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Eurotech Students in Germany: Preparation, Experience and Outcome

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Eurotech Students in Germany: Preparation, Experience and Outcome

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ABSTRACT

Higher education study abroad programs for U.S. students are on the rise. A variety of undergraduate disciplines are being coupled with international components to bring U.S. students to a higher level of global awareness to meet the demands of today's economy. The University of Connecticut's Eurotech Program is an example of this trend. Its students earn degrees in both German and engineering in a five year program. They are given practical training through study and internships in Germany under the auspices of the Baden-Württemberg Exchange Program. One of the Eurotech Program's major goals is to enhance job opportunities for its graduates by giving them the linguistic and cultural skills to interact with German engineers in the U.S. and Germany and thereby making them more attractive to employers. The study includes an overview of the Eurotech Program, a survey of literature concerning study abroad goals and the collection and analysis of data from former and current participants of the program through their responses on questionnaires. The study highlights the achievements of the program's goals as the Eurotech students see them.

Introduction

Given the globalization of today's economy and the businesses that drive it, universities in the U.S. have responded by adding an international component to a variety of undergraduate disciplines. There are twenty-four universities listed by Parkinson (2007) with engineering study abroad programs (pp. 5-8). The Eurotech Program is a specific case where engineering students at the University of Connecticut (UConn) are given practical training through study and internships in Germany during the fourth year of a five year program. Graduates of the program complete both a Bachelor of Arts in German and a Bachelor of Science in engineering. Students who participate in programs such as Eurotech are bridging the gap between technological and humanist studies (Grandin, 1989, p. 151). These students are made aware of the global economy, and through participation in these programs, they are preparing themselves for competition in the international market place, and likely becoming more knowledgeable world citizens.

One of the Eurotech Program's major goals is to increase job opportunities for its graduates by giving them the linguistic and cultural skills to interact with German engineers and thereby making them more attractive to employers in a global economy. In addition to this goal, the Eurotech Program hopes to turn its students into world citizens. By getting to know another country and learning how to speak another language, they are better educated, more sophisticated, and culturally enlightened. Students who attend college or a university broaden their experience by getting away from home. Students who study abroad widen their horizons even more by going to another country. Students who study in the Eurotech Program go even further by living, studying and working in

another country. The purpose of this study is to ask whether the educational, cultural and career goals of the Eurotech Program are met.

The Eurotech Program

The Eurotech Program began in the fall of 1993. The program founders were Maria-Regina Kecht and Richard Long. The current program directors are Friedemann Weidauer and Marcelle Wood (Weidauer & Wood, n.d.). The program is organized through the German Program and the School of Engineering at UConn. The German Program and the School of Engineering train students academically in their respective fields and encourage them to study abroad. The Baden-Württemberg (BW) Exchange Program of the Connecticut Office of Financial and Academic Affairs for Higher Education organizes the Eurotech students' study and internship in Germany. The BW Exchange Program originated in 1989. It is a partnership between the governments of Connecticut and Baden-Württemberg. It sends students abroad from the following Connecticut colleges and universities: Central Connecticut State University, Connecticut College, Eastern Connecticut State University, Fairfield University, Southern Connecticut State University, Trinity College, the University of Connecticut, the University of Hartford, Wesleyan University and Yale University. In Baden-Württemberg, students attend the universities of Freiburg, Heidelberg, Hohenheim, Karlsruhe, Konstanz, Mannheim, Tübingen, Stuttgart and Ulm (Seitz, n.d.). Eurotech students go abroad with students from a range of other fields and institutions. The director of the BW Exchange Program from its beginnings has been Renate Seitz (Seitz, n.d.). I have been her assistant for the past four years. Through the collaboration of the German Program, the School of Engineering and the BW Exchange Program, the

students in the Eurotech Program are prepared to study and intern abroad and eventually to work with international partners.

The Eurotech Program illustrates two schedules of courses on their website: one for students who begin German courses together with engineering courses in the first semester of study, the other for those who add German courses later on. The full schedules from the Eurotech website are in Appendix A. In general, students who begin their German degree at the start of their studies take courses such as Building Language Skills Through Culture I and II before going abroad. These courses are preparation for study or work abroad, in that they focus on "cultural differences and practical issues of coping with the experience of a different culture" (Weidauer & Wood, n.d.). If students begin their German degree later on, they can follow an alternate schedule. These students take engineering courses during their first and second years and can jump start their German coursework in the summer preceding their third year. Students take the equivalent of a regular first year of German during the summer session at UConn or find comparable courses elsewhere. All students then take multiple courses at their German university that can be transferred to UConn for credit, and a Capstone in German Studies course in their final year back at UConn. With either schedule, students finish with degrees in both German and engineering (Weidauer & Wood, n.d.).

Following the preparatory course work, a major part of the Eurotech Program is to study abroad during the fourth year. Some students spend one semester abroad, while most spend the recommended full year. In a few cases students are not able to go abroad. Those that go abroad for the full year normally take courses at a German university during the first semester and complete an internship at a German company during the

second. With guidance from the BW Exchange Program, students put together their applications for internships during the first semester. The applications include cover letters and resumes in German, as well as high school and university transcripts and recommendation letters. At each university there is a BW Exchange peer advisor, who is there to support students on their arrival and throughout their time abroad. Peer advisors are German students who have studied in Connecticut on the BW Exchange Program. Their familiarity with the BW Exchange Program and with Connecticut is a plus in their initial contact with students. Peer advisors help Eurotech students with the internship application process and preparation for interviews. Internships are normally completed during the second semester abroad. After study abroad, Eurotech students return to UConn for a final year of study in both German and engineering.

Literature Review

This review surveys selected literature on the goals of study abroad programs and examines how their achievement is assessed. First, the goals of studying abroad are considered: goals such as better career opportunities, improved foreign language skills, broader cultural understanding, new social awareness and personal growth (Steube & Teichler, 1991, p. 331-2). These goals raise the following questions which are addressed in the literature: Is there enough support for international education in the U.S. for the goals of foreign study to be achieved (Pufahl & Rhodes, 2011)? More specifically, is the foreign language preparation of American students equal to that of students from other countries and adequate for study abroad (Jochems & Vinke, 1993)? Second, the assessment of the goals of foreign study in the literature is examined. Here questions are also raised. Are there measures for whether students get a competitive edge in the job

market through their study abroad (Grandin, 2011)? Do students improve linguistically and academically before, during and after studying abroad (Davidson, 2007)? Are they more well-rounded individuals after experiencing the life and language of another country (Asay & Younes, 2003)? Third, as a specific case study, the goals and assessment of the University of Rhode Island's International Engineering Program (IEP) are presented (Grandin, 1989, 1991, 2006, 2011).

Opinions about studying abroad have changed over time. Two-hundred years ago Thomas Jefferson was skeptical of the value going abroad for educational reasons.

> Let us view the disadvantages of sending a youth to Europe. To numerate them all would require a volume. I will select a few. If he goes to England he learns drinking, horse racing and boxing. These are the peculiarities of English education… He forms foreign friendships which will never be useful to him… It appears to me that an American coming to Europe for education loses in his knowledge, morals, in his health, in his habits and in his happiness (Jefferson as cited in Shank, 1961, p. 100).

Jefferson points to drinking, irrelevant sporting events and temporary friendships as not contributing to morals, health and happiness. Some of the same can be said of study abroad today. For example, if students go to Germany, they will learn of nationally approved beer drinking at Oktoberfest celebrations and of national soccer madness during World Cup events. They may make friendships that are of necessity only temporary, and attend classes in a language still not well understood. Of course, drinking, sports events and temporary friendships are part of the study environment in the U.S. as well.

Nevertheless, in the 1960s, the outlook for study abroad grew positive as both Presidents Kennedy and Nixon were strong supporters of such programs (Shank, 1961, p. 100). Today, American universities strongly encourage students to study abroad. By 2006, the number of students going abroad had more than doubled since the decade

before to 206,000 (Davidson, 2007, p. 276). However, among the students that study abroad, "less than 3% are engineering students" (Blummenthal & Grothus, 2008, p.4). Nevertheless, with the continuing growth of the importance of study abroad programs, the question arises whether their goals are realistic and if the claims for the benefits are verifiable.

Shank (1962) presents five objectives for students studying abroad: "to see other countries, to learn about other peoples and cultures, to learn a foreign language, to pursue some specific field, and to teach or to help abroad" (p. 99). Shank recommends a follow up assessment of these foreign study objectives and encourages the need for evaluation. However, he does not propose a way to achieve this assessment and evaluation. Weidauer (2001) presents the goal of learning another culture, not just the language, through study abroad. In this case, the importance is shown specifically for engineering students.

> First, international engineering education must mean a complete integration of the study of the other culture into the engineering program. By this I mean the courses of study in the other culture allow the students to see their work as engineers in a specific social and cultural context. The foreign language alone is just a tool; it is the knowledge of the other culture that forms the most important asset of the international engineer, both during the research and design phase of a product and during its entire life cycle (p. 46).

Grandin (2006) also emphasizes a holistic approach for engineering students.

> Given the new and highly rigorous emphasis on engineering and science education in the rapidly emerging economies of nations such as China and India, where work can be done at a fraction of the cost and where a great deal of attention is paid to dealing culturally and linguistically with others, American students must be prepared to understand, work and communicate with their peers abroad. It is therefore critical that engineers be educated as global citizens, trained to work in global teams, and prepared to develop and manufacture for a global market. Without these skills, they will fail and their work will be handed off to peers from other parts of the world where such global preparation is already valued and broadly practiced (pp. 1-2).

Wakeland (1990) also stresses both language and cultural training for engineering students and all students who wish to work in today's global economy. He says "international competitiveness requires cultural awareness, international experience, and language skills" (p. 131). Although there is strong recognition of the need for students to incorporate the goals of study abroad into their undergraduate careers, which of these goals are realistic and what can be done to fill the gap between the statement of goals and the degree to which the goals are achieved?

