, I think that anyone who’s studied abroad would know it even if they can’t exactly say how it makes you a better engineer. I don’t think it makes you a better engineer, I think it just makes you a better person at dealing with things, which is one of the things that you have to do as an engineer.

Personal impact: social skills. Ten interview participants described the importance of studying abroad on social skills. Social skills included both personal and professional relationships. Examples of social learning included students’ descriptions of intercultural communication skills and their comfort with working with people from different cultures.

Ian explained that he is “more than open to meeting people and dealing with people.”

Brandon explained it as “I think definitely just having more experience with having to deal

with different people, definitely I can be more effective on an international team.” Students tended to feel that learning how to communicate better with others helped them not only in their personal relationships but also in their engineering teams. Richard explained:

I’ve learned engineering ... is communicating with other people. Study abroad with that tangible experience of communicating with vastly different groups of people that you see in Europe, that worldly ... perspective it gives you, or growth it gives you, that can be applied very well in the work environment or the professional environment as you progress as an engineer, because it helps communicate with others in a deeper sense.

Students also became more comfortable in the linguistic minority. Since for most of the students English was the only language that they speak, being abroad forced them to become more comfortable in social situations where English was not the language spoken. Ian described that while at first he felt out of place when Swedish was spoken, he eventually overcame that barrier by asking them to speak English.

Personal impact: global awareness. Eight students described global awareness as a result of studying abroad. Simply leaving the United States was an important way for students to gain global awareness. Global awareness included situations where students described how they compared other cultures with the United States. For example, Marcus explained “when you talk to different exchange students you get to hear their culture you realize wow, the world is a really big place, there’s a lot of different ideas, different perspectives outside of the United States.” Brandon said “Just a much better understanding of the culture, the way people think, the way people conduct their daily lives, the differences

between a lot of these countries, because I went to a lot.” Michael and Richard described comparing politics in America with their respective host countries.

Global awareness expanded beyond classifying cultural difference. Students also critically compared the U.S. to other countries. Ian took some time to get used to the public transit system, but eventually found it convenient and readily available. Brandon also found the way that societies in Asia built their infrastructure was “fascinating. Most of these cities have fantastic public transit systems, bullet trains in Japan, the MTR in Hong Kong is fantastic.”

Reflection

Students were asked to describe the ways that they processed or reflected on their experiences. While they did not immediately identify mechanisms for processing their experience, upon further clarification they described several ways they tried to make meaning out of their experiences. Because reflection was not mandatory in programming, they took it upon themselves to process their experiences. Reflection took on two forms: individual and with others. Individual reflection included instances when students described thinking alone or journaling. Reflection with others included instances when students described talking with others or interacting with others in some way. For many students, both internal reflection and reflection with others were important to making sense of their experience. While for some students reflection while abroad was important, others also mentioned reflection upon return from the experience.

Reflection: individual. The theme of individual reflection emerged as students described either journaling or thinking to themselves about their time abroad. Andrew, Daniel, Jim and Cody described journaling as a way for them to reflect. Journaling while

abroad was not always successful, though, as Cody explained: “While I was in Sweden I did keep a journal, I did a pretty poor job though. I didn’t write everyday, I just wrote when I felt like it.” For Andrew and Jim, journal writing did not happen until after they returned home. Jim explained “I actually wound up keeping a journal, not while I was abroad but when I came back, I was like I need to write this down or I’m going to forget ... so that helped me.” Instead of keeping a written journal, Peter indicated that “my journal is my photo album.” For him, taking 100 to 200 photos a day was his way to reflect on what he saw. Marcus and Jeffrey did not write anything down, but explained that they still spend a lot of time thinking about the trip.

Two students described regretting not reflecting through journaling. Marcus explained:

I do kind of regret not doing a journal but it’s a lot of work. I didn’t bring my computer with me when I was travelling or even my phone sometimes, it would be kind of hard to write stuff down, or you would have to write it down when you come back and then maybe you’d forget.”

Reflection: with others. More students described engaging in reflection with others than they did while alone. Seven students described talking with others as a form of reflection. For five of these students, talking with other American students that participated in their program with them was a way to make meaning of their experiences abroad. Brandon described that since he has returned he has gotten together with his study abroad cohort to talk about their trip. Marcus explained how he still compares experiences with other study abroad returnees: “sometimes when I’m talking to other people who studied

abroad we'll ... laugh about 'oh Europeans have this misconception about us and stuff,' and then they'll talk about something they learned or a story they had about this topic."

Daniel is the only student who took a seminar upon return that was specifically for critical reflection on his experience. He explained it as "a study abroad returnee class, it was talking with my classmates who were still taking classes at Campus 5 and comparing it with my experience. It was how to reflect and process on your experience." He found it useful to be able to compare experiences with other study abroad returnees at his school and to reflect on his experience abroad.

Two students, Brandon and Daniel, also referenced reflecting via social media. Brandon used Twitter, while Marcus used Instagram. Marcus described it as "I would post a few Instagram photos and show people oh yeah there's this place down here that's really cool, this food, or just things to do."

Chapter Five Summary

This chapter presented the findings from interviews with both academic advisors and students. First the global theme *Decision-Making Regarding Study Abroad* was discussed. Personal factors were the most important positive influence on students' decisions to study abroad. Institutional factors, such as degree requirements, were the most important negative influences on students' decisions to study abroad. Second the global theme *Impact of Study Abroad* was discussed. The impact of study abroad was described in three different ways: (a) through their future careers, (b) through engineering/academic learning, and (c) through personal development. While reflection was not mandatory in programming, students described reflecting in two different ways: individually and with others.

CHAPTER SIX: DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

The purpose of this study was to explore and analyze study abroad for engineering majors from both the students' perspectives and academic advisors' perspectives. Specifically, this study analyzed goals and motivations, facilitators and challenges, reflection, and outcomes of the study abroad experience. Engineering students are under-represented in study abroad, yet the engineering profession is global and engineers will need to adapt to the global workplace. The current study used both Fishbien and Ajzen's (1975) theory of reasoned action and Mezirow's (1991) transformational learning theory as a guiding theoretical framework, and combined Kasravi's (2009) and Johnson's (2016) models to form the conceptual framework. To achieve the purpose of the study, four research questions were presented:

1. What are undergraduate engineering majors' goals and motivations for studying abroad?
2. What barriers and challenges do undergraduate engineering majors face in their attempts to study abroad?
3. What outcomes do undergraduate engineering majors report as a result of studying abroad?
4. What are academic advisors' perspectives of undergraduate engineering majors' goals and motivations for studying abroad, as well as their perspectives of barriers and challenges that these students face?

This chapter presents a summary and discussion of the major findings, as well as implications for theory and practice.

Summary and Discussion of the Decision-Making Stage

In this study, decision-making in study abroad was examined through the lens of the theory of reasoned action (Fishbien & Ajzen, 1975). According to the theory of reasoned action, attitudes and the subjective norm are important predictors of intention. This study expanded the theory of reasoned action by adding in institutional factors as an important predictor of intent to study abroad, based on Kasravi's (2009) findings. Important factors in the decision-making stage were explored in three ways: through a survey distributed to engineering majors and recent alumni at eight university campuses, through individual interviews with 11 engineering majors and recent alumni at five different university campuses, and through individual interviews with seven academic advisors at six different university campuses.

Facilitators

According to students themselves, personal factors were far more influential than social and institutional factors in facilitating study abroad. In the survey, nearly 80% of respondents called "It was a good opportunity to travel" a very strong motivation to go abroad. Other personal factors, like "I wanted to live in another culture" and "It was a good opportunity to develop global competency" were cited by more than 50% of respondents as a very strong motivation to go abroad. Other studies have also concluded that students' motivations for going abroad are based on personal growth and culture learning (Carlson et al., 1990; Chambers & Chambers, 2008; He & Chen, 2010; Kasravi, 2009; Sanchez et al., 2006; Van Der Meid, 2003; Van Hoof & Verbeeten, 2005).

The influence of personal factors is echoed in the interviews with students. Data revealed that students who did study abroad were able to overcome barriers, whether personal, social, or institutional, because of their strong determination to study abroad. Two

factors emerged relating to personal influences: personal characteristics and perceived outcomes. Personal characteristics included internal drive and advanced planning. Kasravi (2009) noted that internal drive was an important personal factor, but advanced planning also emerged in this study. For example, students who wanted to study abroad started thinking about going abroad early, as soon as their freshman year or even in high school. Perceived outcomes included the desire for cultural experience and knowledge, personal growth and outlook, and practical outcomes.

Importantly, student interviews revealed that students expected study abroad to be important for their personal growth. They expressed the belief that study abroad would help them meet other people, travel, and appreciate other cultures. Of less importance was the exposure to engineering in another culture. However, some students were looking for the hands on aspects of engineering abroad, and other students were interested in engineering courses that the host university taught.

Social factors were described as less important influences in the decision to study abroad, but still served as facilitators. While the survey did not address social facilitators directly, 82.64% of students agreed or strongly agreed that meeting new people was a motivation for them to go abroad. In the interviews, students gave more details regarding social influences. For Cody, having friends to study abroad with was important. Some students also used social media in order to obtain more information regarding study abroad. Advising, both with academic advisors and study abroad advisors, were also important resources for students. Academic advisors helped students plan out their international experience, particularly to ensure students could satisfy major requirements with courses taken abroad. Study abroad advisors helped students pick appropriate programs. While

Marcus in this study worked as a peer advisor, no interview participants discussed visiting a peer advisor. Wainwright et al. (2009) suggest the important influence that peers can have in disseminating information regarding study abroad.

Institutional factors included study abroad program characteristics, which were described during interviews. Students were particularly encouraged to study abroad when classes were easy to find, when the host university offered something of interest to them, and when financial aid or scholarships paid for the program expense. Because the students in this study participated in general study abroad programs, these programs were not designed specifically for engineering students. Students had to work a little bit harder to make sure the program fit their academic and personal needs. Other studies have noted facilitators like short-term programs for engineers (Maldonado et al., 2014; Schubert & Jacobitz, 2013) or programs that offer the development of engineering-specific skills (DiBiasio & Mello, 2004; Maldonado et al., 2014). It appears that engineers have many motivations for going abroad, and especially when institutional factors promote study abroad, students are more likely to go.

Challenges

While students described challenges they faced, one major theme was “no regrets” for studying abroad. Even though some barriers were worse than others, all students felt studying abroad was worth the effort. On the survey, the top challenges included those related to program characteristics and academic/curricular requirements. The top four factors listed as “strong barrier/drawback” or higher were “High cost” (52.45%), “Too difficult to leave because of course requirements” (46.15%), “Lack of applicable education abroad programs” (39.16%), and “Timing issues (i.e., program offered in fall and you couldn't go in

the fall)” (32.87%). The only barrier agreed upon by more than 50% of the respondents was “high cost.” This suggests that for this group of study abroad participants, the benefits far outweighed any challenges they faced. Although academic issues have been cited as a challenge in the literature, less than 50% of the respondents reported it here.

While cost was cited as a very strong barrier on the survey, this did not emerge as a major barrier in the interviews. When given a chance to explain themselves, students in the interviews described that cost was an issue, but they were able to work around it. For example, many students received financial aid or scholarships for going abroad.

Social factors did not emerge as a barrier in the survey, but they did emerge in the interviews. Nearly 70% of respondents on the survey felt that “Study abroad not valued by your parents, family, or friends” was a very weak barrier or drawback. The individual interviews, however, revealed a few instances where social factors were an issue. For some students, a “fear of missing out” emerged. They did not want to leave campus because they did not want to be away from their friends. However they also realized that by studying abroad they would meet new friends, and eventually overcame that obstacle.

The survey and the interviews differed somewhat in the findings regarding institutional factors. The major barrier that students described in the interviews was related to academics, while on the survey less than 50% of the respondents reported course difficulties as a barrier. There are a few possible explanations for this. One, this population of students actually did study abroad, so they were able to work around any course issues they faced. Two, nearly half of respondents (48%) on the survey went abroad over the summer. There are less academic difficulties over the summer since students are not missing any sequence classes or courses that are only offered during the academic year. In order to

understand the nature of the academic barriers, the researcher purposefully chose students to be interviewed that studied abroad during the academic year. These students explained that satisfying degree requirements for their major is just one potential barrier related to academics. Other academic barriers include the limited amount of approved courses abroad for engineering majors and the fear that studying abroad would delay graduation. As the literature shows (Grandin & Hirleman, 2009), these barriers are true for most engineering majors.

