

AC 2007-402: ASSESSMENT OF AN ENGINEERING STUDY ABROAD PROGRAM: REFLECTIONS FROM THE FIRST 124 STUDENTS (2001 - 2006)

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Assessment of an Engineering Study Abroad Program: Reflections from the First 124 Students (2001-2006)

Abstract

In spring 2001, the Boston University College of Engineering inaugurated a study abroad program at the Technical University of Dresden (TUD) in Germany. This program was designed specifically for second-semester sophomore engineering undergraduates and was structured to make it possible for engineering students to seamlessly incorporate a study abroad experience into their normal engineering programs without extending the length of the degree program, without incurring additional expense, and without having prior knowledge of a foreign language.

The second semester of the sophomore year was targeted because this is the last semester in which engineering students at Boston University share a substantially common curriculum. Program participants take the same technical courses at TUD that they would have taken in Boston. These courses are taught in English by TUD faculty using the same textbooks and syllabi as in Boston and incorporate equivalent laboratory experiences. In addition, students take a sociology course which focuses on technology and society in Germany (also taught in English), and an intensive German language course.

To date, 124 students have completed the program in Dresden. Several approaches have been used to assess the success of the program. These include annual debriefing sessions with returning students early in the fall semester and a review of pre- and post-study abroad academic performance. Additionally, a comprehensive survey of all participants to date was undertaken in fall 2005, and updated in fall 2006 to include spring 2006 participants. This paper will report on the feedback received.

By all measures, the program has been outstandingly successful. Student interest and program scope have increased substantially since 2001. In 2006, we launched a second site at Tech de Monterrey in Guadalajara, Mexico and a third site at Tel Aviv University in 2007. We are also in discussions with institutions in India, China and Singapore about future programs. We interpret this success as validation of our belief that engineering students will embrace the opportunity to study abroad if appropriate structures are created and significant barriers are reduced.

Introduction

The Boston University College of Engineering and the Boston University Division of International Programs launched a study abroad program designed specifically for engineering students in spring 2001. The authors reported on the planning and design of this program in a previous paper¹. Twelve students participated that spring in the first program, which was sited at the Technical University of Dresden, in Dresden, Germany. In spring 2006, a second site was established at the Guadalajara, Mexico campus of Tech de Monterrey, and a third site was established in spring 2007 at Tel Aviv University, Israel. In spring 2007, a total of 52 students studied abroad in these programs at all three sites. Since program inception, a total of 124 students have participated in Dresden through spring 2006. We believe that one reason for the

robust growth of these programs is related to the model we developed. This model was designed to minimize those elements that we had identified as being barriers to participation. Specifically, all majors are able to participate; knowledge of a foreign language is not required for admission; there are no additional costs for participation; participation does not add additional time to complete degree requirements. We will elaborate on these factors below.

Rationale and Context

The Institute of International Education noted in its annual report, *Open Doors 2001*, that only 2.9% (4139) of study abroad participants in 1999/00 were engineering majors². The most recent report (*Open Doors 2006*) shows that while this percentage has not changed, the total number of engineers studying abroad has grown substantially to 5974 in 2004/05³. This growth reflects a growing consensus within the engineering community about the desirability of including a study abroad experience as a more normative part of engineering training, in part as a response to the changing nature of work and the “flat world” paradigm introduced by Thomas Friedman⁴.

In years prior to 2001, virtually no engineering undergraduates at Boston University studied abroad. This was true even though the University enjoys a large and long-established Division of International Programs which coordinates study abroad programs at sites in eighteen cities in fourteen countries on six continents, which now serve approximately 2000 undergraduates each year. When an occasional engineering student did choose to go abroad, the academic content generally included only humanities and social science subjects. With the advent and expansion of our engineering study abroad programs, the participation of BU engineering undergraduates has risen to include ~ 17% of the target population (second semester sophomores).

Background and Program Structure

The Boston University College of Engineering enrolls approximately 1,200 undergraduates, in six ABET accredited degree programs: Aerospace Engineering, Biomedical Engineering, Computer Systems Engineering, Electrical Engineering, Manufacturing Engineering, and Mechanical Engineering. As indicated above, even with the large and well developed study abroad infrastructure at BU, the participation rate among engineering undergraduates was virtually zero. In evaluating this situation, we identified a number of obstacles to participation, which included the rigor and general lack of flexibility of the engineering curricula, the lack of fluency in a language other than English seen in most domestic engineering students, the difficulty of finding appropriate courses that could be used to meet degree requirements, and the reluctance of engineering students to extend the time needed to earn a degree.