Typically, students are asked to assess their experience on return from study abroad by answering questions about language learning, academic study, world view, and their experience in general. These reports are done by oral or written answers to interview questions. Thus, the assessments are done by the self-reporting of the returned students. Can self-reporting accurately assess the specific goals of study abroad? Nath (2007) addresses the problem of self-reporting comparing achievements in literacy through self-report and examination. He found that "the literacy rate generated through a literacy test was significantly lower than that found when the self-report method was used" (p. 119). Self-reporting is subjective and Nath says it will generally be higher than objective measures. However, it is not clear how to equate a self-report to an externally constructed test as Nath does, since the criteria for each are different. How students feel about their achievements is not measured on the same scale as what a test designer decides a measure of student achievement should be. For example, minor grammatical errors characteristic of a foreign accent may be ignored in actual communication, but trigger negative marks in a language test. The question remains, can the self-report of

engineering students who study abroad be a useful and reliable assessment of their achievements?

This study shows that self-report as an assessment tool can be reliable. The students are very forthcoming about their experience in the program. In this study, their responses to questions about language preparation at UConn and language use in Germany, the internship experience, and their job search after graduation were serious and insightful. They are thoughtful in assessing the program and its effects on their careers. There is a consistency across the participants' responses that suggests the information they provide is reliable. This will become evident in the presentation and discussion of the data in the results and conclusion sections.

For Grandin (2011), the goals of international study, the assessment of the goals, and whether it is worthwhile are all unclear:

> Despite the increase in programs and models and the growth in numbers of engineering students being sent abroad, engineering educators are far from sure about the best ways to achieve a global education for their students. Indeed, there is a lack of clarity about the very goals of international education and how to demonstrate that those goals have been met. What are the characteristics of a globally educated engineer? What are the characteristics of a good global education program for engineers? Is such training necessary for all engineering students, or just for a select few? How do we know if the goals have been achieved? And, if they have been achieved what difference does it make? Although there is broad support for the global education of engineers at the instinctual level, it is based largely upon anecdotal evidence. Uncertainty about the details still prevail (p. 12).

The question of assessment is addressed by Grandin in the even broader context of the value of study abroad programs for engineers. Nevertheless, there is a common expectation that students will gain from studying abroad. And as Grandin goes on to say,

"Institutions are nevertheless moving forward with the programs, with the belief that study abroad, work abroad, and travel abroad are inherently good" (p. 12-13). Though there are uncertainties about study abroad programs, these should not prevent the programs from going forward, since in principle the idea seems correct. This study shows that in the view of engineering students who go abroad, the experience is valuable and leads to success in securing jobs.

To assess improvement in language proficiency students can be examined before they go abroad and after they return to their home university. The outcomes can then be compared. Davidson (2007) uses a "proficiency scale for listening, reading, and speaking" to compare the students' level of fluency before and after studying abroad (p. 277). The study made a noteworthy case that not only were improvements made through study abroad, but also more students were able to improve their linguistic skills if they had a higher level of initial proficiency before going abroad.

> In the case of the academic year program, 85% of participants entered the program in the Intermediate range or lower, and more than half (58%) completed the program in the Advanced range or higher. Initial level of proficiency also has an impact on gain with the study-abroad environment. For example, of those participants entering the academic year program with 2-level reading skills, 81% crossed the threshold to 3-level proficiency in reading, as compared to 44% of those in the semester program and 39% of those in the summer program (p. 278).

Better results in language learning can be achieved by recommending longer stays abroad and a higher level of proficiency before the student goes abroad. A level of proficiency similar to that required by American universities of foreign students in English, as measured by the TOEFL exam, might be warranted. After all, why should American universities require a specified level of English proficiency for foreign students to study here, but not have as strong a stand on the foreign language proficiency of American

students going abroad to study? The self reports of students in this study suggest that more language study, and thus a higher proficiency level, prior to going abroad, is recommended.

A higher level of proficiency in a foreign language can have its beginnings at earlier stages of education. It is relevant to ask whether or not the interest in foreign language instruction in the U.S. is supported at early stages of education. A survey was administered nationally by Pufahl and Rhodes (2011) to identify how much foreign language instruction takes place in elementary and secondary schools today and what type of programs and curriculums are being offered (p. 259). The survey was conducted first in 1987, then in 1997 and most recently in 2008 (p. 261). The results of the 2008 survey are compared to the previous surveys. The outcomes are grim for early instruction in foreign language. Not only has foreign language instruction decreased in both elementary and middle schools since the survey in 1997, it is also reported that the availability of foreign language instruction is not widespread throughout the U.S. (p. 262). With the general decrease in support of foreign language instruction in the early stages of education, American students appear to have a disadvantage when it comes to preparation for such study in higher education. The question that now arises is will the growing support of study abroad programs in higher education stimulate foreign language offerings in high schools? Wakeland (1990) says that at the University of Illinois at Urbana-Champaign the foreign language entrance requirement was raised in an effort to "strengthen students' language backgrounds," (p. 131). This in turn could stimulate high schools to increase their offerings if they want their graduates to attend the university.

Foreign language education in the U.S. is still nowhere near the amount of training in English as a foreign language that students in other countries receive. Students in other countries are introduced to English at a young age in response to its widespread use in academic and professional fields (Jochems & Vinke, 1993, p. 275). American students, on the other hand, are not necessarily given the option to learn a foreign language until middle or high school or, as the national survey addressed, often not until higher education. American students in the early stages of education are subject to the additional advantage, which may actually be a disadvantage, in choosing from the multiple foreign languages available to them. While having a variety of foreign languages to choose from may seem like an advantage, choosing the right language for later professional objectives is an uncertain task. Elementary school students cannot know whether they will need to be fluent in a particular foreign language to work side by side with foreign partners. Not only does the decline in foreign language instruction in elementary and secondary schools in the U.S. impede American students, the predicament of which foreign language to learn, where foreign language opportunities exist, remains. The language chosen in early education cannot necessarily be counted on as preparation for study abroad at the university level.

Another expectation of study abroad is that students will be culturally enriched through their time abroad. American students have been described as naïve before they venture on their international experience. Shank (1961) says "young and naïve Americans are suddenly faced with mature, politically sophisticated individuals in a foreign country (pp. 108-9). Therefore, one reason that American universities have for sending students to Europe involves encouraging the American students to thereby become more

sophisticated and culturally well-rounded. The tendency to view American students as less sophisticated than their European peers may be exaggerated. Sophistication is an individual characteristic and probably varies across both populations. Nevertheless, individuals in any culture can gain in sophistication by experiencing other cultures. To guarantee that American students are better prepared for study abroad, they can be required to take courses designed to enrich their understanding of the country they go to (Weidauer, 2001, p. 46). Additionally, American students, once they are abroad, not only learn about the cultures by which they are surrounded, but also become more aware of their own American culture (Asay & Younes, 2003, p. 144). Asay and Younes conclude that "future research is needed to fill a definite gap in scholarly literature, as no studies were found that compared quality and outcome of classroom learning to those of international tours" (p. 146). Perhaps the assessment of cultural enrichment cannot be measured and must remain one of the intangible benefits of study abroad. Self-report may be the best solution for learning about such matters. This is the approach taken in this study.

With stronger evaluation measures it might be possible to improve study abroad programs by making it clear which goals are more likely to be met. Although improvement in language proficiency, academic achievement, and job opportunities can be measured, there may be some other intangible benefits of study abroad that are not as simple to measure, such as cultural enrichment and personal growth. Here self reporting may be the most valuable measurement. And for those achievements of foreign study that can be measured objectively, it is important to do so, since the advice given to students thinking of studying abroad should depend on it.

This review now turns to a case study of the International Engineering Program (IEP) at the University of Rhode Island (URI). Several articles and one book have been written about IEP over its twenty-five year history. The review of these articles is relevant to this study because of the similarity IEP has with the Eurotech Program at UConn. The co-founder of IEP, John M. Grandin, claimed that with increasing global technical competiveness in engineering, students trained in the U.S. come up short. Since most American engineers lack knowledge of foreign languages, it puts the responsibility for mutual understanding on their foreign partners (Grandin, 1991, p. 209). Grandin, the former associate dean of the College of Arts and Sciences at URI, and professor of German, together with the former dean of engineering, Hermann Viets, founded IEP in 1987 with hopes of lessening the gap American engineers have in the global engineering profession (Grandin, 1989, p 146). As in UConn's Eurotech Program, students in IEP receive a dual degree in engineering and German by completing a fifth undergraduate year which involves "rigorous foreign language and intercultural study as well as an internship abroad, with no sacrifice to the technical subjects in the engineering program" (p 147). A major goal of the program is the same as that of the Eurotech Program. It is to increase the competitiveness of American engineering students in the international marketplace through the additional year of study, including study and internships abroad (p 148). The intent of Grandin's publications is to show the progress of the program.

Statistical outcomes of IEP were provided by numerically calculating the growth of the program across its years of existence. Grandin looked at how many students participated and how many internship opportunities were available to IEP students. After the first year of the program, twelve internship opportunities were established with

German companies for IEP students. By the second year, the list of participating companies grew to over thirty. In its fourth year, seventy-five students were participating in the program (Grandin, 1991, p. 209). In 2006, "in its nineteenth year, the IEP enrolls approximately 200 students or 20% of all URI engineering undergrads" (Grandin, 2006, p. 2). In terms of the number of students and internships made available, it seems that the success of the program is ongoing. However, though ever growing numbers of students can indicate the popularity of a program, they do not guarantee that the program is meeting its goals.

In order to get insight into the outcomes of IEP, Grandin (2011) surveyed fifteen students on their experiences in the program and their current job positions (p. 8). Grandin found from the self-report of these students that their linguistic abilities improved, that they felt more confident in the new cultural setting, and that they were able to work internationally. Although Grandin (2011) addresses the successful experiences of these students, he also points out:

> While engineering educators may rightfully be proud of the progress made in the last decade in preparing students to work internationally, many would concur, especially when compared with the global preparation of engineering students in other countries, that only baby steps have been taken in the American system (pp. 11-12).