Some literature also points to the need for clear connections between study abroad and career benefits (Goldstein & Kim, 2006; Relyea et al., 2008; Sanchez et al., 2006). Lucas (2009) found that males are more likely to participate in activities that provide clear benefits for their careers. On the survey, over half (55.24%) of respondents listed “Study abroad not valued by employers” as a very weak barrier/drawback. These findings suggest that students in this study are not particularly concerned about the value potential employers place on their study abroad experiences. Whether or not study abroad increases their chances of getting hired, these students still wanted to participate in study abroad. In the interviews, career considerations were seen as a barrier only because students missed hiring events on campus and opportunities for internships. Some research may need to be reevaluated—students appear less concerned with the value that employers place on study abroad, and more concerned about missing important internships and hiring events.

Decision-Making Factors and Program Duration

While ample literature discusses student outcomes by program duration, little empirical literature found in this review looks at decision-making by program duration. Some anecdotal reasons for choosing short-term programs include affordability, student

unwillingness to commit to a longer period abroad, and the ability for students in rigid majors to spend time abroad (Donnelly-Smith, 2009).

In this study, few decision-making factors differed based on program duration. Students studying abroad for a semester were more likely to want to take general education or elective courses while abroad. One possible explanation for this is that students who go abroad for a semester want to take courses related to the country they are in. Corey, an advisor interviewed in this study, suggested that engineering majors are often bored by general education courses and would prefer to take the science and math courses required for their major. But, as she described, general education courses taken abroad are often more rewarding because of the ability to make connections to history while abroad. Students who choose to study abroad for a semester are able to take general education courses that fulfill degree requirements and the courses may be more interesting to them. In another difference, the goal of living in another culture was more important the longer the students studied abroad. This makes sense based on past research that indicates students who study abroad for the year do so because of foreign language and cultural interests (Donnelly-Smith, 2009).

Due to the rigid nature of the engineering curriculum, students who go abroad during the academic year, whether for a semester or a year, are more likely to encounter academic barriers. In this study, the difficulty in transferring credit back to campus was more pronounced for yearlong students. Unsurprisingly, choosing engineering courses abroad that would transfer back and apply to their degree was difficult for yearlong students.

The lack of other engineering majors who studied abroad served as more of a barrier for yearlong students than for students in other program durations. Role models have been found to be highly influential in study abroad decision making (Salisbury et al., 2009;

Wainwright et al., 2009), so this explains why the lack of other students going abroad for a year could limit yearlong participation. Students who were interviewed for this study also described the difficulty in finding courses that could apply for their major; for students who studied abroad for the full year, it was not only more difficult to find applicable courses abroad, but the consequences of not finding applicable courses could significantly delay graduation.

Cost was a barrier for summer students in particular, but surprisingly less for students who had studied abroad for longer durations. One reason for this is that in some cases financial aid does not apply to summer programs. This means that students who go abroad over summer are forced to pay for these programs out of pocket or with additional loans. Despite the shorter timeframe, summer programs are more expensive.

Decision-Making Factors and Gender

Not only do women participate in study abroad at higher rates than men (IIE, 2015b), but women are also more likely to intend to study abroad than men (Stroud, 2010). In this study, intention to study abroad was not measured, but goals and barriers for studying abroad were explored. Overwhelmingly decision making-factors did not differ significantly by gender, but men were more likely to cite wanting to meet new people and wanting an internship as goals for going abroad.

Generally, challenges to participation also did not differ significantly. Lucas' (2009) study found that males reported less social support than females and received less information regarding study abroad. Findings from this study were different because neither males nor females cited lack of social support as a barrier to participation. In this study, social support included family, friends, faculty, study abroad program advisors, or the

College of Engineering. It can also be concluded that because the group of students in this study all studied abroad, they found the information sufficient to their needs. Further, no students in their follow up interviews cited lack of information regarding study abroad opportunities to be a problem. Instead, these students sought out information either before arriving at their university or shortly after they enrolled.

Major Findings From Advisors

Academic advisors have been largely under-examined in the study abroad literature, which often focuses on the perspectives of faculty, study abroad professionals, and employers. The literature that does mention advisors often highlights the shortcomings of advising. For example, Grandin and Hirleman (2009) noted “Engineering programs often do not have advisors who are knowledgeable about study abroad opportunities and who are willing to commit the time to compare courses and determine credit” (p. 12). However, the benefits of good advising also appear promising: “Properly structured, advising in preparation for study abroad can help students gain valuable insight with regard to their academic goals and progress overall and the relationship of their academic work to an eventual career” (Heisel & Stableski, 2009, p. 34).

One important finding from this study is that advisors try to “debunk” the myth that study abroad is impossible for engineering majors. In their advising sessions, they encourage study abroad and work with students to make sure study abroad fits into their academic plans. Some research has found that students who choose not to study abroad find the process too difficult to navigate (Spiering & Erickson, 2006). In this case, educating the student about their options, either through informational meetings or one-on-one advising, is important.

Spiering and Erickson (2006) suggest “targeting the role of the study abroad adviser as the change agent” (p. 320). In this study, academic advisors were considered change agents as well. Rogers (2003) defines the change agent as “an individual who influences clients’ innovation-decisions in a direction deemed desirable by a change agency” (as cited in Spiering & Erickson, 2006, p. 27). Both academic and study abroad advisors must work to change students’ perceptions that study abroad is impossible for engineering majors. Spiering and Erickson suggest one possible way to do this is to educate faculty so that they not only promote study abroad in their classes but also facilitate transfer credit for work taken at foreign universities.

Advisors repeatedly described difficulties in ensuring that courses taken abroad would fulfill major requirements. Since faculty at each individual campus determine major requirements, course approval rested on them. Many faculty took weeks or months to review the courses, and some were not willing to allow courses taken abroad to fulfill major requirements.

Curriculum integration, which ensures that study abroad experiences are incorporated into the undergraduate curriculum and approved for both major and degree credit, has long been a goal of education abroad practitioners (Parcells & Woodruff, 2016). It has also been suggested that faculty attitudes and curricular integration go hand in hand, as “greater faculty involvement has the capability to lead to better curriculum integration and the likelihood that credit earned through study abroad will contribute to students’ degree progress” (Gutierrez, Auerbach, & Bhandari, 2009, p. 20). Curricular integration would lessen the barriers for students who want to ensure that they graduate within four years.

Summary and Discussion of the Impact of Studying Abroad

General Outcomes

This study also sought to explore and analyze the impact of study abroad for engineering majors. Through both the survey and the individual interviews, it is clear that studying abroad does have a strong impact. On the survey, the two categories that were ranked closest to “strongly agree” were Impact on International/Intercultural Understanding and Competence and Impact on Personal Development. Students strongly agreed that study abroad increased their insight and appreciation of other cultures. Additionally, study abroad made them more self-reliant, independent, and increased their self-confidence. Bettez and Lineberry (2004) also found that students ranked personal outcomes over academic outcomes.

Engineering learning, in both the survey and the interview, was of secondary importance to students. Other studies have also found that academic learning is secondary to the personal learning students experience while abroad (Bettez & Lineberry, 2004; Carlson et al., 1990; Chambers & Chambers, 2008). One possible reason for this is that students in engineering majors, like students in other majors, go abroad for their own personal interest. Perhaps they have a hierarchical view of American science education (Klahr & Ratti, 2000) so they would rather complete courses for their major at home. In the current study, a few students did report that the education abroad was less rigorous than the education at home.

Some studies have measured engineering learning in engineering-specific study abroad programs (DiBiasio & Mello, 2004; Maldonado et al., 2014; Schubert & Jacobitz, 2013). These studies tend to have more successful results in engineering learning, as they are focused on engineering. The results from this study show that without purposeful planning in engineering, engineering learning is of secondary importance. While many students

appreciated the hands on nature of engineering learning while abroad, they did not find their technical skills to be much improved over courses taken at the home university.

Study abroad impacted students' careers in three ways: by altering or confirming their career paths, by appealing to employers, and by interest in working internationally. On the survey, students reported that they would feel comfortable working internationally and that study abroad was important to their professional development. However in the interviews the outcomes were a little more nuanced. While some students felt that study abroad made them a more attractive candidate to employers, others were unsure. Additionally, three of 11 students felt that after getting exposure to international living, they would not like to work internationally.

Outcomes by Program Duration

Many studies have sought to measure outcomes based on program duration. In this study, outcomes appeared to be nearly the same regardless of program duration. The top two outcomes were the same: study abroad was important to students' personal development and gave them increased insight into other cultures.

In a longitudinal study, Dwyer (2002) found that yearlong students were more likely to use a foreign language on a regular basis and were more likely to report that study abroad increased their self-confidence. While these factors did not emerge as differences in this study, it is perhaps too soon to tell—in a retrospective study, these differences might emerge as more profound. Ingraham and Peterson (2003) found differences in the impact of students' career development as a result of studying abroad, indicating that the longer students went abroad, the more impactful the experience was for career development. At this point, career development did not emerge as a significant difference in this study.

Outcomes by Gender

In general, most outcomes did not vary significantly by gender. This finding counters other studies (Vande Berg et al., 2009) which did find significant differences between males and females. Unlike in other studies, for the few findings that did show significant differences, males actually reported stronger impacts than females. In this study, males were more likely to report an increase in second-language competency than females. In the Georgetown Consortium study (Vande Berg et al., 2009), females made significantly greater progress in foreign language acquisition than males. While the results of this study were based on self-reports and not on a foreign language exam, it is promising to see that males did report an increase in second-language competency. It is possible that the males in this study were highly motivated to learn a foreign language. Indeed, both Jeffrey and Jim purposefully chose programs where the language of instruction was not English. Additionally in the Georgetown Consortium study, females made statistically significant gains in intercultural learning, while males did not. In the current study, males were more likely to have increased contact with international students on campus than females. These findings seem to indicate that when males are highly motivated to study abroad and increase their intercultural competency and understanding, they do so at rates equal to, or higher than, females.

Reflection

Interview participants described reflecting in two ways: alone and with others. Some students reflected in multiple ways, but in general reflection did not emerge as important for students to help them process what they learned abroad. Some students found it either challenging or not important to reflect while abroad.

While students in this study found it difficult to dedicate time to reflection, they are not unusual. Many studies have found that often students will not reflect on their experiences without reflection time incorporated into the education abroad curriculum. In order for more transformational learning to occur, several studies show the importance of guided reflection (Paige & Goode, 2009; Root & Ngampornchai, 2012; Vande Berg et al., 2009; Wessels et al., 2011). Students are less likely to reflect if they are not guided throughout their program. If reflection truly is a key component to perspective change, then adding required guided reflection throughout programs is critical. Additionally, students need to be guided on how to reflect. Root and Ngampornchai (2012) suggest counseling students on the importance of reflection in pre-departure programs.

Implications of the Findings for Global Engineers

One of the purposes of this study was to determine if study abroad is an effective way to develop “global engineers.” The literature has reported that engineers need to become global engineers in order to be successful in their careers. In this study, the term global engineer was explored through the development of global competency (Parkinson, 2009) and professional, or soft, skills (ABET Criterion 3 guidelines; Shuman et al., 2005).

Global Competency

Global engineers must be globally competent. This study utilized the conceptualization of global competency from Parkinson (2009). Globally competent engineers possess the following characteristics:

1. can appreciate other cultures.
2. are proficient working in or directing a team of ethnic and cultural diversity.
3. are able to communicate across cultures.

4. have had a chance to practice engineering in a global context, whether through an international internship, a service-learning opportunity, a virtual global engineering project or some other form of experience.
5. can effectively deal with ethical issues arising from cultural or national differences.

(p. 12-13)

The students in this study reported outcomes similar to the attributes of global competency. Because of studying abroad, they developed a strong appreciation for other cultures and a new perspective of the world (attribute #1). Many students had the opportunities to work in multi-ethnic teams, and all students learned the difficulties of communicating across cultures, especially when the dominant language is not English for everyone involved (attributes #2 and #3). While most students did take courses in engineering, not all students had the opportunity to practice hands-on engineering projects (attribute #4). These skills would be better measured in engineering-specific learning programs. And while it is too soon to learn if students can effectively deal with cultural and national differences in their careers (attribute #5), the experiences of studying abroad did provide a strong foundation for enhanced global-mindedness.

Soft Skills

It has been speculated that many of the soft skills recognized by the ABET Criterion 3 guidelines can be improved through study abroad. Attempting to measure the growth of each of the soft skills was outside the scope of this study, but the findings did point to development of four skills: the ability to function on multidisciplinary teams; the ability to communicate effectively; the broad education necessary to understand the impact of

engineering solutions in a global, economic, environmental, and societal context; and knowledge of contemporary issues.