Our belief that engineering students urgently need greater global awareness and our understanding of these obstacles to participation led us to design a study abroad experience specifically for engineering students that would effectively remove or minimize these impediments. A collaboration between the College of Engineering and the Division of International Programs at Boston University was forged to design a semester-long academic program that would allow participants to make normal progress on the technical aspects of their respective degree programs while enjoying all of the cultural, language and travel opportunities associated with a study abroad experience. After evaluating a number of potential foreign partner

institutions, the Dresden University of Technology (TUD) was chosen as the initial site because Boston University already operated a small language and liberal arts program there and appropriate TUD faculty and facilities were available to teach the requisite science and engineering courses in English.

The program is offered in the spring semester and is designed for second-semester sophomores. Participation is limited to students with a minimum 3.0 GPA. At the Boston University College of Engineering, the second semester of the sophomore year is the last semester in which engineering students share a substantially common curriculum. Therefore, it was possible to design a program in which all majors could participate. This was an important pragmatic consideration that enabled us to achieve the necessary critical mass of students early in the program's evolution.

Students are not required to have prior foreign language ability but must be willing to study the local language while abroad. This was another pragmatic consideration since we found that our engineering students generally did not enter the university with the requisite language ability, and could not include language instruction in addition to the normal introductory engineering curriculum. Hence, we concluded that requiring language facility as a prerequisite to studying abroad was a significant obstacle to participation.

The program consists of an intensive language course, a social science course focused on the host country, and three technical courses taught in English by full-time faculty from the host institution, for a total of five, 4-credit courses. The technical courses are designed to be functionally equivalent to the technical courses students would take if they stayed in Boston for the semester. The courses follow the same syllabi, use the same textbooks, and provide equivalent laboratory experiences as the Boston-based courses. All are official Boston University courses, and appear directly on student transcripts, thereby eliminating transfer credit issues. All three program sites use the same basic model, although the constraints and opportunities available at each site account for minor differences, the most important being the total length of each program and when programs end.

At TUD, support services are provided by a resident director and resident assistants (generally former BU students) who have participated in the BU language and liberal arts program in Dresden. The RAs speak fluent German and help the students with the initial settling in process, and mediate difficulties that arise during the semester. At Tech de Monterey, Guadalajara and at Tel Aviv University, student support services are provided by the host institutions, which have large international student populations. The cost of participation includes tuition, room, board, round trip transportation, field trips and excursions, and is no more than a student would pay for tuition, room and board for the semester in Boston.

Participant Demographics

Although we now have programs at three sites, we report below on the experiences of the 124 students who have participated in Dresden, Germany since spring 2001. Participants included 105 BU students and 19 from other institutions (Tulane, Brown, Cornell, Vanderbilt, Villanova and the University of Washington); 77 men and 47 women. The participants' majors at the time

of the study abroad experience are shown in Figure 1. We have accounted for the undergraduate majors available at BU. Undecided BU students and non-BU students in majors not available at BU are included in “other.”

Program Assessment

Since the inception of the program, we have monitored student progress, and collected feedback from participating students. These efforts have included debriefing sessions with returning students in the fall of the junior year, approximately 6 weeks after the beginning of classes. Student feedback at these sessions has indicated that students feel equally or in some cases better prepared for junior coursework than their non-traveling peers, and have easily reentered courses and the University community. We have also examined the academic performance of study abroad students and have compared it to their performance prior to the study abroad experience, and to the performance of their non-traveling peers. These comparisons show on average that academic performance abroad (as measured by GPA) is somewhat better than performance prior to going abroad. More importantly, the average GPA at graduation is virtually the same as prior to the semester abroad. The latter is similar to what is observed for the appropriate sub-set of non-traveling peers (end of fall sophomore GPA ≥ 3.0), confirming that students did not suffer academically as a result of their participation in the study abroad experience.

Survey of 2001–2006 Dresden Participants

In fall 2005, a more comprehensive survey of all participants was undertaken. We attempted to email all students who had participated in our study abroad program since its inception, and asked them to respond to an on-line survey about the program. In fall 2006, we also surveyed the students who participated in spring 2006 in Dresden. We had live email addresses for 114 of the 124 participants, and received responses from 97 (85% response rate from those contacted). The survey consisted of three parts. The first part included 6 statements, and students were asked to rate the extent to which they agreed with each statement (1= not at all; 5= strongly). The second part asked for open-ended responses to two questions. The first question asked students to comment on what they thought were the most important aspects of their study abroad experience. The second question asked students to reflect on how they thought the experience would impact what they would be doing in ten years. We also provided an open-ended opportunity for participants to share anything else about their study abroad experiences. The third part of the survey was directed only to those students who had earned degrees at the time the survey was first administered (Classes of 03, 04, 05). There were 40 students in this category; we had live email addresses for 34 and received responses from 25. These questions asked about what graduates were currently doing, whether they thought the study abroad experience had influenced this, and if so, how?