According to Grandin, programs such as IEP, though in existence for twenty-five years, are just beginning to explore the potential of international education.

Students who participate in programs such as IEP are preparing themselves for competition in the international work place. What about students in other academic fields of study? Grandin (1989) suggests the time is now "for foreign language educators to consider new alliances on the university campus, and to take advantage of new

opportunities to challenge the American monolingual mindset" (p. 152). With innovative and successful programs that universities such as URI are implementing, more students will be free to work outside the U.S., and they will not be second class partners in the international work place. Grandin states that the "experience at Rhode Island has convinced us that internationalism cuts across all disciplines today" (p. 151). In addition to bridging the gap between engineering and foreign languages, the time may also be now for recognition that international competitiveness also requires bridging the gap between other areas of study and foreign languages. IEP began as a German and engineering program and has grown to include French, Spanish and Chinese. The program has also extended to the master's and doctoral levels (Grandin, 2011, p. 17). For IEP students, the workplace has truly become international.

The literature in this review displays a general agreement on the appropriateness of study abroad as part of undergraduate programs, in addition to early foreign language instruction, in the U.S. today. This agreement is taken a step further by saying that "in light of [the] growing national mandate in support of expanded study abroad for American students, it must be a matter of national resolve to devise enabling strategies and mechanisms whereby capable, motivated students from the widest variety of backgrounds are motivated to study abroad" (Walker, 1993, p. 204). Not only are internationally motivated students desirable, stronger evaluation measures of these study abroad programs could lead to improvement of the programs and make clear which goals are achievable. Further evidence of the benefits of study abroad, which range from improved linguistic and cultural understanding to better preparation for performance in

the work place, is needed. This study of the Eurotech Program is an attempt to begin to fill this gap.

Methodology

This study of the Eurotech Program uses both qualitative and quantitative research methods. It involves undergraduate Eurotech students who recently studied abroad or are currently studying abroad and graduates of the program who studied abroad in the past. Seventy-four questionnaires were sent out in February 2012 with the approval of the University of Connecticut's Institutional Review Board (IRB). The IRB approved information sheet, which appears in Appendix B, was emailed to all participants along with one of the two questionnaires provided in Appendices C and D. A pilot study was done in April 2011 with 18 Eurotech participants. The questionnaires were developed for this study on the basis of the results of the pilot study. Data were collected and analyzed from these questionnaires. The raw data appear in Appendix H, with information that might identify individual participants removed. The data involved student responses to questions about:

1. Preparation in German language and culture before going abroad
2. Language spoken during their first semester abroad
3. Preparation to successfully complete an internship abroad
4. Language spoken in their internship in Germany
5. Job applications and job offers after they returned to UConn

In addition, the Eurotech graduates were specifically asked if they are:

1. Currently working

2. Continuing to use the linguistic and cultural skills they acquired during the program in their jobs
3. Working side by side with German engineers

The findings on these questions are summarized in the results section. In some cases, follow up questions about internships and current jobs were emailed to participants on the basis of information in their responses.

Participation in this study was voluntary. Current and former Eurotech students were encouraged to take part since their participation could improve the program for future students. Participants were informed about the goals for the study. They were told that their role would be kept anonymous and their responses would be merged with others.

Results and Discussion

This section is divided into three parts. The first part concentrates on the participants of this study. The second part focuses on the analysis of the data from the completed questionnaires. This includes divisions into prior to study abroad, study abroad and after study abroad. The third part concludes the section with feedback from the participants for the program. If the results of this study match the expectations that the program promotes, it can only reinforce the growing support of study abroad for engineers and assure students of the benefits they will receive from participating in the Eurotech Program.

Participants

All participants of this study have been or are currently abroad through the BW Exchange Program. These former and current students went abroad from as early as January 2004 to most recently in September 2011. The BW Exchange Program's records indicate that a total of 74 Eurotech students have been abroad in Baden-Württemberg, Germany. These 74 students were all contacted via email and asked to participate in this study. Several of the email addresses for the graduates from the first 10 years of the Eurotech Program may have been outdated. Those potential participants did not respond and may not have received the questionnaire. Even so, nearly 70% of all Eurotech students who went abroad through the BW Exchange Program participated in this study. According to the UConn Registrar's records, there are over 100 current students and graduates of the Eurotech program. However, only those who have studied abroad through the BW Exchange Program are included here.

Fifty-one former and current Eurotech students participated in this study through voluntarily completing a questionnaire. There were two questionnaires. One questionnaire was emailed to graduates of the program. These participants graduated with a Bachelor of Arts in German and a Bachelor of Science in Engineering between May 2005 and May 2011. A total of 33 graduates completed this questionnaire. The second questionnaire was emailed to current students, who either have recently returned from being abroad or are currently abroad in Germany for the 2011-2012 academic year. These students plan to graduate between May 2012 and December 2013. A total of 18 undergraduate students completed this second questionnaire. The entire group of

participants for this study is represented in Figure 1 with attention given to their engineering majors.

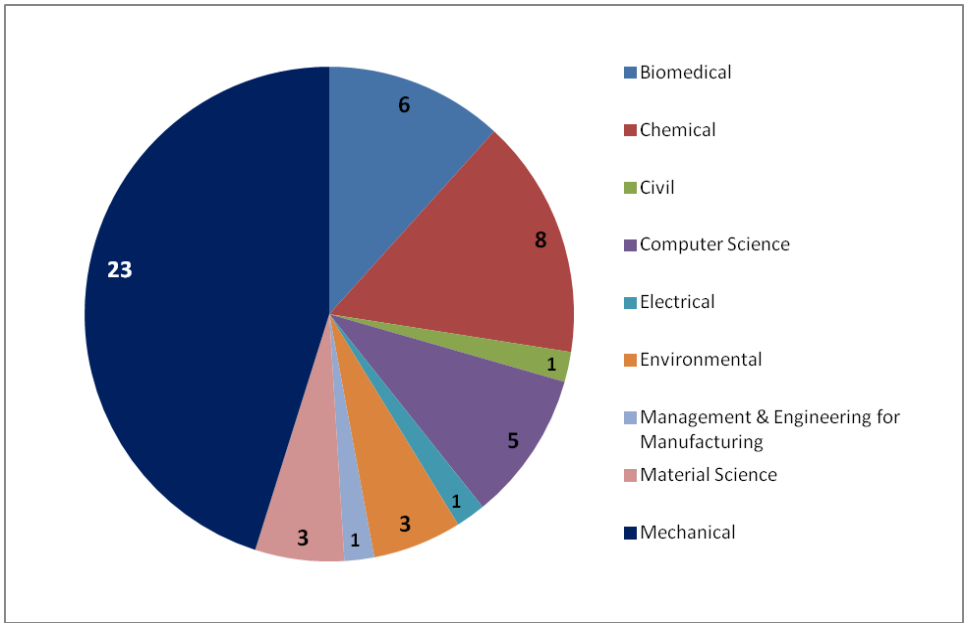

Figure 1: Engineering Majors

Most of the participants in this study have mechanical engineering as their major. This seems to be characteristic of the field. The distribution of engineering majors of Eurotech students parallels that of engineering students generally. As the most recent UConn School of Engineering Annual Report states:

> The greatest share of undergraduates resides with the Mechanical Engineering Department with 432 full-time undergraduates during the 2010-2011 school year. The Biomedical Engineering Program enjoyed enrollments of over 300 undergraduates. Chemical Engineering and Civil Engineering had full-time undergraduate enrollments of over 227 and 222, respectively (Choi, 2011, p. 3).

Among the possible participants for this study, there were 12 female (16%) and 62 male (84%). This distribution also parallels the female and male breakdown in the undergraduate engineering field as a whole, where there were 367 female (18%) and 1,668 male (82%) in the 2010-2011 academic year (p. 3). This suggests that the

participants of this study are representative of the engineering field and that the results here may generalize to other study abroad programs for engineers.

Students can choose where they study abroad. They discuss their options with the representatives of the German Program, the School of Engineering and the director of the BW Exchange Program before placement. Most study at the University of Stuttgart because of its reputation in the engineering field and the availability of internship companies in the metropolitan area. The location of study in Baden-Württemberg for the participants in this study is shown in Figure 2.

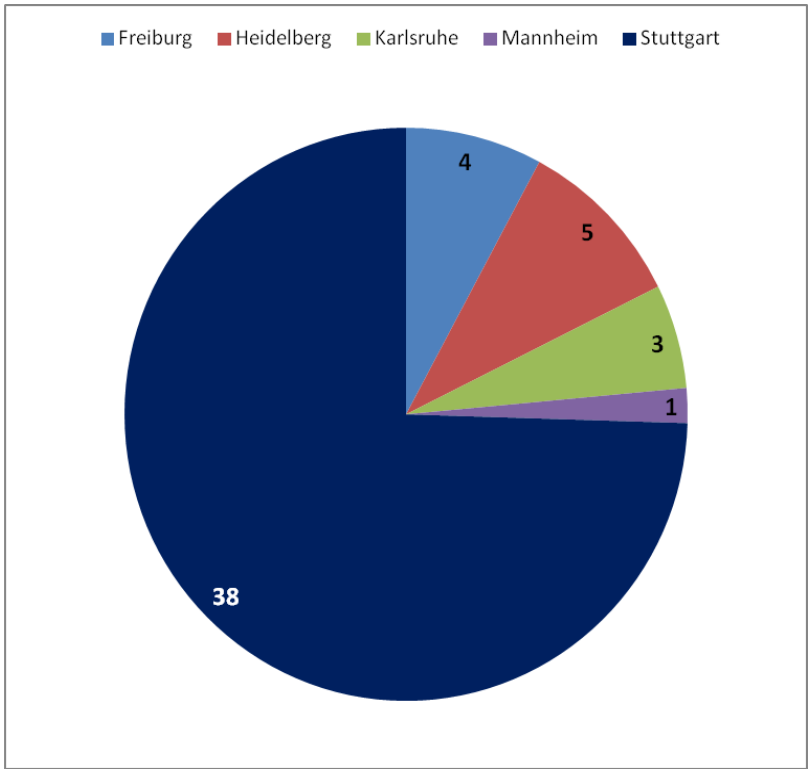

Figure 2: Study Abroad Locations

Descriptions of the universities where Eurotech students study abroad are available on the BW Exchange Program website and included below.