The students in this study reported that study abroad improved their ability to work as team members, particularly with students from other cultures. Peter led a team of other engineers in creating a Formula One racing car. In this team, he had to navigate working with students from other cultures. Michael explained that he was reluctant to work with a group of local Singapore students because he was unsure of their capabilities in computer science, but after working with them felt that they were just as competent, if not more so, as peers at his home university.

Additionally, it was apparent that they did come away from their experience with a broadened understanding of engineering. Students found “there’s more than one way to solve a problem.” By taking courses abroad, they understood the engineering issues that people in other countries face. Many students also described abilities to compare political and social issues with those of the United States. Simply living abroad for a semester or more gave them the ability to identify important issues in their host countries.

Implications of the Findings for Theory

Theory of Reasoned Action

Fishbien and Ajzen’s (1975) theory of reasoned action helps explain a person’s intent to perform a behavior; in this context, that behavior was the decision to study abroad. The theory posits that two factors directly relate to a person’s intent to perform a behavior: his or her attitude toward the behavior and the subjective norm regarding the behavior. The subjective norm consists of other peoples’ beliefs about performing the behavior, which may influence a person’s motivation to perform that behavior.

Kasravi (2009), building on the theory based on research from Booker (2001) and Peterson (2003), re-conceptualized the theory of reasoned action as personal and social factors that help explain why students may or may not participate in study abroad. Based on findings, she added a third determinant: institutional factors, like program cost and availability of classes, that also influence intent to study abroad. Interview participants in this study confirmed that personal, social, and institutional factors facilitated or challenged study abroad participation. Importantly, interview participants explained the challenges of using courses taken abroad to satisfy major requirements. These institutional challenges could only be overcome through their strong internal drive to study abroad, which for some students meant extending their time to degree. Considering that students' strong desires to study abroad helped them to overcome these challenges recognizes that both personal and institutional factors can facilitate study abroad.

Transformational Learning Theory

The experiences abroad, which encompasses interacting with individuals from other cultures, becomes a catalyst for deep change. Transformational learning theory (Mezirow, 1991) is a theoretical description of the steps that learners go through to change their worldviews (Brock, 2009). As Brock explains, "transformative learning is when a learner is struck by a new concept or way of thinking and then follows through to make a life change" (p. 2). Transformational learning theory provides a theoretical underpinning for the possibility of becoming a global engineer and transforming in other ways as a result of study abroad. A disorienting dilemma serves as a catalyst for transformation. In this study, as in other studies focusing on study abroad, the study abroad experience served as the disorienting dilemma.

Much research indicates the importance of reflection in leading to perspective change. In this study, reflection was not of central importance to interview participants. However, one student, Peter, indicated a type of reflection that is less common in the literature: taking pictures and reviewing what he saw at the end of the day. Due to the prevalence of cameras, students can easily take pictures of what they saw or thought of. This type of reflection not only engages students who might consider journal writing not useful, it also helps students process their experiences in a new way. Additionally, reflection after the experience abroad is necessary as well. It may be that the experience is too chaotic or fast-paced to stop and think about what they are learning. But when students return home and continue to reflect, that is when the transformative learning actually occurs.

Measuring transformation may also not be possible in a short timeframe. Some research does question whether transformation is “cataclysmic” or “gradual” (Brock, 2009). In this study it appears that the process of transformation extends beyond students’ return home, perhaps even several months or years after their experience. Measuring transformative learning too soon may cause students to feel they were not actually “transformed.”

Integrated Conceptual Model

In light of the findings from this study, the integrated conceptual model used for this study needs to be revised (see Figure 6.1). Kasravi’s (2009) conceptual model (Figure 1.1) displays factors that positively influence study abroad. Her findings revealed that personal factors weighed more heavily in decision-making than the social and institutional factors. While personal factors certainly outweighed others in terms of positively influencing study abroad, the model must also incorporate barriers to studying abroad as well. Institutional

barriers (such as academics) weighed more heavily than personal and social barriers. For that reason, the model in this study is revised to express the importance of both institutional factors and personal factors in engineering students' decision-making regarding study abroad.

Regarding transformational learning, Johnson's (2016) model (Figure 1.3) indicated that transformation ends before students return home. However, this study concluded that transformation appears to continue when students return home, as they are making sense of their experience and understanding how their new perspectives will impact their daily lives. For some students, this newfound perspective will continue as meaning schemes, whereas for others the newfound perspective will change their meaning perspective and become transformational learning. Additionally, reflection appears to either start while students are abroad or once they return home. For that reason, reflection was also added to the model to indicate that reflection is ongoing.

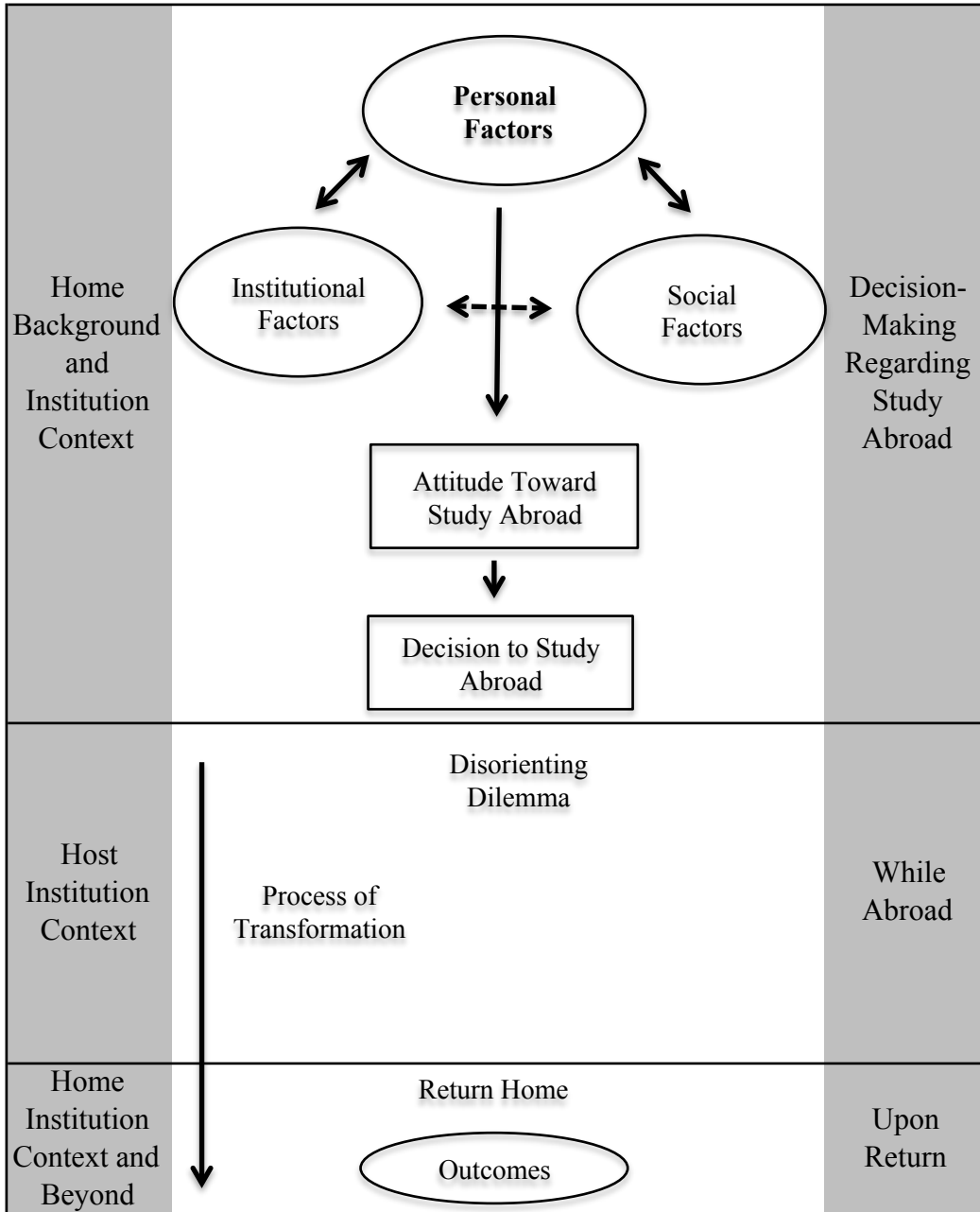


Figure 6.1. Revised integrated conceptual model for understanding the experiences of undergraduate engineering majors who study abroad, based on Johnson's (2016) and Kasravi's (2009) models.

Implications of the Findings for Practice

One of the purposes of this study was to increase study abroad participation for engineering majors. The findings of this study are valuable to both personnel in the college

of engineering (faculty, administrators, and advisors) as well as study abroad offices. These implications and recommendations come not only from the findings of this study but also from suggestions by students and advisors themselves.

Pre-Departure Phase

Recruiting engineering majors. In this study, few participants reported making the decision to study abroad because of the opportunity to develop as engineers. However, the “soft skills” students developed abroad may be just as important as any technical skills that can be offered. Particularly in programs that are not geared toward engineering majors, the learning of soft skills can be emphasized. Recruitment material may need to include how study abroad helps students develop valuable career-related skills, in addition to technical skills.

Academic advisors play an important role in promoting study abroad. They encourage study abroad in the following ways: by speaking positively about the study abroad experience in general, by showing students how it is possible to fit study abroad into their 4-year plan, and by connecting prospective students with returned engineering students. Advisors must also have accurate, updated information for students. Misinformation can inhibit participation. Advisors are particularly effective when they are familiar with program options that help students make progress toward their degrees. Peer advisors can be just as effective if they are well-informed.

Goldstein and Kim (2006) suggested encouraging participation by moving beyond academic integration and career development. Instead, institutions are encouraged to develop programs on campus that give students accurate expectations regarding study abroad, increase their intercultural understanding and competence, and facilitate language

learning. With these objectives in mind, engineering students in particular may be more likely to want to study abroad.

Faculty support, through both encouraging study abroad in their classrooms and by approving coursework taken abroad, is particularly crucial during this stage. Research has shown that students are more likely to go abroad with strong support from faculty (Klahr & Ratti, 2000; Grandin & Hirleman, 2009; O'Hara, 2009; Paus & Robinson, 2008; Relyea et al., 2008; Spiering & Erickson, 2006). Educating faculty on the importance of studying abroad for both academics and the development of important intercultural skills is key. Any mechanisms or initiatives to encourage faculty to expedite decisions on course transferability would enhance student participation. Oftentimes students were deterred from studying abroad because faculty could not determine pre-departure if courses would meet major requirements.

Incorporating study abroad into engineering curriculum. One major barrier to engineering majors studying abroad is the rigidity of the engineering curriculum. The strict guidelines set by ABET have been blamed for reducing the flexibility of the curriculum (Klahr & Ratti, 2000). Even if curriculum requirements cannot change, it is possible to integrate study abroad into the curriculum. For example, allow students one specific quarter they can study abroad.

In this study, a major challenge for students was finding courses that would satisfy degree requirements. Colleges of engineering and the SAPO must work together so that students can easily find courses to take abroad. Colleges can facilitate study abroad by not only pre-approving courses for credit (as many study abroad programs already do) but also approving these courses to fulfill general education and major requirements (which is far less

common). Study abroad offices can facilitate access by giving students an easy way to find classes that are appropriate to take abroad, particularly courses that are appropriate for engineering majors. These offices are encouraged to maintain a database of courses that have been approved for major or general education credit and make them easy to find. For universities with multi-campus systems, courses that have been approved at one campus as a course equivalent should also be approved at other campuses. For example, if a course on “Dynamics” taken at a university abroad was approved by one campus in the system, it should be acceptable at all campuses in the system.

Program Phase

One of the goals of study abroad programming for engineering majors is to encourage the development of engineers who are prepared to work globally and interact successfully with people from diverse cultures. To encourage this type of transformational learning, guided reflection is necessary to help students understand what they are learning and how these new experiences and skills can help them in the future. Guided reflection should be incorporated into the curriculum. As Taylor (2008) explains, educators must “take time to know students as individuals, recognizing their preferences, and engaging a variety of approaches in fostering transformative learning (p. 12). This means that students should not be limited to reflecting through journals. Some students may prefer talking with others or even taking pictures or drawing as a means of reflection.

Returnee Phase

Results from this study suggest that students are unclear how employers may value their study abroad experience. Additionally, while students gained many career-related skills by studying abroad, they were not always able to see the connections to their future careers.

Career counselors could help students transfer the attitudes, skills, and abilities they learned from studying abroad onto their resumes.