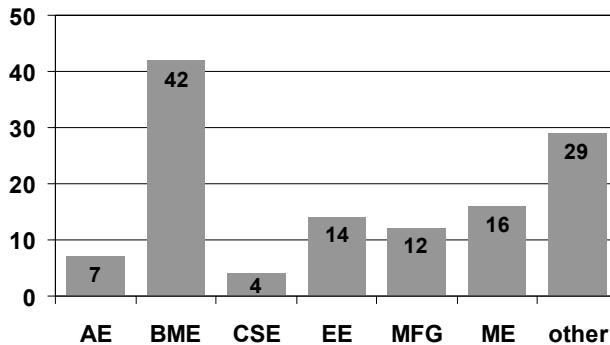


Figure 1. Participation by major

The compiled responses we received to the first six statements are shown in Figure 2.

a) The academic workload in Dresden was comparable to the workload at my home campus.

A substantial majority of students agreed that the workload was comparable, with a smaller number responding that the work load was different (Figure 2a).

b) I was adequately prepared for my junior year courses.

Although most respondents agreed that they were adequately prepared for their junior year coursework, there was some range of opinion expressed (Figure 2b).

c) The study abroad experience helped expose me to new perspectives.

Virtually all respondents agreed that the study abroad experience exposed them to new perspectives (Figure 2c).

d) I traveled extensively while studying in Dresden.

Again, almost all respondents reported that they traveled extensively during their stay in Germany (Figure 2d).

e) This was a valuable experience.

Virtually all respondents strongly agreed that the experience was valuable (Figure 2e).

f) I would recommend this experience to other ENG sophomores.

Almost all respondents strongly agreed that they would recommend the experience to other engineering sophomores (Figure 2f).

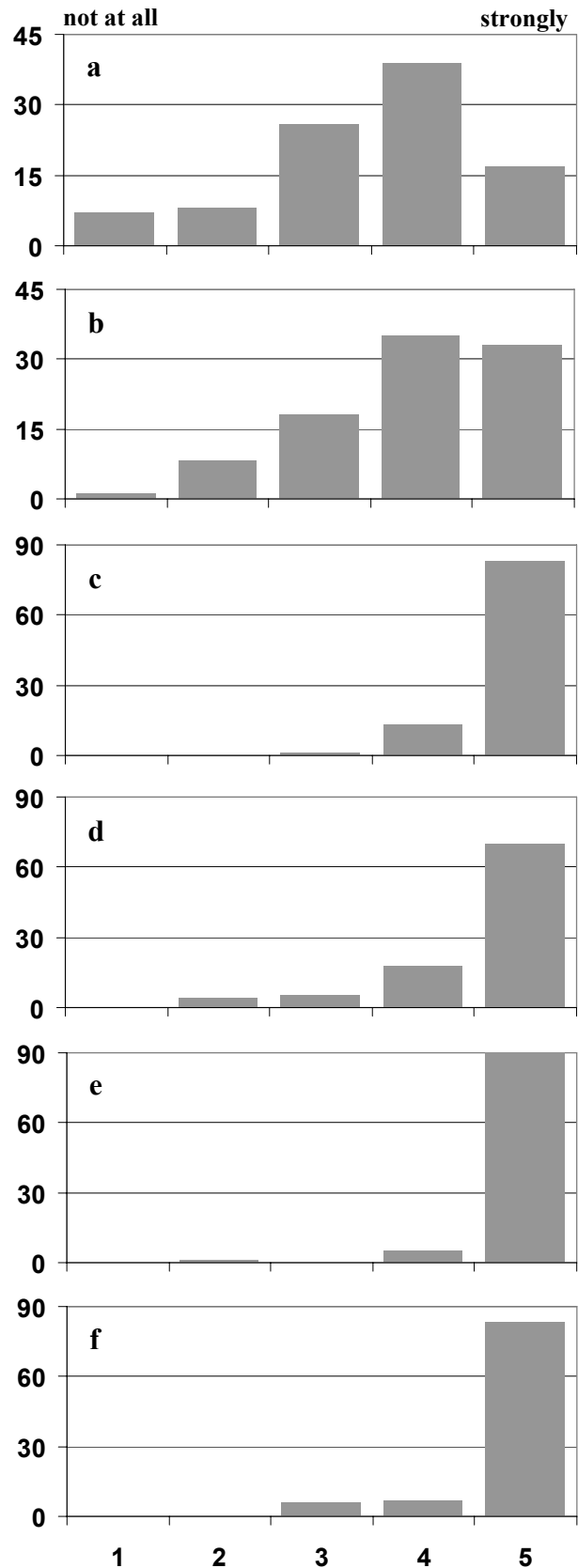


Figure 2. Responses to survey statements a – f.