The University of Freiburg offers both unsurpassed beauty and one of the warmest climates in Germany. It is located in a picturesque valley on the western border of the Black Forest. Founded in 1457, it is the second oldest university in Germany. It offers a wide range of liberal arts courses as well as a fully developed *Deutsch als Fremdsprache* [German as a Foreign Language] program.

The University of Heidelberg is nestled between rolling hills, where the Neckar River spills out into the Rhine plane. Under the watchful eye of the famous Heidelberg Castle, the university is interspersed throughout the city enjoying a beautiful and historic location. Founded in the 14th Century, the University of Heidelberg has a strong tradition in the liberal arts. Building on this, the University has taken its place as a leader in the sciences and medicine as well. In addition, it has an extensive *Deutsch als Fremdsprache* program.

The University of Karlsruhe opened its doors in 1825 as a polytechnic school to 250 students. With 20,000 students today, it is a major technical university comparable to MIT or California Polytech. Karlsruhe offers degrees in 40 different fields. Its largest programs are in civil, electrical and mechanical engineering; computer science; and the natural sciences. It also has offerings in the humanities and social sciences.

The University of Mannheim, which began as a school of commerce and business in 1907, offers a metropolitan environment with easy access to some of Baden-Wuerttemberg's largest business firms and cultural centers. A university since 1967, its largest program is in business administration and economics. It is also highly regarded in the social sciences (including history and education) and has excellent programs in the humanities (including modern and ancient languages). As a school of business, Mannheim has consistently received the highest ranking not only in Germany but also throughout Europe.

Located in the capital of Baden-Württemberg, the University of Stuttgart began life in 1829 as a high school of commerce and trade. By 1890 it had developed into a technical college. In 1967, it was elevated to a full university. Today Stuttgart boasts 120 departments housed in 14 schools. Some of the best known are the school of architecture and city planning and the school of aeronautical and space engineering. The University of Stuttgart is highly regarded in all branches of engineering and has an especially strong profile in the natural sciences and mathematics. Liberal arts students would do well to consider Stuttgart as well. The course offerings in the humanities and social sciences are impressive. Like Karlsruhe, the University of Stuttgart has much in common with MIT or California Polytech (Seitz, n.d.).

The BW Exchange Program works with the following universities as well: Hohenheim, Konstanz, Tübingen and Ulm. These universities are more often chosen by non-Eurotech students.

Figure 3 displays the number of years it took or will take the study participants to complete the Eurotech Program.

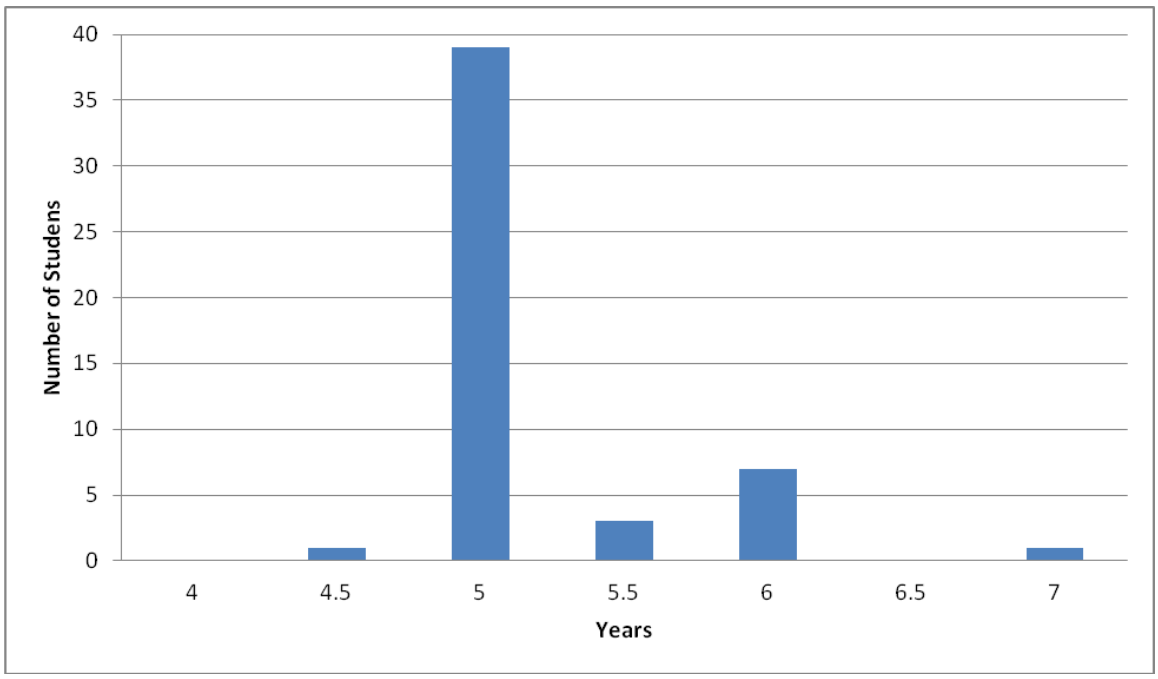

Figure 3: Length of Eurotech Program

The results show that a majority of Eurotech students can complete the program in the projected five years. Some of the outliers who took longer or know it will take longer to complete the program mention reasons such as spending three semesters abroad, instead of the recommended two, or having a family emergency which slowed their progress. The one student who was able to complete the program in four and a half years only went abroad for one semester. Nevertheless, most students successfully complete the program in five years, satisfying the program design for students to spend an extra undergraduate year to complete degrees in both German and engineering.

Analysis

Prior to Study Abroad

There are several questions in the questionnaire that focus on coursework prior to study abroad. The aim of these questions was to find out if students are adequately prepared in German language and culture, as well as in their field of engineering, before going abroad. Figure 4 presents the number of semesters of German that the participants took before going abroad. Figure 5 shows how many semesters of German they would recommend before going abroad.