Peer role models have been found to be important influences of study abroad, both in this study and in the literature reviewed. Advisors should ask study abroad returnees to give testimonials of their experience. Students who have successfully studied abroad for an academic year should be particularly encouraged to report on their experiences in order to show students that yearlong programs are possible.

Limitations and Recommendations for Future Research

While this study contributes to the limited research in study abroad programming for engineering majors, there are a few limitations that must be mentioned. First, this study focused on one university system. Future studies may wish to broaden the sample to different university types or different locations throughout the United States. Second, a common limitation with study abroad research is self-selection bias, where students who choose to participate in the study are more inclined to describe favorable experiences and outcomes. However, including varying program durations (like summer, semester, and yearlong) allowed for more variation in the outcomes.

While both males and females were asked to participate in interviews, there was a gender imbalance in the interviews. All academic advisors were female, and all students were male. While this does limit the generalizability of the findings, it was also important to hear the male voice, as male participation in study abroad is generally much lower than that for females (IIE, 2015c).

Future studies may wish to expand the definition of a “global engineer” and explore the development of global engineers during university study. Researchers might ask experts

in the field to define a global engineer. An additional study could also look at what it means to be a global engineer in a different context, such as in a work setting.

Outside of the limitations, there are also several additional areas that are important to continue with future research. Researchers might use the same survey or interview protocols with students from other majors. Additionally, because longitudinal studies are lacking in the study abroad literature, it would be useful to follow up with students in 1 year, 5 years, and 10 years. It would be useful to compare engineers who had an international experience while in college with those who did not to measure global competency and the development of soft skills.

Further, this study examined academic advisors' perspectives on study abroad; faculty could comprise another study focus. Engineering faculty have notably been less likely to encourage students to participate in international experiences (Grandin & Hirleman, 2009; O'Hara, 2009). Future research could interview engineering faculty members to explore what is restricting them from encouraging study abroad.

Conclusion

Globalization requires that engineering graduates become global engineers. Global engineers are expected to embody the tenets of global competency and utilize the so-called soft skills in order to be successful in their careers. This study attempted to determine if study abroad could develop global engineers. While the definition of global engineering was limited, the students in this study showed promising characteristics consistent with global engineering. Study abroad has proved to be an effective way at developing these important traits and skills.

While the benefits of studying abroad for engineering majors are quite clear, the road to participation is difficult. Both academic advisors and the students themselves identified barriers to participation, such as stringent academic requirements and the need for experiences like research and internships that employers seemingly value more. Participation in study abroad is more likely when students themselves have an internal drive that motivates them to study abroad in spite of the barriers, and when academic advisors have carefully planned studying abroad into students' degree plans.

In order for study abroad to be a truly beneficial international experience, students need support while abroad that encourages them to become global engineers. Particularly, guided reflection is an important way to help students make meaning of their experience. With the support of a cultural mentor as emphasized in other literature (Anderson et al., 2006; Paige & Goode, 2009; Root & Ngampornchai, 2012; Vande Berg et al., 2009), students are likely to make connections between their experience abroad and the experiences employers are looking for. Vande Berg and colleagues found that when students met with a cultural mentor "very often," their intercultural learning scores dramatically increased. Their time abroad serves more than just as a vacation or as a semester away; instead, it becomes a meaningful experience that helps them not only in their future careers but also in their personal lives.

References

- ABET, Criteria for Accrediting Engineering Programs, 2016-2017.
<http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2016-2017/>
- Allen, H. W. (2009). What shapes short-term study abroad experiences? A comparative case study of students' motives and goals. *Journal of Studies in International Education*, 14(5), 452–470. doi:10.1177/1028315309334739
- Allport, G. (1954). *The nature of prejudice*. Reading, MA: Addison-Wesley.
- Altbach, P. G., & Knight, J. (2007). The Internationalization of Higher Education: Motivations and Realities. *Journal of Studies in International Education*, 11(3–4), 290–305. <http://doi.org/10.1177/1028315307303542>
- Amir, Y. (1969). Contact hypothesis in ethnic relations. *Psychological Bulletin*, 71, 319–342.
- Anderson, P. H., Lawton, L., Rexeisen, R. J., & Hubbard, A. C. (2006). Short-term study abroad and intercultural sensitivity: A pilot study. *International Journal of Intercultural Relations*, 30(4), 457–469. <http://doi.org/10.1016/j.ijintrel.2005.10.004>
- Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative Research*, 21, 7–21.
- Baxter Magolda, M. B. (1999). *Creating contexts for learning and self-authorship: Constructive-developmental pedagogy*. Nashville, TN: Vanderbilt University Press.
- Bennett, M. J. (1993). Towards ethnorelativism: A developmental model of intercultural sensitivity. In R. M. Paige (Ed.), *Education for the intercultural experience* (pp. 21–71). Yarmouth, ME: Intercultural Press.
- Beausoleil, A. (2008). Understanding heritage and ethnic identity development through study

- abroad: The case of South Korea (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3330411)
- Bettez, D. J., & Lineberry, G. T. (2004). *Assessing engineering students' study abroad experiences*. Paper presented at the American Society for Engineering Education Annual Conference & Exposition, Salt Lake City, UT.
- Bloomfield, S. B. (2004). *One man at a time. NAFSA Underrepresentation in Education Abroad Newsletter, 1*, 3–4.
- Blumenthal, P., & Grothus, U. (2009) Expanding Study Abroad in the STEM Fields: A Case Study of U.S. and German Programs. In P. Blumenthal & S. Laughlin (Eds.) *Meeting America's global education challenge: Promoting study abroad in science and technology fields. IIE Study Abroad White Paper Series, (5)*, 10-25.
- Booker, R. W. (2001). *Differences between applicants and non-applicants relevant to the decision to apply to study abroad*. Doctoral dissertation, Columbia, MI: University of Missouri.
- Braskamp, L. A., Braskamp, D. C., & Merrill, K. (2009). Assessing progress in global learning and development of students with education abroad experiences. *The Interdisciplinary Journal of Study Abroad, 18*, 101–118.
- Bremer, D. (2008). Engineering the world. *Online Journal for Global Engineering Education, 3*(2), 13–18. <http://doi.org/10.1109/EMR.2009.4804354>
- Brenner, M. E. (2006). Interviewing in educational research. In J. Green, C. Camilli, & P. Elmore (Eds.), *Handbook of complementary methods in education research* (pp. 357-370). Mahwah, NJ: Erlbaum.
- Brock, S. E. (2009). Measuring the importance of precursor steps to transformative learning.

- Adult Education Quarterly*, (2), 122–142. <http://doi.org/10.1177/0741713609333084>
- Carlson, J., Burn, B., Useem, J., and Yachimovicz, D. (1990). *Study abroad: The experience of American undergraduates*. Westport, CT: Greenwood Press.
- Chambers, A., & Chambers, K. (2008). Tuscan dreams: Study abroad student expectations and experiences in Siena. In V. V. Savicki (Ed.), *Developing intercultural competence and transformation: Theory, research, and application in international education* (pp. 128-153). Sterling, VA: Stylus.
- Chang, Y., Atkinson, D., & Hirleman, E. D. (2009). International research and engineering education: Impacts and best practices. *Online Journal for Global Engineering Education*, 4(2), 1–8.
- Chang, Y., Groll, E. A., & Hirleman, E. D. (2013). Best of both worlds: Foreign language preparation for Purdue University’s undergraduate global engineering education program. *Online Journal for Global Engineering Education*, 6(1), 1–12.
- Chieffo, L., & Griffiths, L. (2003). What’s a month worth? *International Educator*, 26–31.
- Chieffo, L., & Griffiths, L. (2004). Large-scale assessment of student attitudes after a short-term study abroad program. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 10, 165–177.
- Clarke, I., Flaherty, T. B., Wright, N. D., & McMillen, R. M. (2009). Student intercultural proficiency from study abroad programs. *Journal of Marketing Education*, 31(2), 173-181. <http://doi.org/10.1177/0273475309335583>
- Continental AG. (2006). Final report of the global engineering excellence initiative. Hanover, Germany: Author.

- Courter, S.S., Millar, S.B., & Lyons, L. (1998). From the student's point of view: Experiences in a freshman engineering design course. *Journal of Engineering Education*, 87(3), 283–288.
- Covert, H. H. (2013). Stories of personal agency: Undergraduate students' perceptions of developing intercultural competence during a semester abroad in Chile. *Journal of Studies in International Education*, 18(2), 162–179.
<http://doi.org/10.1177/1028315313497590>
- Cranton, P. (2002). Teaching for transformation. *New Directions for Adult and Continuing Education*, 93, 63–71.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage Publications.
- Dessoff, A. (2006). Who's not going abroad? *International Educator*, 15(2), 20–27.
doi:10.1017/CBO9781107415324.004
- DiBiasio, D., & Mello, N. (2004). Multi-level assessment of program outcomes: Assessing a nontraditional study abroad program in the engineering disciplines. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 10, 237–252.
- Dolby, N. (2005). Globalisation, identity, and nation: Australian and American undergraduates abroad. *The Australian Educational Researcher*, 32(1), 101–117.
<http://doi.org/10.1007/BF03216815>
- Dolby, N. (2007). Reflections on nation: American undergraduates and education abroad.

- Journal of Studies in International Education*, 11(2), 141–156.
<http://doi.org/10.1177/1028315306291944>
- Donnelly-Smith, L. (2009). Global learning through short-term study abroad. *Peer Review*, 12-15.
- Downey, G., Lucena, J., Moskal, B., Parkhurst, R., Bigley, T., Hays, C., ... Nichols-Belo, A. (2006). The globally competent engineer: Working effectively with people who define problems differently. *Journal of Engineering Education*, 95(2), 107–122.
- Dwyer, M. (2002). More is better: The impact of study abroad program duration. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 10, 151–164.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley Publishing.
- Foronda, C. L., & Belknap, R. A. (2012). Short of transformation: American ADN students' thoughts, feelings, and experiences of studying abroad in a low-income country. *International Journal of Nursing Education Scholarship*, 9(2), 141–147.
<http://doi.org/10.1515/1548-923X.2411>
- Fry, G.W., Paige, R.M., Jon, J., Dillow, J., & Nam, K.A. (2009). *The transformative power of study abroad*. Portland, ME: Council on International Educational Exchange (CIEE).
- Goldstein, S. B., & Kim, R. I. (2006). Predictors of US college students' participation in study abroad programs: A longitudinal study. *International Journal of Intercultural Relations*, 30(4), 507–521. <http://doi.org/10.1016/j.ijintrel.2005.10.001>
- Goodman, A. (2009). Foreword. In P. Blumenthal & S. Laughlin (Eds.) *Meeting America's*

- global education challenge: Promoting study abroad in science and technology fields. IIE Study Abroad White Paper Series, (5), 4-6.*
- Grandin, J. M., & Hirleman, E. D. (2009). Educating Engineers as Global Citizens: A Call for Action. *Online Journal for Global Engineering Education, 4*(1), 24. Retrieved from <http://globalhub.org/resources/799>
- Green, M. F., Hesel, R. A., & Bartini, M. (2008). ACE: College-Bound Students' Interests in Study Abroad and Other International Learning Activities. *ACE, 1*–32.
- Hammer, M. R., Bennett, M. J., & Wiseman, R. (2003). Measuring intercultural sensitivity: The intercultural development inventory. *International Journal of Intercultural Relations, 27*(4), 421–443. [http://doi.org/10.1016/S0147-1767\(03\)00032-4](http://doi.org/10.1016/S0147-1767(03)00032-4)
- Hammer, M. R. (2012). The intercultural development inventory: A new frontier in assessment and development of intercultural competence. In M. Vande Berg, R. M. Paige, & K. H. Lou (Eds.), *Student learning abroad, what our students are learning, what they're not, and what we can do about it* (pp. 115–136). Sterling, VA: Stylus.
- Hayward, F. (2000). *Internationalization of higher education, preliminary status report, 2000 edition*. Washington, DC: American Council on Education:.
- He, N., & Chen, R. J. C. (2010). College students' perceptions and attitudes toward the selection of study abroad programs. *International Journal of Hospitality & Tourism Administration, 11*(4), 347–359. <http://doi.org/10.1080/15256480.2010.518525>
- Heisel, M., & Stableski, R. (2009). Expanding study abroad: Where there's a will, there's a way. In P. Blumenthal & R. Gutierrez (Eds.) *Expanding study abroad capacity at U.S. colleges and universities. IIE White Paper Series (6)*, 28–37.
- Hett, E. J. (1993). *The development of an instrument to measure global-mindedness*