Students provided a variety of responses to the question “In retrospect, what do you think was the most important aspect of your study abroad experience?” Exposure to a different culture and the awareness of different perspectives on the world were most frequently mentioned as positive aspects of the study abroad experience. Some representative responses were:

“opening my eyes to a world beyond America,”

“opened up my blind American eyes to the global condition,”

“I feel that it is important for Americans in general to see that there is life outside of the U.S.”

The authors feel that such insight is an essential outcome of an initial study abroad experience and is the first step towards increasing global awareness. Other common responses included the ability to learn another language, learning to function outside of one’s comfort zone, growth in self-confidence, and the pleasure of learning in a less stressful environment.

Forty-nine of the 61 students who responded to the question “Do you think your study abroad experience will influence what you will be doing in 10 years?” answered positively. A third of the respondents mentioned that they were interested in working abroad in the future. Others frequently mentioned an interest in continued travel, continuing language study, increased ability to work with people from other cultures, and a general and lasting broadening of perspective. “The breadth of my outlook on world politics and economics is permanently improved” and “Instead of hearing what Americans think of America, you begin to hear what the world thinks of America” were two particularly trenchant comments.

Respondents to the question “What else would you like to share about your study abroad experience?” were unanimous in considering the experience valuable and in urging eligible students to participate. Interestingly, 6 of the 19 students from the class of 2008 who responded to this question opined that the workload was too demanding, although none of the respondents from previous classes had expressed similar concerns. In fact, several students from previous years had commented on experiencing a more relaxed learning environment in Dresden as noted above. However, even those who complained about the workload valued the experience and recommended it to others. Two comments of interest:

“The study abroad program offers an excellent opportunity for students to mature in many ways. It encourages them to represent their country responsibly, to be flexible in learning about other people, and to be creative and adventurous in their lifestyle.”

“I am [now] part of a team that is helping to recruit new graduates for my company. If there is a study-abroad experience on the resume of the candidate, it is considered highly because it tells us that this person can adapt to any situation and meet its challenges.”

We asked participants who had graduated to indicate the best combination of the following four choices to describe what they were doing at the time of the survey: full-time graduate student; part-time graduate student; full-time employment; part-time employment. Twenty-three responses were received: 10 selected full-time graduate student; 2 selected full-time graduate student and part-time employment; 10 selected full-time employment; 1 selected full-time employment and part-time graduate student. Thus, slightly more than 50% of respondents were

engaged in full-time graduate study, which is larger than the percentage for the analogous sub-set of the graduating class (end of fall sophomore GPA \geq 3.0).

We also asked the graduates whether they thought the study abroad experience influenced what they were doing now, and if so, how? We received responses from 23 of the graduates to this question; twelve thought that the study abroad experience had been influential. The responses to “how” indicated that students felt they had acquired an expanded world view. Some respondents specifically mentioned holding jobs that required extensive travel abroad. Several credited the abroad experience with helping them get jobs or get into graduate programs. Others mentioned developing increased confidence, adaptability and the ability to meet new challenges as a result of their participation in the program.

Discussion

While the imperative for engineers to study abroad may be more obvious today, it was not as clear during the initial planning phases of this program in 2000 how the engineering community (faculty and students) would respond to a semester-long academically-based study abroad experience. We have been fortunate that both students and faculty have embraced the program. Positive student experiences and the resulting impact on student perspectives and global awareness have been essential to program success. Students participating in our study abroad experience have felt well served by the program and have returned to their home campuses with positive energy. Returning students have become the most enthusiastic and effective ambassadors to prospective participants. We are also convinced that our model has delivered what was promised to students – a virtually seamless way to incorporate a semester abroad experience into their undergraduate engineering training. The program allows participants to make uninterrupted progress towards their degrees, without additional cost and without extending the time required to earn a degree.

Assessing a study abroad program is difficult – while there is a developing consensus that the benefits of a study abroad experience are numerous and highly desirable, demonstrating these benefits as tangible outcomes is substantially more challenging⁵. Students report positive academic, cultural and social experiences while abroad. Additionally, we have documented that participating students do not suffer in any way academically as a result of their study abroad experience. Nonetheless, it will be difficult to measure the longer term outcomes related to these experiences. It is also possible that many of these longer term benefits may not be manifest in measurable outcomes at all – how do we objectively measure the impact of a broader perspective or of a more informed global awareness on the professional development and career paths of participating students?

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