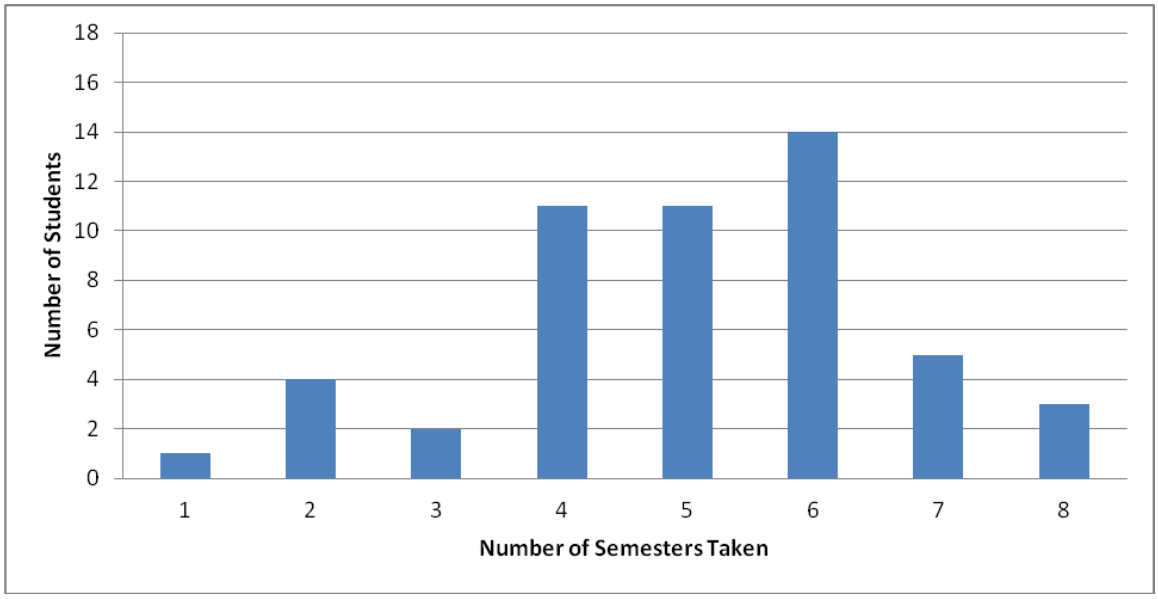

Figure 4: Semesters of German Prior to Going Abroad

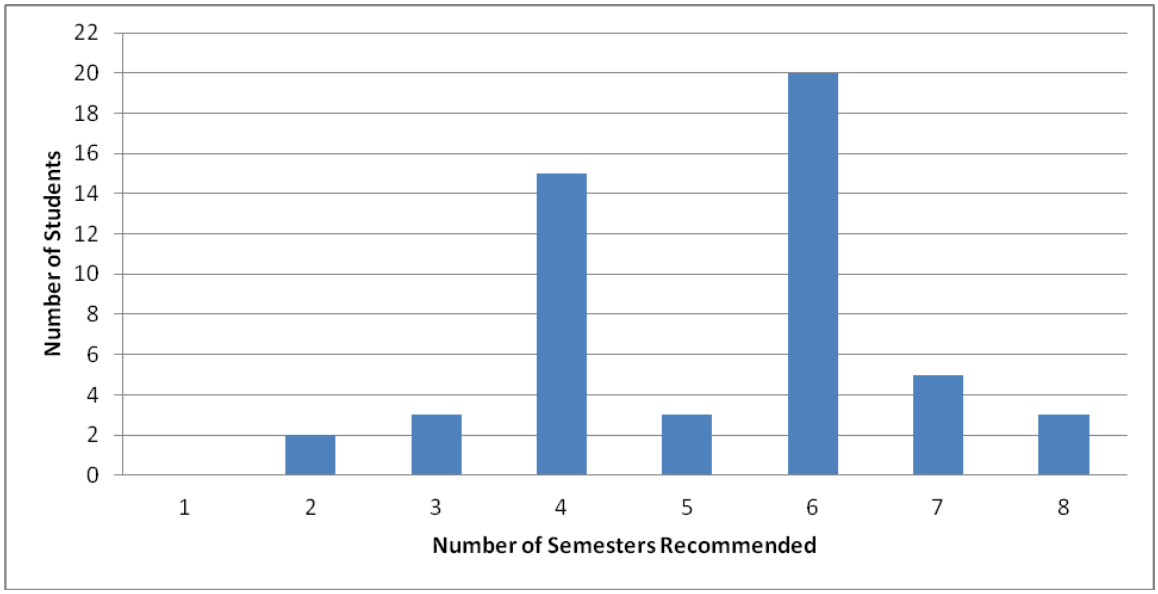

Figure 5: Recommendations for Semesters of German Prior to Going Abroad

These figures show that most students take four to six semesters before going abroad and recommended that amount as well. Some students join the Eurotech Program late. That is, they add the German component after they start working on their engineering degree and take fewer German courses before going abroad. The largest group of participants recommend six semesters. This is consistent with the plan of having students study German for three years before going abroad in their fourth year. Figure 6 takes the illustration a step further. It compares the semesters of German taken by particular students and their recommendations for how many semesters should be taken.

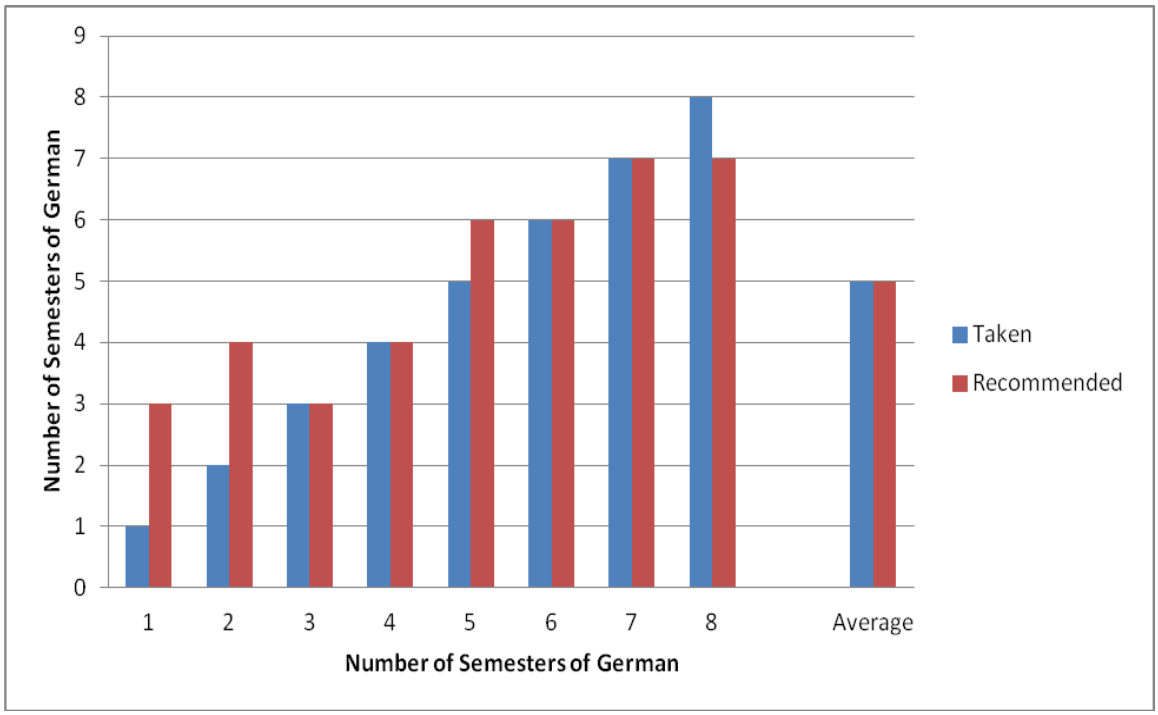

Figure 6: Number of Semesters of German Taken and Recommended

It is interesting to note that the students who took the fewest semesters of German recommended taking more, whereas those who took six or seven semesters were content with that number. On average, participants in this study took at least five semesters of German and would recommend taking at least five. Some students added remarks on the number of semesters of German such as, "the more the better," "more intensive courses at UConn," and "as much as possible!"

The recommendations for semesters of engineering courses were different. Figure 7 presents the number of semesters of engineering that the participants completed.

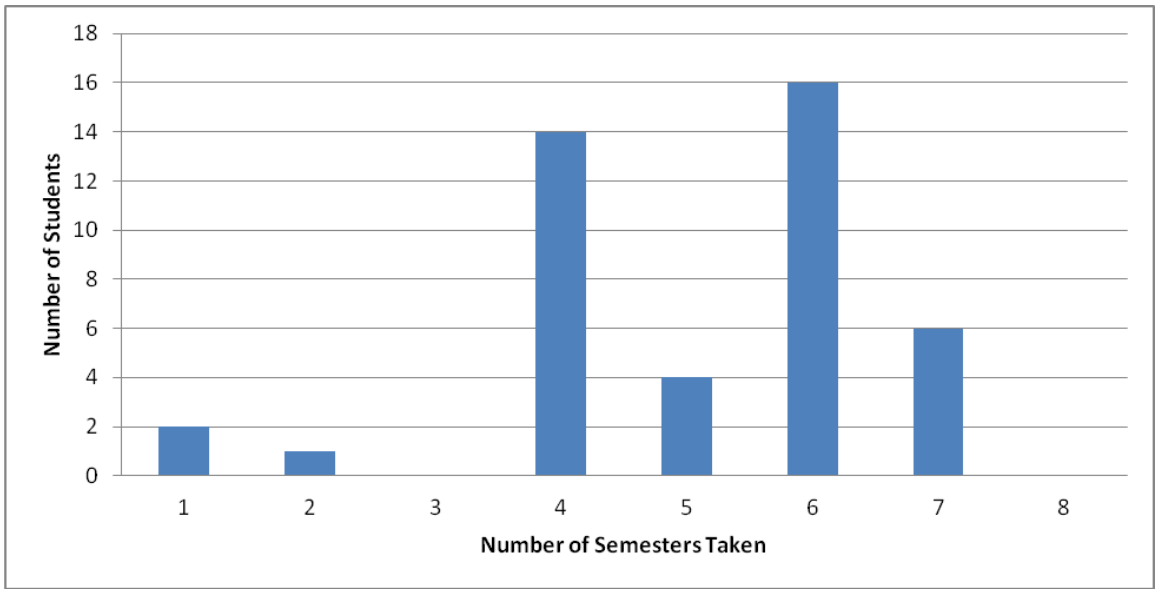

Figure 7: Semesters of Engineering Prior to Going Abroad

A comparison of Figures 4 and 7 shows that most students take an equivalent number of semesters in German and in engineering, which is in keeping with the goals of the dual degree program. However, many said the number of semesters of engineering courses "is not as relevant," "doesn't really matter," and "is less critical" than the number of semesters of German courses for the purpose of going abroad. On the other hand, a few said it "depends on students' academic focus in Germany" and "the more semesters of engineering a student has had, the more likely they are to find an internship." It is relevant to note that the participants recognize that preparation in German is essential to their success in the study abroad experience. In general, the participants showed that if they had at least four or more semesters of German and engineering, they felt adequately prepared to go abroad. Another goal of the Eurotech Program, preparation for study and internships abroad, appears to have been accomplished.

Study Abroad

With prior coursework, students are confident enough in their German and engineering skills to study and intern abroad. The full year study abroad program allows for German and engineering instruction during the first semester and an internship during the second. Eighty percent of the participants in this study went abroad for an entire year. All students, whether they go abroad for one semester or two, are placed in a university dormitory with German and other international students. An effort is made by the German universities to avoid placement with other American students. Ninety-six percent of the participants said they lived with German and other international students. The few that did live with another American student had German or other international students in their apartment or on their floor as well. In Figure 8, one can see that besides the two outliers who spoke only English while in the dormitory, these participants reported speaking at least 25% German in their living quarters and socially, and the majority reported speaking German 50% of the time.

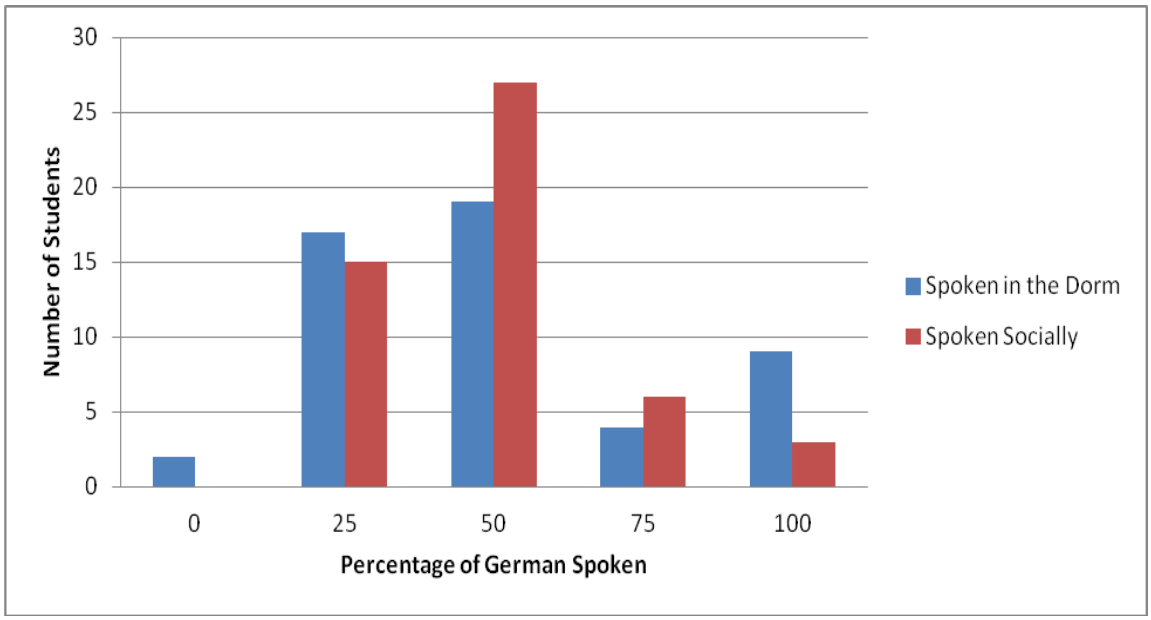

Figure 8: German Spoken in the Dorm and Socially

Through their living abroad experience these students are immersed in a global setting where they can develop both culturally and linguistically. This contributes to the goal of growth in cultural awareness.