- (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (UMI No. 9408210).
- Hoffa, W. W., & DePaul, S. C. (2010). *A history of U.S. study abroad: 1965–present*. Carlisle, PA: Forum on Education Abroad.
- Hunter, A. (2008). Transformative learning in international education. In V. Savicki (Ed.), *Developing Intercultural Competence and Transformation: Theory, research, and application in international education* (pp. 92-107). Sterling, VA: Stylus Publishing, LLC.
- Hunter, W. (2004). Knowledge, skills, attitudes, and experiences necessary to become globally competent. (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3147319)
- Hunter, B., White, G. P., & Godbey, G. (2006). What does it mean to be globally competent? *Journal of Studies in International Education*, 10(3), 267–285.
<http://doi.org/10.1177/1028315306286930>
- Ingraham, E. & Peterson, D. (2003). Assessing the impact of study abroad on student learning at Michigan State University. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 10, 83-100.
- Institute of International Education (IIE). (2004). *Open doors: Report on international educational exchange*. Annapolis Junction, MD: IIE Books.
- Institute of International Education (IIE). (2015a). Fields of study of U.S. study abroad students, 2003/04-2013/14 [Data file]. Retrieved from <http://www.iie.org/Research-and-Publications/Open-Doors/Data/US-Study-Abroad/Fields-of-Study/2003-14>
- Institute of International Education (IIE). (2015b). Profile of U.S. study abroad students,

- 2003/04-2013/14 [Data file]. Retrieved from <http://www.iie.org/Research-and-Publications/Open-Doors/Data/US-Study-Abroad/Student-Profile/2003-14>
- Institute of International Education (IIE). (2015c). Open doors report 2015. Available from <http://www.opendoors.iienetwork.org>
- Institute of International Education (IIE). (2015d). Duration of study abroad, 2003/04-2013/14 [Data file]. Retrieved from <https://www.iie.org/Research-and-Insights/Open-Doors/Data/US-Study-Abroad/Duration-of-Study-Abroad>
- Institute of International Education (IIE). (2016). Open doors report 2016. Available from <http://www.opendoors.iienetwork.org>
- Jackson, J. (2008). Globalization, internationalization, and short-term stays abroad. *International Journal of Intercultural Relations*, 32(4), 349–358.
<http://doi.org/10.1016/j.ijintrel.2008.04.004>
- Jesiek, B. K., Zhu, Q., Woo, S. E., Thompson, J., & Mazzurco, A. (2014). Global engineering competency in context: Situations and behaviors. *Online Journal for Global Engineering Education*, 8(1). Retrieved from <http://digitalcommons.uri.edu/ojgee/vol8/iss1/1>
- Johnson, R.S. (2016). *Creative minds abroad: How design students make meaning of their international education experiences* (Doctoral dissertation). Retrieved from <http://hdl.handle.net/11299/45272>
- Kasravi, J. (2009). *Factors influencing the decision to study abroad for students of color: Moving beyond the barriers* (Doctoral dissertation). Retrieved from <http://hdl.handle.net/11299/45272>
- Kegan, R. (1994). *In over our heads*. Cambridge, MA: Harvard University Press.

- Kitchenham, A. (2008). The evolution of John Mezirow's transformative learning theory. *Journal of Transformative Education*, 6(2), 104–123.
<http://doi.org/10.1177/1541344608322678>
- Klahr, S. (2002). Every engineer a nomad? International education as a challenge to the profession. In W. Grünzweig & N. Rinehart (Eds.), *Rockin' in red square: Critical approaches to international education in the age of cyberculture* (pp. 119-126).
Münster: Lit.
- Klahr, S., & Ratti, U. (2000). Increasing Engineering Student Participation in Study Abroad: A Study of U.S. and European Programs. *Journal of Studies in International Education*.
- Knight, J. (2003). *Internationalization of Higher education Practices and Priorities: 2003 IAU Survey Report*.
- Koskinen, L., & Tossavainen, K. (2004). Study abroad as a process of learning intercultural competence in nursing. *International Journal of Nursing Practice*, 10(3), 111–120.
<http://doi.org/10.1111/j.1440-172X.2004.00470.x>
- Kumi-Yeboah, A. (2014). Transformative learning experiences of international graduate students from Africa. *Journal of International Students*, 12(1), 25–53.
<http://doi.org/10.1177/1541344614538120>
- Leung, A.K., Maddux, W.W., Galinsky, A.D., & Chiu, C. (2008). Multicultural experience enhances creativity: The when and how. *American Psychologist*, 63(3), 169-181.
- Lohmann, J. R., Rollins, H. A., & Hoey, J. (2006). Defining, developing and assessing global

- competence in engineers. *European Journal of Engineering Education*, 31(1), 119–131. <http://doi.org/10.1080/03043790500429906>
- Lou, K., & Bosley, G. W. (2012). Facilitating intercultural learning abroad: The intentional, targeted intervention model. In M. Vande Berg, R. M. Paige, & K. H. Lou (Eds.), *Student learning abroad: What our students are learning, what they're not, and what we can do about it* (pp. 335–359). Sterling, VA: Stylus
- Lucas, J. M. (2009). *Where are all the males? A mixed methods inquiry into male study abroad participation* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3381358)
- Maldonado, V., Castillo, L., Carbajal, G., & Hajela, P. (2014). Building international experiences into an engineering curriculum: A design project-based approach. *European Journal of Engineering Education*, 39(4), 377–390. <http://doi.org/10.1080/03043797.2013.874979>
- Medina-Lopez-Portillo, A. (2004). Intercultural learning assessment: The link between program duration and the development of intercultural sensitivity. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 179–200.
- Merriam, S.B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco: Jossey-Bass.
- Merriam, S., & Caffarella, R. (1999). *Learning in adulthood* (2nd ed.). San Francisco: Jossey-Bass.
- Mezirow, J. (1978). Education for perspective transformation: Women's reentry programs in community colleges. New York: Center for Adult Education, Teachers College, Columbia University.

- Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco: Jossey-Bass.
- Mezirow, J. (2000). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco: Jossey-Bass.
- Morais, D. B., & Ogden, A. C. (2011). Initial development and validation of the global citizenship scale. *Journal of Studies in International Education, 15*, 445–466.
<http://doi.org/10.1177/1028315310375308>
- National Center for Education Statistics [NCES]. (2015). Degrees in engineering and engineering technologies conferred by postsecondary institutions, by level of degree and sex of student: Selected years, 1949-50 through 2013-14 [Data file]. Retrieved from https://nces.ed.gov/programs/digest/d15/tables/dt15_325.45.asp
- Norris, E. M., & Gillespie, J. (2008). How study abroad shapes global careers: Evidence from the United States. *Journal of Studies in International Education, 13*(3), 382–397.
<http://doi.org/10.1177/1028315308319740>
- Ogden, A. C. (2010). Education abroad and the making of global citizens: Assessing learning outcomes of course-embedded, faculty-led international programming (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3420254)
- O'Hara, S. (2009). Vital and overlooked: The role of faculty in internationalizing U.S. campuses. In P. Blumenthal & R. Gutierrez (Eds.) *Expanding study abroad capacity at U.S. colleges and universities. IIE White Paper Series* (6), 38–45.
- Olson, J. E., & Lalley, K. (2012). Evaluating a short-term, first-year study abroad program

- for business and engineering undergraduates: Understanding the student learning experience. *Journal of Education for Business*, 87(6), 325–332.
doi:10.1080/08832323.2011.627889
- Orbst, B. S. & Jones, R. C. (2003). *Megatrends in engineering education*. Paper presented at the American Society for Engineering Education Annual Conference and Exposition.
- Paige, R. M., Cohen, A., & Shively, R. (2004). Assessing the impact of a strategies-based curriculum on language and culture learning abroad. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 253–276.
- Paige, R. M., Fry, G. W., Stallman, E. M., Josić, J., & Jon, J. (2009). Study abroad for global engagement: the long-term impact of mobility experiences. *Intercultural Education*, 20, S29–S44. <http://doi.org/10.1080/14675980903370847>
- Paige, R. M., & Goode, M. L. (2009). Intercultural competence in international education administration. In D. K. Deardorff (Ed.), *The SAGE handbook of intercultural competence* (pp. 333-349) Thousand Oaks, CA: Sage.
- Parcells, C., & Woodruff, G. (2016, August 4). Curriculum integration: Best practices. [Webpage]. Retrieved from https://www.nafsa.org/Professional_Resources/Browse_by_Interest/Education_Abroad/Network_Resources/Education_Abroad/Curriculum_Integration__Best_Practices/
- Parkinson, A. (2009). The rationale for developing global competence. *Online Journal for Global Engineering Education*, 4(2), 2. Retrieved from <http://digitalcommons.uri.edu/ojgee/vol4/iss2/2/>
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

- Patton, M.Q. (2015). *Qualitative research and evaluation methods* (4th ed.). Thousand Oaks, CA: Sage.
- Paus, E., & Robinson, M. (2008). Increasing study abroad participation: The faculty makes the difference. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 7, 33–49.
- Pedersen, P. J. (2009). Teaching towards an ethnorelative worldview through psychology study abroad. *Intercultural Education*, 20(sup1), S73–S86.
<http://doi.org/10.1080/14675980903370896>
- Peterson, D. L. (2003). *The decision to study abroad: Contributing factors and implications for communication strategies*. Doctoral dissertation, Michigan State University, Ann Arbor.
- Potts, D. (2015). Understanding the early career benefits of learning abroad programs. *Journal of Studies in International Education*, 19(5), 441–459.
<http://doi.org/10.1177/1028315315579241>
- Redden, E. (2008). Women abroad and men at home. *insidehighered.com*. Retrieved September 11, 2017 from
<http://www.insidehighered.com/news/2008/12/04/genderabroad>.
- Relyea, C., Cocchiara, F. K., & Studdard, N. L. (2008). The effect of perceived value in the decision to participate in study abroad programs. *Journal of Teaching in International Business*, 19(4), 346–361. <http://doi.org/10.1080/08975930802427551>
- Root, E., & Ngampornchai, A. (2012). “I came back as a new human being”: Student descriptions of intercultural competence acquired through education abroad experiences. *Journal of Studies in International Education*, 17(5), 513–532.
<http://doi.org/10.1177/1028315312468008>

- Rowan-Kenyon, H. T., & Niehaus, E. K. (2011). One year later: The influence of short-term study abroad experiences on students. *Journal of Student Affairs Research and Practice, 48*(2), 213–228. <http://doi.org/10.2202/1949-6605.6213>
- Rust, V., Dhanatya, C., Furuto, L., Kheiltash, O. (2008). Student involvement as predictive of college freshman plans to study abroad. *Frontiers: The interdisciplinary journal of study abroad, 15*, 1-16.
- Salisbury, M. H., Umbach, P. D., Paulsen, B., & Pascarella, E. (2009). Going global: Understanding the choice process of the intent to study abroad. *Research in Higher Education, 50*(2), 119–143.
- Salisbury, M. H., Paulsen, B., & Pascarella, E. (2010). To see the world or stay at home: Applying an integrated student choice model to explore the gender gap in the intent to study abroad. *Research in Higher Education, 51*(7), 615-640.
- Sanchez, C. M., Fornerino, M., & Zhang, M. (2006). Motivations and the intent to study abroad among U.S., French, and Chinese Students. *Journal of Teaching in International Business, 18*, 27-52. doi:10.1300/J066v18n01_03.
- Schubert, T., & Jacobitz, F. G. (2013). Compact international experiences: Expanding engineering technical content. *Online Journal for Global Engineering Education, 7*(1).
- Shuman, L. J., Besterfield-Sacre, M., & McGourty, J. (2005). The ABET “professional skills:” Can they be taught? Can they be assessed? *Journal of Engineering Education, 94*(1), 41–55. <http://doi.org/10.1002/j.2168-9830.2005.tb00828.x>

- Sloan, T. F., Ho, H., Sciaky, E., & Otto, K. (2017). Shifting perspectives and pedagogies: The impact of student teaching abroad. In D. Sharpes (Ed.), *Handbook on comparative and international studies in education*. Hoboken, NJ: Wiley Blackwell.
- Spiering, K., & Erickson, S. (2006). Study abroad as innovation: Applying the diffusion model to international education. *International Education Journal*, 7(3), 314–322.
- Stroud, A. H. (2010). Who plans (not) to study abroad? An examination of U.S. student intent. *Journal of Studies in International Education*, 14, 491–507.
doi:10.1177/1028315309357942
- Sutton, R. C. & Rubin, D. L. (2004). The GLOSSARI project: Initial findings from a system-wide research initiative on study abroad learning outcomes. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 10, 65–82. Retrieved from <http://eric.ed.gov.proxy.library.ucsb.edu:2048/?id=EJ891449>
- Taylor, E. (1997). Building upon the theoretical debate: A critical review of the empirical studies of Mezirow's transformative learning theory. *Adult Education Quarterly*, 48(1), 34–59. <http://doi.org/0803973233>
- Taylor, E. (2008). Transformative learning theory. *New Directions for Adult and Continuing Education*, 119, 5-15. DOI: 10.1002/ace
- Trilokekar, R. D., & Kukar, P. (2011). Disorienting experiences during study abroad: Reflections of pre-service teacher candidates. *Teaching and Teacher Education*, 27(7), 1141–1150. <http://doi.org/10.1016/j.tate.2011.06.002>
- Trooboff, S., Vande Berg, M., & Rayman, J. (2008). Employer attitudes toward study abroad. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 15, 17–34.
- Twombly, S. B., Salisbury, M. H., Tumanut, S. D., & Klute, P. (2012). Study abroad in a