The questionnaire asks about the courses Eurotech students take while abroad. The BW Exchange Program provides all participants with a four to six week intensive language course in Germany before the first semester (Seitz, n.d.). The length of the course depends on which university the student attends. For example, in Freiburg, Heidelberg, Karlsruhe and Mannheim the course meets every day for four weeks, and in Stuttgart it runs for six. With the guidance of their peer advisors, students can choose courses for the first semester that best fit their study interests and needs. There are two types of courses. Students can enroll in *Deutsch als Fremdsprache* (German as a Foreign Language), abbreviated as *DaF*, courses or regular university courses. The type of courses that the participants of this study take is displayed in Figure 9.

Figure 9: Courses Taken Abroad

As the responses to questions on preparation to study abroad shows, Eurotech students want to learn as much German as they can before going abroad, and even more so before starting an internship. Figure 9 displays that the greater part of their course load is in taking German language courses. A sample of course titles is given below.

> *Deutsch in der Naturwissenschaft und Technik* (German in Science and Techology)
>
> *Die Europäishe Union* (The European Union)
>
> *Landeskunde: Baden-Württemberg* (Geography of Baden- Württemberg)
>
> *Literatur und Kunst in Deutschland* (Literature and Art in Germany)
>
> *Mundliche Kommunikation in der Fachsprache* (Verbal Communication in Technical Terminology)
>
> *Phonetik* (Phonetics)
>
> *Training zum Sprechen und Hören* (Training in Speech and Hearing)
>
> *Überblick über die deutsche Geschichte* (Oveview of German History)

In addition to strengthing their German language abilities through language courses, students also attempt regular university courses. These courses are often taught in German. However, there are a number of courses offered in English as well. Figure 10 displays the number of regular university courses that the participants of this study took and whether the courses were taught in English or German.

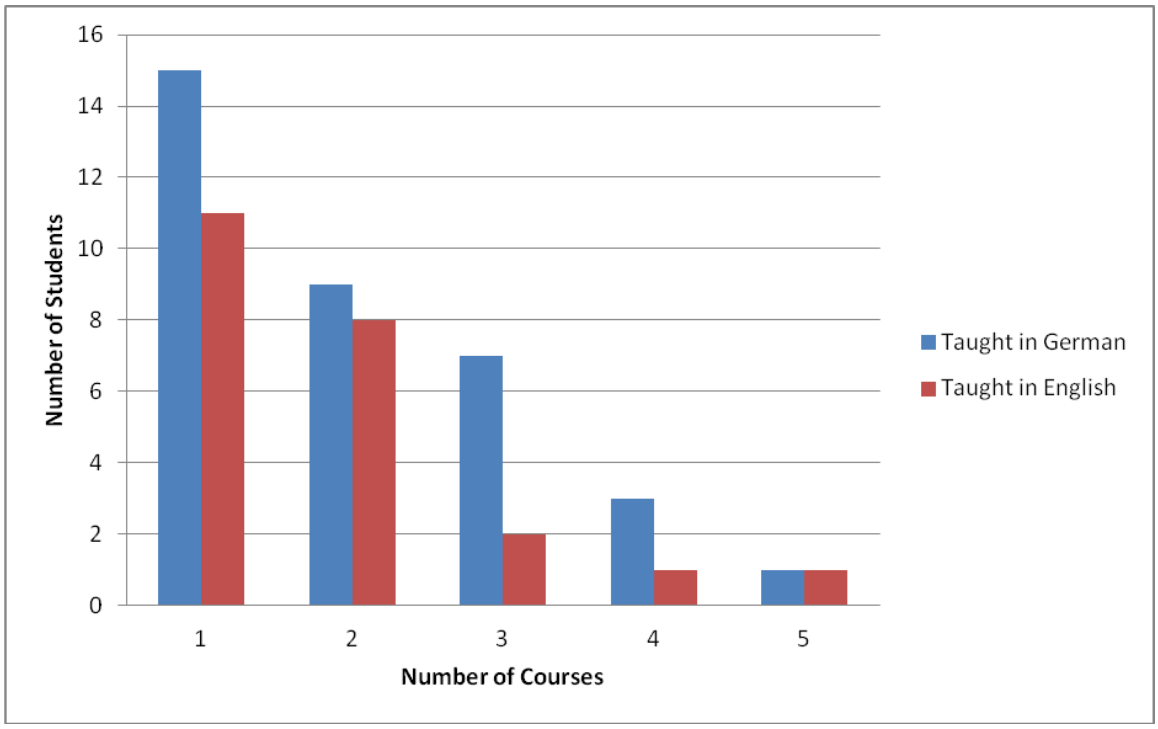

Figure 10: Language of Instruction in Regular University Courses

Students try to take at least one or two regular university courses, some even take more. A sample of regular university course titles is given below.

Air Quality Control

Allgemeine Toxikologie (General Toxicology)

Einführung in die Bioverfahrenstechnik (Introduction to Bioengineering)

Einführung in die Informatik (Introduction to Computer Sciences)

Grundlagen der Datenbanken und Informationssystemen (Fundamentals of Databases and Information Systems)

Introduction to Turbochargers

Medizinische Verfahrenstechnik (Medical Engineering)
Verbrennungsmotoren (Combustion Engines)

Both sets of courses are appropriate to the goals of the Eurotech Program.

In the first semester of study, students are also working to put their internship applications together. The students are not limited to interview with companies in the state of Baden-Württemberg. Here is the list of companies where participants in this study interned. If more than one student interned at a particular place, then the number of students is given in parentheses.

Atec Pharmatechnik GmbH, Sörup
Behr GmbH & Co. KG, Stuttgart
BMW, Munich
Bosch GmbH (3), Schwieberdingen
Chemical Engineering Department at the University of Stuttgart
Daimler AG (7), Mannheim and Stuttgart
eCCOMES GmbH, Stuttgart
Ed Zueblin AG, Stuttgart
Fraunhofer Institute (8), Stuttgart
German Cancer Research Center at the University Hospital Heidelberg
High Performance Computing Center (2) at the University of Stuttgart
Imtech Deutschland GmbH & Co. KG, Hamburg
KNIME, Konstanz
Kuhlmann, Ostfildern
Linde Engineering, Pullach
Mahle GmbH, Stuttgart
Mercedes AMG, Affalterbach
Microsystems Energy Harvesting Laboratory at the University of Freiburg
MTU Aero Engines (3), Munich
Porsche AG (2), Stuttgart
Orthopedic Clinic (3) at the University Hospital Heidelberg
Swissmetal, Dornach, Switzerland
Trumpf GmbH, Stuttgart

In a follow up question, participants who completed an internship were asked to give a short description of what their internship was about. Below are some responses.

1. I worked in a research laboratory at MTU Aero Engines in Munich. MTU fabricates, maintains and repairs aircraft engines. The lab specialized in non-

destructive techniques to measure mechanical characteristics of materials, e.g. stresses, impurities and deformations resulting from various manufacturing processes. As MTU was trying out new forms of manufacturing or was working to optimize existing ones, test components were sent to the lab and the effects of new processes were evaluated. I worked in a subgroup of this lab that focused on measuring residual stress, which can significantly reduce the longevity of a part if present in large magnitude. I worked with two other interns and we were each in charge of one residual stress measurement technique. All three techniques were complementary. Each day I would carry out the measurements assigned to me and write up reports and presentations on the results. I also worked on developing a standard sample for testing the sensitivity of a separate piece of equipment in the lab. On one occasion I performed a short literature review and prepared a brief report of my findings for my supervisor. In the lab all written and verbal communication was in German, and in the *Kantine* [cafeteria] all *Weißwiascht* [Bavarian sausage] were served with *siassem Senf* [sweet mustard].

2. I worked at the orthopedic clinic probably 35 hours a week. I was in charge of a project that was researching different methods to isolate and analyze polymer, ceramic and metallic wear particles that come off of hip and knee replacement joints during simulation testing. I researched the different methods and tested them out on the three materials to see which methods worked best for which material. At the end of the internship I gave a presentation and wrote up a final report on the subject. I also did some editing and translating of scientific articles for publication written by the staff who worked at the clinic.

3. At first, they had me develop a user-friendly workflow system for production planning processes. This entailed mapping out a standard process, and the steps it would take for a project/assembly line to go into production. My role was to create a standardized project evaluation database in Excel using basic programming in Visual Basic. This made it easy to complete evaluations of the work, and also to search through the evaluations once they were completed. After this, there wasn't a lot to do, and EVERYONE went on vacation, so I meandered around a bit and found things to do. Finally though, one of the grad students was working on a project that I was able to help with. He wanted to create an assembly with numerous lasers and cameras mounted on it to be used in engine inspection. An engine would move down the assembly line and by this setup, and instantaneously we could tell if all the parts were in their place and if the engine was acceptable. This saved considerable time when compared to a person inspecting the engine piece by

piece. My role was to help him build the assembly, and I also introduced the software design that would be used to control the lasers and cameras using National Instruments LabVIEW software. This was because I had prior experience with LabVIEW during my early engineering classes at UConn.

4. I was responsible for reading current research from around the world on biomimetic solutions to engineering problems. Biomimetics is a flexible term, but one definition of it is the study of the structure and function of biological systems as models for the design and engineering of materials and machines. It attempts to use the naturally evolved solutions to problems that animals, plants and insects have developed as models for engineering solutions to human problems. I would try to determine if any of the existing research could be applied to current research being undertaken by the department. I presented my conclusions to my *Betreuer* [advisor] and the department head and worked on MATLAB programming assignments to develop a script that could break down and identify images to theoretically help a robot navigate a room. I also performed German to English translations of presentations and documents for use by the company.

5. I worked in the *Betriebstechnik* (Process Engineering) department at Linde Engineering. Our project was to design a natural gas facility in Mexico for our client, PeMex, the Mexican national oil and gas company. Our main deliverables to our client were Process Flow Diagrams (PFD's) and Piping and Instrumentation Diagrams (P&ID's). There is a lot of revision of these documents, as well as design implementation from both Linde and the client. There was a lot of documentation, book keeping, and checking of the documents as they progressed. I did general tasks on several projects, including back checking new drafts of documents against old drafts, updating equipment lists, and taking notes during meetings. Linde also assigns their interns a report (they called it a "Know-How Manual") about a technical process in English. My Know-How report was on thermal fluid systems. The report included the equipment in a thermal fluid system, how it operates, and how it varies in different facilities. My report was 30 pages, but included a lot of pictures and diagrams, it was a relatively easy 30 pages. At the end of my 4-month internship I handed in my report and gave a 10 minute PowerPoint presentation in German to my Co-workers.

These reports on internships are impressive for their clarity and professional qualities. They identify specific projects worked on. These projects indicate that the internships are serious steps in education and training. What is most striking is the evidence of how well

these participants fit into the work stream of the company in which they are interning. Here, self-reports are good evidence of the achievements both in language and engineering of Eurotech students in their study abroad program. Further descriptions of the participants' internships are provided in Appendix E.

The length of internships varies, which can be seen in Figure 11.

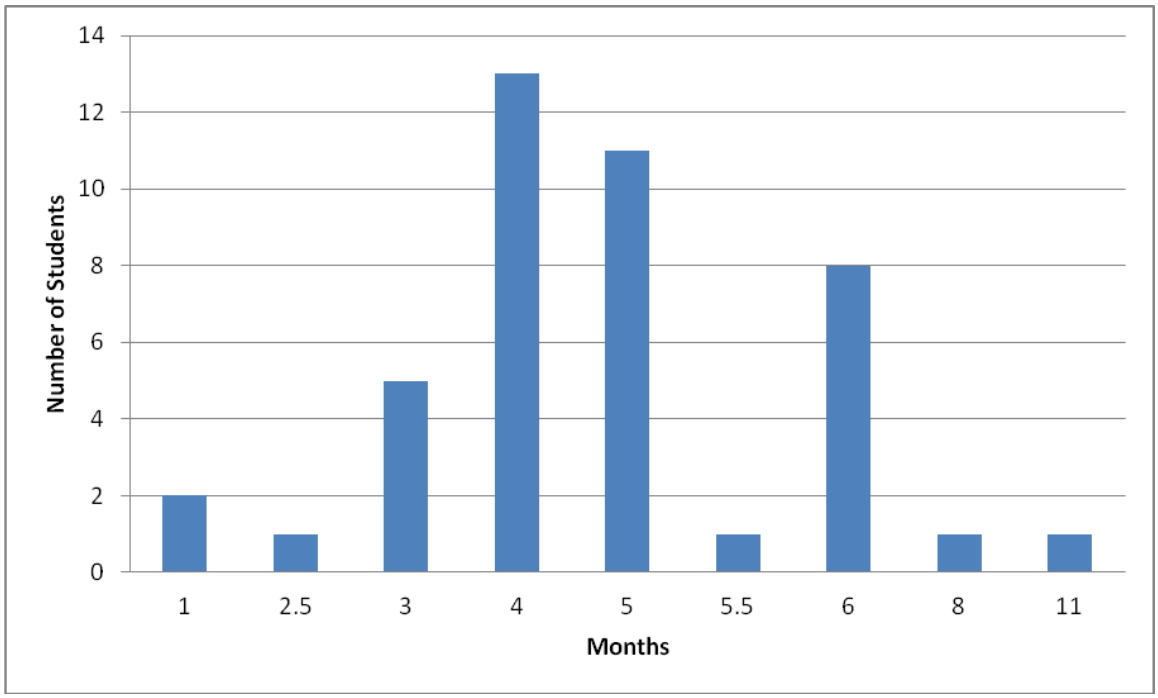

Figure 11: Length of Internship

Most participants of this study interned for four or five months. It is important to note that those who interned for fewer months were abroad only for one semester. There are eight participants missing from Figure 11. One student, who is currently in Germany, is still applying for an internship, and seven participants of this study did not complete an internship. Three of the six went abroad for one semester and only took university courses during this time. The remaining four decided to take courses for both semesters that they were abroad. Nevertheless, it is a sign of true success of the collaborative efforts

of the Eurotech Program and the BW Exchange Program that all participants of this study who applied for an internship received one.

The opportunity to complete an internship encourages linguistic growth. The participants who completed an internship were asked how much German they spoke in their work environment. Figure 12 displays a comparison of the amount of German spoken in the dorm, socially and during their internships.

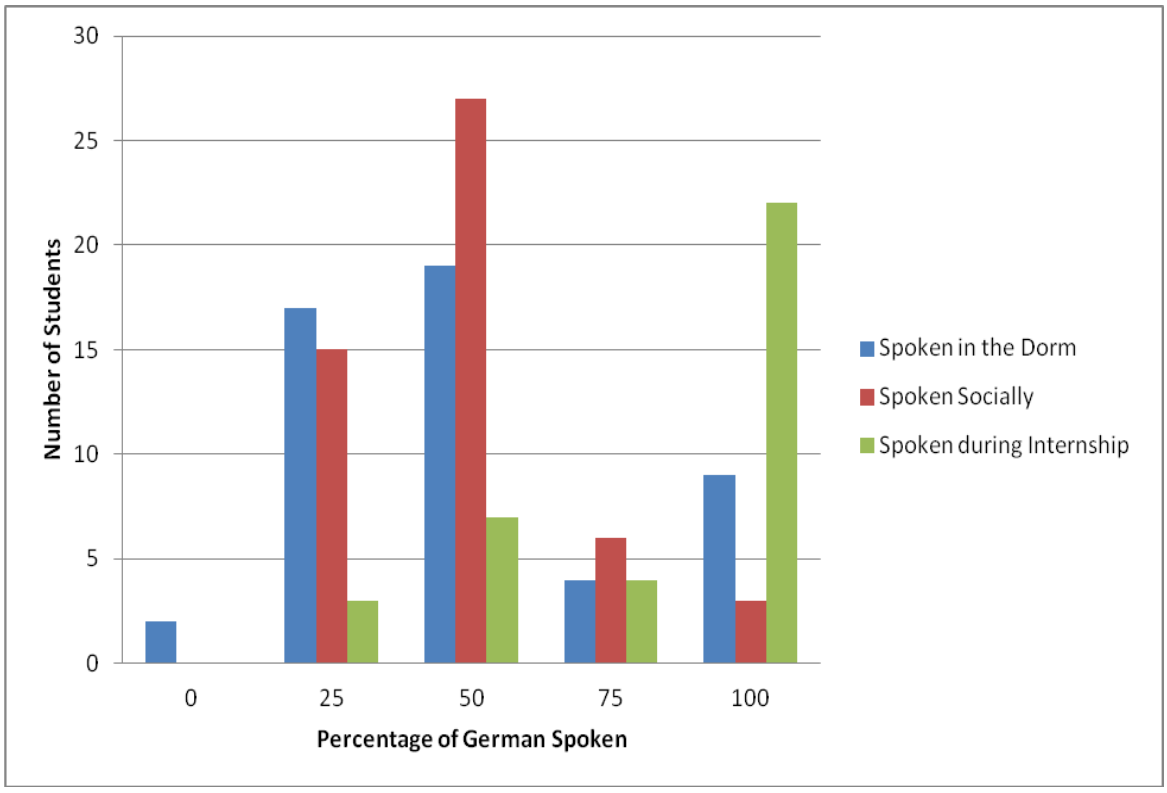

Figure 12: German Spoken in the Dorm, Socially and during Internship

No student spoke English exclusively during an internship. The majority reported speaking German 100% of the time. The participants were asked whether or not they felt confident in their language skills going into their internship. Eighty percent said yes. This highlights the fact that the students reported that they were adequately prepared in German through study at UConn and abroad to intern in Germany. The students were

then able to advance linguistically even more during their internship. One participant said that the "majority of the German (especially technical German) I learned while abroad happened during my internship when I was surrounded by Germans and immersed in the language 40 hours per week." Thus, it appears that the educational goal of the Eurotech Program, advancing in both language and technical skills, is greatly enhanced through the internship experience.

Since the students are not limited to apply for an internship in the city of their German university, some take the opportunity to move into an apartment close to where their company is located. One participant even recommended it by saying, "If you do an internship, I'd recommend moving out of the student dorms and finding an apartment with German students/interns. Getting away from the university will force you to use German socially." Weidauer (2001) promotes this as well:

> The graduate who is not afraid to take the local bus and rent an apartment in a German city (rather than renting a car and staying in one of the global temporary housing arrangements) will help his or her company be more successful in this market because he or she will know what is culturally accepted in this market. No crash course in German for the professions can provide the cultural proficiency necessary to gain this local knowledge. Therefore, part of every successful international engineering program must be a work-abroad period (possibly combined with a study-abroad period) to ensure that graduates will know what it is like to work in the other culture (p. 47).