- new global century. *ASHE Higher Education Report*, 38(4), 1–152.
doi:10.1002/aehe.20004
- Vande Berg, M., Connor-Linton, J., & Paige, R. M. (2009). The Georgetown consortium project: Interventions for student learning abroad. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 18, 1–75.
- Van Der Meid, J. S. (2003). Asian Americans: Factors influencing the decision to study abroad. *Frontiers: The Interdisciplinary Journal of Study Abroad*, 9, 71–110.
- Van Hoof, H. B., & Verbeeten, M. (2005). Wine is for drinking, water is for washing: Student opinions about international exchange programs. *Journal of Studies in International Education*, 9(1), 42–61. <http://doi.org/10.1177/1028315304271480>
- Wainwright, P., Ram, P., Teodorescu, D., & Tottenham, D. (2009). Going global in the sciences: A case study at Emory University. In Lewin, R. (Ed). *The handbook of practice and research in study abroad: Higher education and the quest for global citizenship* (pp. 381-398. New York, NY: Routledge.
- Wessels, S., Holmes, M., & Herrera, S. (2011). The Role of Preservice Teachers' Meaning Perspectives and Schemes in a Study Abroad Experience. *Multicultural Teaching and Learning*, 6(2), 1–24. <http://doi.org/10.2202/2161-2412.1089>
- Williams, T. R. (2005). Exploring the impact of study abroad on students' intercultural communication skills: Adaptability and sensitivity. *Journal of Studies in International Education*, 9(4), 356–371. <http://doi.org/10.1177/1028315305277681>
- Zemach-Bersin, T. (2007). Global citizenship and study abroad: It's all about U.S. *Critical Literacy: Theories and Practices*, 1(2), 16–28.

Appendix A: Undergraduate Engineer Consent Form Survey Participants

PURPOSE:

You are being asked to participate in a research study. The purpose of the study is to understand your experience abroad and how such experiences have (or have not) impacted your development as a engineer, as well as your intercultural competence. We are also interested in learning how we can make this exchange program better for future students, and we would love to have your feedback about what worked, what did not work, and what could be added into future study abroad programs.

PROCEDURES:

If you decide to participate, you will do the following:

1. You will complete the following survey, which is expected to take 10-15 minutes to complete.
2. If you so choose, you may include your contact information so that the researcher can interview you individually regarding your study abroad experience. The interview is voluntary. It is not required to be interviewed nor is it required to leave your contact information. Note: if you would like to be entered into the raffle to win a \$25 amazon.com gift card, you must leave your contact information (name and email address and/or phone number).
3. If you volunteer, you will be interviewed once by a graduate student researcher. The interview will be conducted individually within a few months of survey completion, and is expected to take 1 to 1 ½ hours. This interview is meant to help us understand how you are making sense of your abroad experience once you've had time to reflect, and how you have (or have not) integrated that experience into your current practices.
4. Interviews may take place either in person on campus or through an online service like Skype, Google Hangout, or FaceTime.

RISKS:

1. Participation in this study is completely voluntary, and the research team does not want you to feel in any way coerced.
2. During individual interviews, some individuals are uncomfortable being audio recorded for the purposes of research.

BENEFITS:

Although we cannot guarantee that you will benefit from this study, we believe it is an opportunity to make the most of your experience abroad by reflecting purposefully on the experiences that you've had, and the ways that they may (or may not) have changed you as an engineer and a person.

This study is also a way to help your fellow engineering majors by helping program coordinators learn how they can best support your learning and growth before, during, and after your abroad experiences. The success of this program will hopefully help bring a more international perspective to undergraduate engineers who have learned more about the world and how things are done differently in different places.

CONFIDENTIALITY:

Your decision to participate WILL NOT have any impact on your standing in the school of engineering, and if you do participate, nothing that you share with researchers will be used as a part of your assessment in the school of engineering. To ensure that this is the case, we have taken the following precautions:

- Interviews are conducted by a graduate student researcher, who will not inform the school of engineering faculty or staff of your identities.
- Your name will not be revealed at any point during our study and will not appear in any publications. Although we may occasionally quote from your interviews or assignments, all identifying information will be stripped from the quote.
- The audio files that we collect will be stored on a secure, password protected computer. Your image and your voice will never be published or shared without your express permission, which the researchers will request separately if it ever becomes necessary.

COSTS/PAYMENT:

If you leave your name and email address and/or phone number at the end of the survey, you will be entered into a raffle to win one of two \$25 amazon.com gift cards. You may only complete the survey once. If you choose to withdraw from the study, you will not be able to win the gift card, unless you leave your name and contact information.

RIGHT TO REFUSE OR WITHDRAW:

You may refuse to participate and still receive any benefits you would receive if you were not in the study. You may change your mind about being in the study and quit after the study has started.

PRINCIPAL INVESTIGATORS DISCLOSURE OF PERSONAL AND FINANCIAL INTERESTS IN THE RESEARCH AND STUDY SPONSOR:

Researchers have no financial interests in this study.

QUESTIONS:

If you have any questions about this research project or if you think you may have been injured as a result of your participation, please contact:

Lesley Seccia – [email address] – [phone number]

If you have any questions regarding your rights and participation as a research subject, please contact the Human Subjects Committee at (805) 893-3807 or hsc@research.ucsb.edu. Or write to the University of California, Human Subjects Committee, Office of Research, Santa Barbara, CA 93106-2050

PARTICIPATION IN RESEARCH IS VOLUNTARY. YOUR SIGNATURE BELOW WILL INDICATE THAT YOU HAVE DECIDED TO PARTICIPATE AS A RESEARCH SUBJECT IN THE STUDY DESCRIBED ABOVE. YOU WILL BE GIVEN A SIGNED AND DATED COPY OF THIS FORM TO KEEP.

Yes, I give consent.

No, I do not give consent. (Directed to the end of the survey)

Appendix B: Undergraduate Engineer Consent Form Interview Participants

PURPOSE:

You are being asked to participate in a research study. The purpose of the study is to understand your experience abroad and how such experiences have (or have not) impacted your development as an engineer, as well as your intercultural competence. We are also interested in learning how we can make this exchange program better for future students, and we would love to have your feedback about what worked, what did not work, and what could be added into future study abroad programs.

PROCEDURES: If you decide to participate, we will do the following:

1. You will complete the following survey, which is expected to take 10-15 minutes to complete.
2. If you so choose, you may include your contact information so that the researcher can interview you individually regarding your study abroad experience. The interview is voluntary. It is not required to be interviewed nor is it required to leave your contact information.
3. If you volunteer, you will be interviewed once by a graduate student researcher. The interview will be conducted individually within a few months of survey completion, and is expected to take 1 to 1 ½ hours. This interview is meant to help us understand how you are making sense of your abroad experience once you've had time to reflect, and how you have (or have not) integrated that experience into your current practices.
4. Interviews may take place either in person on the UCSB campus or through an online service like Skype, Google Hangout, or FaceTime.

RISKS:

1. Participation in this study is completely voluntary, and the research team does not want you to feel in any way coerced.
2. During individual interviews, some individuals are uncomfortable being audio recorded for the purposes of research.

BENEFITS:

Although we cannot guarantee that you will benefit from this study, we believe it is an opportunity to make the most of your experience abroad by reflecting purposefully on the experiences that you've had, and the ways that they may (or may not) have changed you as an engineer and a person.

This study is also a way to help your fellow engineering majors by helping program coordinators learn how they can best support your learning and growth before, during, and after your abroad experiences. The success of this program will hopefully help bring a more international perspective to undergraduate engineers who have learned more about the world and how things are done differently in different places.

CONFIDENTIALITY:

Your decision to participate WILL NOT have any impact on your standing in the school of engineering, and if you do participate, nothing that you share with researchers will be used as a part of your assessment in the school of engineering. To ensure that this is the case, we have taken the following precautions:

- Interviews are conducted by a graduate student researcher, who will not inform the school of engineering faculty or staff of your identities.

- Your name will not be revealed at any point during our study and will not appear in any publications. Although we may occasionally quote from your interviews or assignments, all identifying information will be stripped from the quote.

- The audio files that we collect will be stored on a secure, password protected computer. Your image and your voice will never be published or shared without your express permission, which the researchers will request separately if it ever becomes necessary.

COSTS/PAYMENT:

Interview participants will receive a \$5 Starbucks gift card.

RIGHT TO REFUSE OR WITHDRAW:

You may refuse to participate and still receive any benefits you would receive if you were not in the study. You may change your mind about being in the study and quit after the study has started.

PRINCIPAL INVESTIGATORS DISCLOSURE OF PERSONAL AND FINANCIAL INTERESTS IN THE RESEARCH AND STUDY SPONSOR:

Researchers have no financial interests in this study.

QUESTIONS:

If you have any questions about this research project or if you think you may have been injured as a result of your participation, please contact:

Lesley Seccia – [email address] – [phone number]

If you have any questions regarding your rights and participation as a research subject, please contact the Human Subjects Committee at (805) 893-3807 or hsc@research.ucsb.edu. Or write to the University of California, Human Subjects Committee, Office of Research, Santa Barbara, CA 93106-2050

PARTICIPATION IN RESEARCH IS VOLUNTARY. YOUR SIGNATURE BELOW WILL INDICATE THAT YOU HAVE DECIDED TO PARTICIPATE AS A RESEARCH SUBJECT IN THE STUDY DESCRIBED ABOVE. YOU WILL BE GIVEN A SIGNED AND DATED COPY OF THIS FORM TO KEEP.

Name of Participant (Please print):

Signature of
Participant: _____

Date: _____

Time: _____

Appendix C: Academic Advisor Consent Form Interview Participants

PURPOSE:

Engineering Advisors Consent Form

You are being asked to participate in a research study. The purpose of the study is to learn more about the experiences undergraduate engineering majors have during the entire process (pre- departure, while abroad, and upon return). Your role as an advisor means that you have valuable information to share about engineering students studying abroad. We are also interested in learning how we can make this exchange program better for future students.

PROCEDURES:

If you decide to participate, you will do the following:

You will be interviewed once by a graduate student researcher. The interview will be conducted individually and is expected to take 30 to 45 minutes. This interview is meant to help us understand your views of engineering students studying abroad. The interview will be audio recorded.

Interviews may take place either in person, by phone call, or through an online service like Skype, Google Hangout, or FaceTime.

RISKS:

Participation in this study is completely voluntary, and the research team does not want you to feel in any way coerced.

During individual interviews, some individuals are uncomfortable being audio recorded for the purposes of research.

BENEFITS:

Although we cannot guarantee that you will benefit from this study, we believe it is an opportunity to make the most of your role by sharing your experience of advising undergraduate engineers.

This study is also a way to help program coordinators learn how they can best support student learning and growth before, during, and after the study abroad experiences. The success of study abroad will hopefully help bring a more international perspective to undergraduate engineers who have learned more about the world and how things are done differently in different places.

CONFIDENTIALITY:

Your decision to participate WILL NOT have any impact on your current role. To ensure that this is the case, we have taken the following precautions:

- Interviews are conducted by a graduate student researcher, who will not inform the school of engineering faculty or staff of your identity.
- Your name will not be revealed at any point during our study and will not appear in any publications. Although we may occasionally quote from your interview, all identifying information will be stripped from the quote.
- The audio files that we collect will be stored on a secure, password protected computer. Your image and your voice will never be published or shared without your express permission, which the researchers will request separately if it ever becomes necessary.

COSTS/PAYMENT:

There is no payment associated with participation in this study.

RIGHT TO REFUSE OR WITHDRAW:

You may refuse to participate and still receive any benefits you would receive if you were not in the study. You may change your mind about being in the study and quit after the study has started.

PRINCIPAL INVESTIGATORS DISCLOSURE OF PERSONAL AND FINANCIAL INTERESTS IN THE RESEARCH AND STUDY SPONSOR: Researchers have no financial interests in this study.

QUESTIONS:

If you have any questions about this research project or if you think you may have been injured as a result of your participation, please contact:

Lesley Seccia – [email address] – [phone number]

If you have any questions regarding your rights and participation as a research subject, please contact the Human Subjects Committee at (805) 893-3807 or hsc@research.ucsb.edu. Or write to the University of California, Human Subjects Committee, Office of Research, Santa Barbara, CA 93106-2050

PARTICIPATION IN RESEARCH IS VOLUNTARY. YOUR SIGNATURE BELOW WILL INDICATE THAT YOU HAVE DECIDED TO PARTICIPATE AS A RESEARCH SUBJECT IN THE STUDY DESCRIBED ABOVE. YOU WILL BE GIVEN A SIGNED AND DATED COPY OF THIS FORM TO KEEP.

Name of Participant (Please print):

Signature of Participant or Legal Representative:

Date: _____ Time: _____

Appendix D: Recruitment Email to Advisors

Dear _____,

I am writing to request your participation in a research study about undergraduate engineering majors who study abroad. I am a PhD Candidate at the University of California Santa Barbara conducting research for my doctoral dissertation in the Gevirtz Graduate School of Education.

The purpose of my study is to explore how undergraduate engineering majors describe the study abroad process, from deciding to go abroad through return on to campus and life-long impact.

First:

I am seeking to interview undergraduate advisors like you who have advised students in the engineering process. I would like to understand your thoughts about engineering students who study abroad in order to more fully understand students' points of view. These interviews will last between 30 and 45 minutes, either on the phone, through the internet (i.e., Skype), or in person. Your identity will remain confidential in the study.

I intend to begin these interviews in mid-November. If you would like to participate, please let me know!

Second:

I am selecting undergraduate **engineers or computer science** majors who have recently returned from studying abroad (current juniors, seniors, or recent alum).

This study will involve participants' completion of an online survey about their study abroad experiences. Students may also choose to participate in individual interviews by leaving their contact information at the end of the survey. The participants who complete the survey will be entered into a raffle to win one of two \$25 amazon.com gift cards. Participation is completely voluntary and the name of your school and the identity of students will remain confidential.

I need your help to distribute the survey. With your permission, I will email you a template email that I would like you to forward on to engineering and computer science majors. This email will contain a link to participate in the survey portion of this study.

I intend to distribute this survey at the beginning of January, 2016.

Additionally, I am attaching here a flyer. If possible, could you print out this flyer and post it in strategic locations around your office?

I look forward to your response. Please contact me via phone or e-mail with any questions or for additional information. Thank you for considering this request.

Sincerely,

Lesley Seccia, M.A.

PhD Candidate

[University]

[email address]

[phone number]

Appendix E: Recruitment Email for Students (Survey)

Subject: Share your study abroad experiences as an engineering major

Dear study abroad program returnee,

My name is Lesley Seccia and I am a graduate student in the Department of Education at UC Santa Barbara. Your advisor is forwarding the following survey request to support the goals of my research project. The purpose of this project is to explore how students from engineering majors think about study abroad: why they decided to go, what challenges they faced, and the impact of study abroad on their future careers and aspirations. It is in no way an evaluation of you or anyone else.

Participants in the survey will be entered into a raffle to win one of two \$25 amazon.com gift cards!

Before beginning the survey, please carefully read the consent information, which is included as an attachment in this email, and ask me any questions you might have.

Your responses are confidential and will be seen only by the researcher. The survey asks for your name, email address, and phone number because the researcher may wish to interview some respondents in order to gather more information. Sharing your name, email address and phone number is **optional**. However, if you would like to win the gift card, you must share your name and email address or phone number.

To respond to the survey, please follow this link (cite) and click on the response choices that best reflect your experience. When you have completed each item, please submit the survey. The survey should take approximately 10-15 minutes to complete.

Thank you! I really appreciate your honest and helpful answers.

Sincerely,
Lesley Seccia, MA
PhD Candidate
[University]
[email address]
[phone number]

Appendix F: Recruitment Email for Students (Interviews)

Subject: Engineering Study Abroad Follow Up Interview

Dear xxx,

Thank you for completing the survey regarding engineering majors who studied abroad. I have enjoyed learning more about your study abroad experience. You indicated on your survey that you would be willing to participate in an interview regarding your study abroad experiences. **I am following up to ask you to participate in an individual interview with me.** I am particularly interested in how you think study abroad might influence you in the future (or not at all, that's ok too!). I'm expecting the interviews to take an hour or so, depending on what you have to say. While I will audio record all interviews, you will not be identified by name in my study.

Would you be willing to interview with me on Skype/FaceTime or by phone in the next two weeks? Saturdays, Sundays, and after 5 pm Monday through Friday work for me. I can be more flexible as well if needed!

For your participation in the interview, you will receive a \$5 Starbucks gift card.

Please note that if you do agree to participate in the interview, I will need your verbal consent regarding the consent form (attached). Please read it and let me know if you have any questions.

Best,
Lesley

Lesley Seccia, MA
PhD Candidate
[University]
[email address]
[phone number]

Appendix G: Survey Instrument

This survey is only open to undergraduate engineering or computer science majors or recent alumni who studied abroad. Are you an undergraduate engineering or computer science major or recent alumnus/alumna at a [university-system] campus?

- Yes
- No

If No Is Selected, Then Skip To End of Survey.

If Yes Is Selected, Then Skip To Did you study abroad?

Did you study abroad?

- Yes
- No

If No Is Selected, Then Skip To End of Survey.

If Yes Is Selected, Then Skip To Section 1.

Section 1: Your Study Abroad Experience

Did you study abroad through the [system-wide study abroad program]? (If you participated in two different types of study abroad, please choose one program here and describe the other program at the end of this section.)

- Yes
- No

If Yes Is Selected, Then Skip To In what country did you study abroad?

If Yes Is Selected, Then Skip To If no, which provider/program did you...

- Which provider/program did you choose?
- In what country did you study abroad?
- At what university did you study abroad?
- What was the language of instruction at your university abroad?
- What were your dates of participation? (i.e., June 2016-August 2016)
- How long did you study abroad for? (i.e., one quarter, one semester, etc)

What year in school were you at the time of studying abroad?

- Freshman (or summer following)
- Sophomore (or summer following)
- Junior (or summer following)
- Senior (or summer following)

What was your housing situation? (i.e., homestay, student dormitory, etc)

Did you participate in an internship or conduct research in a lab while abroad?

- Yes. If yes, please briefly describe. _____
- No.

What types of courses did you take abroad? (Check all that apply)

- Lower division general education courses not related to my major
- Upper division general education courses not related to my major
- Lower division major courses
- Upper division major courses
- Language and culture classes
- Other (please describe) _____

Did you participate in another study abroad program?

1. Yes
2. No

If No Is Selected, Then Skip To End of Block If Yes Is Selected, Then Skip To Please describe your second (and thir...

Please describe your second (and third, if applicable) study abroad experience in the box below. Include the following: 1. Program provider 2. Country 3. Language of instruction 4. Your dates of participation 5. The year in school you were when you participated 6. Your housing situation 7. Any lab/internship experience or the types of courses you took

Section 2: Demographic Information

Sharing demographic information is not required, but it will be used for research purposes.

Which [school] do you attend?

- [removed for confidentiality]

What is your current academic standing?

- Freshman
- Sophomore
- Junior
- Senior
- Alumnus/Alumna

Did you enroll at your current [school] as a freshman or as a transfer?

- Freshman
- Transfer

What is your current major?

- Aerospace Engineering
- Biochemical Engineering
- Bioengineering
- Bioinformatics
- Biological Systems engineering
- Biomedical Engineering

- Business Informatics
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Energy Engineering
- Engineering Mathematics and Statistics
- Engineering Physics
- Environmental Engineering
- Industrial engineering and operations research
- Materials Science
- Mechanical Engineering
- Nanoengineering
- Network and Digital Technology
- Nuclear engineering
- Structural Engineering
- Technology and Information Management
- Other and/or double major (please list):

Do you have a second major? If yes, please list.

- Yes _____
- No

Do you have a minor? If yes, please list.

- Yes _____
- No

What is your current age?

- 19
- 20
- 21
- 22
- 23
- 24
- Other (please list) _____

What is your gender?

- Male
- Female
- Other (please list) _____
- Decline to state

Are you a first-generation college student? (First generation is defined as the first in your family to earn a 4-year degree.)

- Yes
- No

What is your race/ethnicity?

- African/African American
- American Indian
- Chicano/Latino
- Asian/Asian American
- European/European American
- Other or biracial (please list) _____
- Decline to state

Are you an international student? If yes, please list your native country.

- Yes _____
- No

Do you speak a language other than English?

- Yes
- No

If Yes Is Selected, Then Skip To Which language(s)?

If No Is Selected, Then Skip To End of Block.

Which language(s)?

If Which language(s)? Is Displayed, Then Skip To To what ability? (Beginning, Intermed...

To what ability? (Beginning, Intermediate, Advanced, Native Speaker)

Section 3: Your Study Abroad Goals and Motivations

To what extent were the following goals or motivations for you to study abroad?

Very Strong Goal/Motivation (5) Strong Goal/Motivation (4) Neutral (3)

Weak Goal/Motivation (2) Not At All A Goal/Motivation (1)

- I liked the country the program was in.
- I wanted to meet new people.
- It was a good opportunity to travel.
- I wanted to learn about my cultural heritage.
- I wanted to live in another culture.
- I wanted to take courses that were requirements for my major.
- I wanted to take general education or elective courses.
- I wanted to learn or improve a foreign language.
- I wanted to conduct research in a lab.
- It was a good opportunity to develop global competency (knowledge, skills, and abilities to work with other cultures).
- I wanted to improve my engineering skills.

- I wanted an internship.
- I wanted work experience.

Out of all the goals/motivations listed above, and others that you can think of, what were your top 3 goals/motivations to studying abroad? Please list them here. (1 = highest goal/motivation)

1. _____
2. _____
3. _____

Section 4: Barriers and Drawbacks

To what extent were each of the following items barriers or drawbacks to you studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)
 Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Too difficult to leave because of course requirements
- Lack of other engineering majors who study abroad
- Lack of support from study abroad professionals
- Lack of support by faculty in the College of Engineering
- Language barriers
- Lack of applicable education abroad programs
- Timing issues (i.e., program offered in fall and you couldn't go in the fall)
- High cost
- Difficulty in transferring credit back to campus
- You didn't see the benefit
- Study abroad not valued by employers
- Study abroad not valued by your parents, family, or friends
- Study abroad not valued by faculty
- Lack of cultural preparation (i.e., you weren't prepared to adapt to the norms of another culture)

Out of all the barriers and drawbacks listed above, and others you can think of, what were your top 3 barriers or drawbacks to studying abroad? Please list them here. (1 = top barrier/drawback)

1. _____
2. _____
3. _____

Section 5: General Impact of Study Abroad

Impact on academics

To what extent do you agree with the following statements about studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)
 Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Study abroad has been an important part of my overall college experience.

- Study abroad increased my second-language competency.
- Study abroad increased my interest in global current events.
- Study abroad increased my understanding of global economic and/or political trends.
- Study abroad helped improve my research skills.
- Study abroad helped me focus better on academics.

Impact on professional development

To what extent do you agree with the following statements about studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)

Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Study abroad is important to my professional development.
- Study abroad will help me in my search for my first job after graduation.
- Study abroad will enhance my lifelong career opportunities.
- Because of study abroad, I will feel comfortable working internationally.

Impact on personal development

To what extent do you agree with the following statements about studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)

Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Study abroad was important to my personal development.
- Study abroad increased my self-confidence.
- Study abroad made me more self-reliant and independent.
- Study abroad increased my patience and flexibility when dealing with other people.
- Study abroad increased my tendency to take risks.
- Study abroad increased my leadership abilities.
- Study abroad increased my self-confidence when working or socializing outside my comfort zone.

Impact on international/intercultural understanding and competence

To what extent do you agree with the following statements about studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)

Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Study abroad gave me increased insight into other cultures.
- As a result of studying abroad, I have an increased appreciation for other cultures.
- Study abroad gave me familiarity with international issues and affairs.
- Study abroad made me more aware of how the international community views Americans in general.
- Study abroad made me more aware of differences in peoples and cultures.
- Study abroad made me more aware of how other people view me.
- Study abroad made me more aware of other norms and taboos.
- While studying abroad I made a conscious effort to adjust my behavior to cultural norms and customs.

Impact on working with people

To what extent do you agree with the following statements about studying abroad?

Very strong barrier/drawback (5) Strong barrier/drawback (4) Neutral (3)

Weak barrier/drawback (2) Very weak barrier/drawback (1)

- Study abroad increased my ability to communicate successfully with people from other cultures.
- Study abroad improved my ability to work in teams of ethnic and/or cultural diversity.
- Study abroad helped me network with global experts in my discipline.
- I have increased contact with international students on campus as a result of my experience abroad.
- I have increased contact with international students in my community as a result of my experience abroad.

Overall impact of study abroad

Strongly agree (5) Agree (4) Neither agree nor disagree (3)

Disagree (2) Strongly disagree (1)

- Overall, I was satisfied with my study abroad experience.
- As a result of study abroad, my life was transformed.

Section 6: Global Impact of Studying Abroad Related to Your Discipline

To what extent do you agree with the following statements about studying abroad?

Strongly agree (5) Agree (4) Neither agree nor disagree (3)

Disagree (2) Strongly disagree (1)

- I have a deepened interest in pursuing an engineering career in a multi-national organization because of my experience abroad.
- My study abroad experience enhanced my perspective on the value and importance of my discipline on the global community.
- My study abroad experience enhanced my ability to deal with ethical issues arising from cultural and/or national differences.
- I returned to UC with more confidence in my engineering talents and abilities than I had prior to the study abroad experience.
- My study abroad experience better equipped me to apply my engineering skills to solve real-world problems in a broader global and societal context.
- My study abroad experience increased my understanding of the impact of engineering solutions in a broader global and societal context.

Are there other ways in which you feel studying abroad changed you? If so, please describe in the box below.

Section 7: Other Thoughts

Do you have any additional thoughts about your study abroad experience not asked about on the survey? If so please share these thoughts below.

Follow Up Interviews

Would be willing to participate in an in-person or online (i.e., through Skype) interview about your study abroad experience? Participants who are selected to be interviewed will receive \$5 Starbucks gift cards for their participation.

3. Yes
4. No

If yes, please provide your name, email address, and/or phone number below. Your name and email address are requested because the researcher would like to follow up with some respondents for an interview. Data collected will be confidential. Individual responses will not be shared. Note: if you would like to be entered into the raffle to win a \$25 amazon.com gift card for completing this survey, you must share your name and email address or phone number.

Name

Email Address

Phone Number

You have reached the end of the survey. Thank you for participating! If you have any questions or comments, please reach out to the researcher at [email address].

Appendix H: Sources of Survey By Item

Section	Source	Item Content
Goals/Motivations	Van Hoof & Verbeeten (2005)	I liked the country the program was in.
		It was a good opportunity to travel.
	Chambers & Chambers (2008)	I wanted to meet new people and /or make new friends.
	Van Der Meid (2003)	I wanted to take courses that were requirements for my major.
		I wanted to take general education or elective courses.
	Beausoleil (2008)	I wanted to visit family or friends abroad.
	Beausoleil (2008); Van Der Meid (2003)	I wanted to learn about my cultural heritage.
	Chambers & Chambers (2008); Van Hoof & Verbeeten (2005)	I wanted to experience my host country's life and culture.
	Beausoleil (2008); Chambers & Chambers (2008); Van Hoof & Verbeeten (2005)	I wanted to learn or improve a foreign language.
	Researcher-developed	I wanted to conduct research in a lab.
	It was a good opportunity to develop global competency (knowledge, skills, and abilities to interact with other cultures).	
	I wanted to improve my STEM skills.	
	I wanted an internship.	
	I wanted work experience.	
	I wanted to visit family or friends abroad.	
Barriers/Drawbacks	Virtually all studies	High cost

	Grandin & Hirleman (2009)	<p>Too difficult to leave because of course requirements</p> <p>Lack of support from study abroad professionals</p> <p>Lack of support by faculty in your major</p> <p>Lack of second-language proficiency</p> <p>Difficulty in transferring credit back to UC</p> <p>Lack of cultural preparation (i.e., you weren't prepared to accept or adapt to the norms of another culture)</p>
	Klahr (2002)	<p>Timing issues (i.e., program offered in fall and you couldn't go in the fall)</p> <p>Study abroad not valued by employers</p>
	Researcher-developed	<p>Lack of other engineering majors who study abroad</p> <p>Lack of applicable education abroad programs</p> <p>You didn't see the benefit</p> <p>Study abroad not valued by your parents or family</p> <p>Study abroad not valued by your friends</p>
Impact on academics/overall	Bettez & Lineberry (2004)	<p>Study abroad has been an important part of my overall college experience.</p> <p>Study abroad increased my second-language competency.</p> <p>Study abroad helped improve my research skills.</p> <p>Study abroad helped me focus better on academics.</p>
	Trooboff et al. (2008)	<p>Study abroad increased my understanding of global economic and/or political trends.</p> <p>Study abroad increased my interest in global current events.</p>
	Researcher-developed	<p>As I result of study abroad, my life was transformed. (Inspired by system-wide study abroad program mission statement.)</p> <p>Overall, I was satisfied with my study abroad experience.</p>
Impact on professional development	Bettez & Lineberry (2004)	<p>Study abroad will be important to my professional development.</p>

		<p>Study abroad will help me in my search for my first job after graduation.</p> <p>Study abroad will enhance my lifelong career opportunities.</p> <p>Because of study abroad, I will feel comfortable working internationally. (Inspired by findings from Trooboff et al., 2008)</p>
Impact on personal development	Researcher-developed	<p>Study abroad was important to my personal development.</p> <p>Study abroad increased my self-confidence. Study abroad made me more self-reliant and independent.</p> <p>Study abroad increased my patience and flexibility when dealing with other people.</p> <p>Study abroad increased my leadership abilities.</p> <p>Study abroad increased my tendency to take risks. (Also echoed in findings from Trooboff et al., 2008)</p>
	Bettez & Lineberry (2004)	<p>Study abroad increased my confidence when working or socializing outside my comfort zone. (Inspired by findings from Trooboff et al., 2008)</p>
Impact on international/intercultural understanding and competence	Researcher-developed	<p>Study abroad gave me increased insight into other cultures.</p> <p>Study abroad gave me familiarity with international issues and affairs.</p> <p>Study abroad made me more aware of how the international community views Americans in general.</p> <p>Study abroad made me more aware of how other people view me.</p> <p>Study abroad made me more aware of differences in peoples and cultures. (Also echoed in findings from Trooboff et al., 2008)</p>
	Bettez & Lineberry (2004)	<p>Study abroad made me more aware of cultural norms and taboos.</p>
	Developed by Bettez & Lineberry (2004) but	

	modified by researcher	While studying abroad I made a conscious effort to adjust my behavior to cultural norms and customs.
Impact on working with people	Bettez & Lineberry (2004) Developed by Bettez & Lineberry (2004) but modified by researcher	I have increased my contacts with international students on campus and/or in the community as a result of my experience abroad. Study abroad increased my ability to communicate successfully with people from other cultures.
	Researcher-developed	While abroad, I interacted mostly with people from the host country. While abroad, I interacted mostly with Americans or non-host-country internationals. Study abroad improved my ability to work in teams of ethnic and/or cultural diversity. (Inspired by Parkinson, 2009) Study abroad helped me network with global experts in my discipline. (Inspired by system-wide study abroad program mission statement.)
Global Impact of Studying Abroad Related to Your Discipline	Bettez & Lineberry (2004)	I have a deepened interest in pursuing a STEM career in a multi-national organization because of my experience abroad. My study abroad experience enhanced my perspective on the value and importance of my discipline on the global community. I returned to UC with more confidence in my STEM talents and abilities than I had prior to the study abroad experience. My study abroad experience better equipped me to apply my STEM skills to solve real-world problems in a broader global and societal context. My study abroad experience increased my understanding of the impact of STEM solutions in a broader global and societal

context.

Researcher-
developed

My study abroad experience enhanced my ability to deal with ethical issues arising from cultural and/or national differences. (Inspired by Parkinson, 2009)

Appendix I: Interview Protocol for Engineering Students/Alumni

[Introductions and informed consent process; audio recording the interview]

[NAME], thanks so much for taking the time to talk with me today about your study abroad experience. I'm looking forward to hearing more about what your study abroad program was like and how use your experiences connect to STEM.

1. First, tell me a bit about your major, and what kind of engineering you do.
2. Tell me a little about your study abroad program. Where did you go?

Reflection on Pre-departure

Prefatory statement: In this next section, I'd like to talk about what your experiences were like before you left for your program.

1. Thinking back, what were your goals and motivations to studying abroad?
2. What did you hope to learn while abroad?
3. When you decided to study abroad, what resources helped you to study abroad? (PROBE: in particular your college or department advisor? Then info sessions, advising, etc)
4. What were barriers to studying abroad? (personal, social, or academic)
5. What were the drawbacks to studying abroad? (opportunities you missed by being away)

While abroad

Prefatory statement: Now I'd like to turn to the experiences you had while abroad.

1. I'd like to get a little better idea of the academic portion of your study abroad experience.
 - a. What kinds of courses did you take? What courses did you take that were related to your major?
 - b. How did those courses aid or interfere with your degree progress?
 - c. What out-of-class activities did you do, related to academics? (i.e., Research or Internships)
 - d. Were there any restrictions to the types of courses you could take abroad?
 - e. What would have made the academic experience better for you?
2. What learning did you find to be most significant, your academic or your personal/social learning?
3. In what ways did you reflect on your experience abroad, either while abroad or since you've returned? (i.e., on your own, with other people, as a job/course requirement)
4. I'd like to know how people you interacted with affected your study abroad experience. Tell me about some people you met in [STUDY ABROAD SITE] who were important to your personal, social, and or academic growth? Who were they, and how were they important?

Upon Return: Influence on future

Thank you! We are now turning to our last section. So far you've told me about how you felt before and during study abroad. Now I'd like now to ask you about how study abroad

has influenced you since you returned.

1. To you personally, what do you think is the greatest benefit of studying abroad?
2. How has your study abroad experience affected how you think about or understand engineering? (i.e., the value of STEM in the global community, solving global problems in a broader context, working with multinational teams)
3. In what ways did your understanding about what kind of jobs and global experiences you might have as a future scientist change?
 - a. Probe: What do you hope to do in the future with what you've learned?
4. Some students say that they returned from abroad feeling more globally competent. Global competency encompasses things like appreciating other cultures, ability to work in a team of ethnic and cultural diversity, and good cross-cultural communication skills, for example. How would you describe your global competency as a result of study abroad?
5. What advice would you give to universities who are designing study abroad programs for STEM majors?

I want to finish off by summarizing what you said. (Give some highlights based on notes). Is there anything else you think I should have asked, or that you'd like to tell me about your study abroad experience?

Appendix J: Interview Protocol for Advisors

Thank you for granting me the opportunity to interview you. For this project, I am primarily interested in exploring the benefits and challenges for engineering majors who study abroad. Also of interest are advisors who advise undergraduate engineers in their attempts to study abroad. I chose you because you are an undergraduate advisor. This interview is confidential, and you will not be identified by name. The interview will be recorded for transcription and analytic purposes.

1. Please describe your role as advisor and how it relates to study abroad.
2. Based on what you've seen and heard, what is the perception of study abroad for engineering majors from students? From faculty? From Staff?
3. What are the benefits of engineering students going abroad?
4. What challenges do engineering students face in their attempt to go abroad?
5. What are the drawbacks of engineering students going abroad?
 - a. Probe: Academic (putting students behind, non-transferable courses, courses don't apply to major)
 - b. Probe: Professional development (not able to network locally, lacking internships locally, missing out on research experience in the department)
6. Can you give examples of the various requirements and limitations for academics? (i.e., courses/units, you can only take certain courses, all of your senior capstone needs to be at UC)
7. How does ABET certification play into study abroad advising, or the department curriculum in general?
8. In what ways have you or your office encouraged study abroad for engineering students? (i.e., info sessions, one-on-one advising, worksheets)
9. What would you say are the most important aspects of your role as advisor in promoting study abroad?
10. What are the most important things to impart to students before they go abroad (i.e., top 3 things)?
11. What particular things do you witness in students that do return from studying abroad?
12. When students return from study abroad, what have you done to support students' reintegration into courses?
13. Have you noticed any trends in study abroad through the years? Are more students studying abroad than before? What about the gender divide: are more men studying abroad than women?
14. Based on what you've seen, what could be done to facilitate more engineering students going abroad?
15. What international or global experiences does the College of Engineering provide for students who, for one reason or another, do not leave the campus? For example, does the COE offer any global engineering classes or requirements (even requiring a FL)?
16. Is there anything you'd like to add?