The completion of an internship abroad serves several goals of the Eurotech Program. Students achieve the goal of working side by side with German engineers while having the opportunity to progress even further in their language skills and cultural awareness.

After Study Abroad

The questionnaire for Eurotech graduates asked about their job searches and the outcomes. Out of the 33 participants in this study who graduated from the Eurotech Program, 18 started applying for jobs while they were still at UConn, seven applied for jobs after they graduated and eight applied for graduate school. About half applied for one to six jobs, several listed applied for 20 jobs, and a few applied for 50 or more. Two questions focused on the role the Eurotech Program seemed to play in their job search. These questions were asked before inquiring about their current work status. Were potential employers interested in their Eurotech experience? Had their Eurotech experience played a role in their job search? For both questions, roughly 75% of the participants in this study said yes. Some noted that potential employers were interested in their internship in Germany or interested in talking about their general experiences abroad. For three participants, it was their language abilities that enabled them to secure a position in Germany after graduation.

The results of whether or not Eurotech graduates successfully obtain a job after graduation and whether or not their Eurotech experience plays a role in their current position are now addressed. Out of the 33 graduates, only one student is currently applying for a job. The remaining 32 graduates are working or attending graduate school. The numbers are displayed in Figure 13.

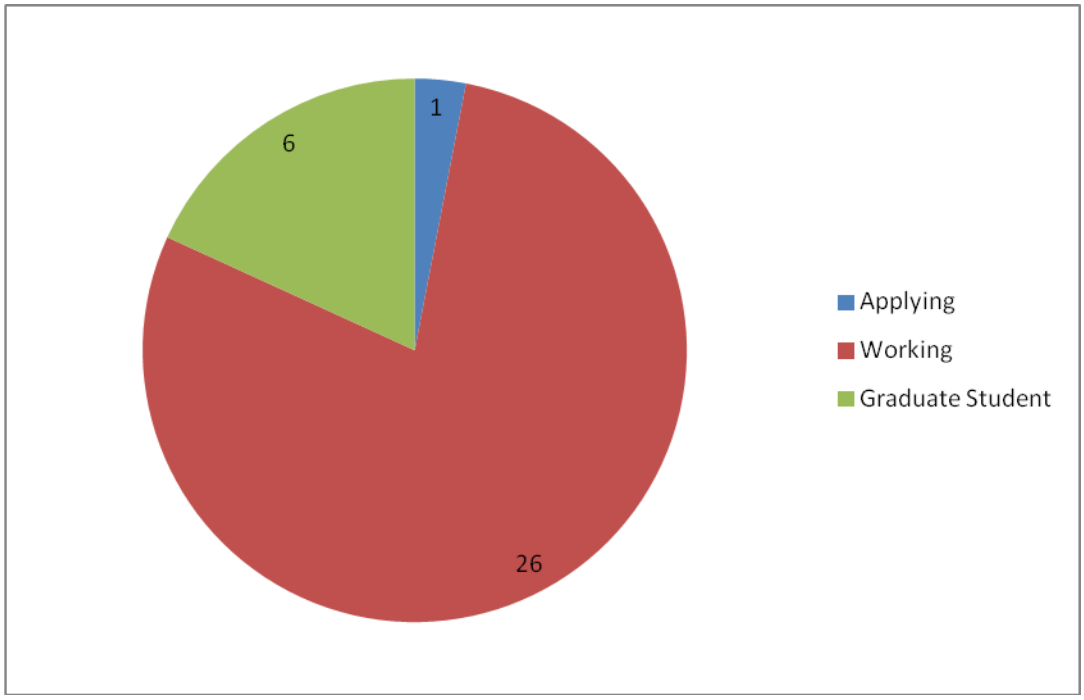

Figure 13: Current Status of Eurotech Graduates

Here is the list of the companies and graduate schools where Eurotech graduates are currently working and studying.

Companies:

AECOM, Rocky Hill, Connecticut
ALSTOM Power, Stuttgart, Germany
ATMI, Danbury, Connecticut
Barcol Air Ltd, Oxford, Connecticut
Boston Scientific Corporation, Marlborough, Massachusetts
Consolidated Industries Inc., Cheshire, Connecticut
CVS Caremark Corporation, Woonsocket, Rhode Island
DePuy Spine, Johnson & Johnson, Raynham, Massachusetts
Fluor Corporation, Sugar Land, Texas
General Dynamics Electric Boat (3), Groton, Connecticut
Henkel Loctite Corp, Rocky Hill, Connecticut
Lucius Pitkin, Inc., Manhattan, New York
Pilz GmbH, Ostfildern, Germany
Practical Energy Solutions, LLC, Wallingford, Connecticut
Respiratory Motion, Inc., Waltham, Massachusetts
Tallan, Inc., Rocky Hill, Connecticut

The Hartford Financial Services Company, Hartford, Connecticut
Top to Bottom Services, Gaithersburg, MD
United Technologies Corporation (5) at:
    Hamilton Sundstrand (2), Windsor Locks, Connecticut
    Pratt & Whitney (2), Middletown, Connecticut
    UTC Power, South Windsor, Connecticut
Volkswagen AG in Wolfsburg, Germany

Graduate Schools:

Dalle Molle Institute for Artificial Intelligence, Manno, Switzerland
Karlsruhe Institute for Technology, Karlsruhe, Germany
Tufts University, Medford, Massachusetts
University of Connecticut (3), Storrs, Connecticut

Some participants held a prior job or did graduate work before their current position. Three are currently working in Germany and two are in graduate school abroad (one in Germany, one in Switzerland). The remainder are working or studying in the U.S., and more than half say that their Eurotech experience does not play a role in their current job. However, their remarks remain positive about the program, saying that the experience gained abroad was important.

Feedback

The final question for all participants in this study asked if they had recommendations for the Eurotech Program. Three major themes emerged.

1. The necessity of enough German preparation prior to going abroad
2. More guidance for the internship process
3. Establish a network for Eurotech students and graduates

As shown in Figure 5, most of the participants recommended four to six semesters of German before going abroad. This came up again as a response to the final question. One participant said, “Students who want to study abroad in Germany need to have stronger

language skills… German language instruction at UConn MUST be more intensive." Others suggested specific course offerings, such as "a course that focuses on everyday conversational German" and more Linkage Through Language (LTL) courses that match up with required engineering courses. LTL courses are taught in German and meet one hour a week in conjunction with a regular university course. This response reinforces Parkinson's (2007) finding that the "benefit of study abroad is significantly enhanced by prior preparation. Even if students do not have a deep understanding of issues surrounding globalization, communication across cultures, etc., but they are aware of what the issues are, they gain much more from the study abroad experience" (p. 12). Prior preparation seems to be paramount. This conclusion appears in the participants' responses as well.

Half the participants recommended more guidance during the internship process, starting before they go abroad. One participant mentioned that they "should have started the application process [for internships] at the beginning of the previous summer," another recommended "increased emphasis on the job [i.e. internship] opportunities which exist in Germany and training in particulars of how to apply for these jobs [i.e. internships]; applying for one's first full-time job [i.e. internship] at the beginning of a professional career can be a daunting enough task in one's own country." Other participants responded similarly. Perhaps a short course specifically to prepare students on how to search and apply for an internship is warranted. There is an emphasis among the participants for more preparation in German language and culture, as well as in the specifics of the internship process.

Since the internship itself is so valuable for the students, it is important to help them to be more confident and capable in the application process. To this effect, an enhanced joint effort of the Eurotech organizers is called for. The applications for internships need to be in German. The German Program has the students prepare a cover letter and resume in German. This preparation could include putting together an entire internship application packet before the students go abroad. Applying for an internship in the engineering field, however, could also benefit from the input of the School of Engineering, and the BW Exchange Program could continue to help students in the internship process while they are abroad. Perhaps the Eurotech Program could have a single advisor represent the German Program, the School of Engineering and the BW Exchange Program. This advisor would be knowledgeable about German engineering companies and the application procedures for internships in German.

Some participants of this study also suggested creating a network for students of the Eurotech Program. The recently implemented Eurotech Learning Community creates a network for current students in the program. It is open to all Eurotech students and provides living quarters during the academic year. The resident assistant of the living quarters is a Eurotech student who has already been abroad. The community was not in existence for the participants of this study and may address some of the concerns raised by them for a more integrated program. Other participants showed interest in a list of "contacts for German/American companies in New England," or of "companies that have expressed a need for graduates with their experience," to maintain a "connection with alumni students," and to "hold events or have newsletters exposing alumni/students to new jobs, news, innovative ideas in the combined fields of Germany and engineering."

Thus, in addition to enhanced guidance in respect to their internships abroad, students have expressed the desire for continued support in their future careers. Again, a collaboration of the Eurotech organizers or a single advisor could help in this regard.

Although the final question asked for recommendations for the Eurotech Program, many participants responded with reports of positive experience.

1. The Eurotech Program offered me the excellent opportunity to spend a year abroad and really explore myself and reevaluate my goals, values, and outlook on life. I am thankful for the experiences it allowed me to gain and hope that with some of this feedback it can be even better for students in the future!

2. I think the program was excellent. I learned so many things, and significantly matured as an individual by facing the challenges that such an opportunity provides. After attempting a job interview in a foreign language, my English job interviews seemed quite casual!

3. The Eurotech Program provided intangible value by helping me to develop my dynamic abilities. My confidence to enter the workplace increased dramatically after completing a technical internship in a foreign country while speaking a different language. I am extremely supportive of the personal growth opportunities offered by the program.

4. The Eurotech program is a fantastic program that gives UConn students an opportunity that most university students don't have, and I definitely wouldn't be living and working as an engineer in Germany had I not participated in the program. Now in a time of globalization, it is more important than ever that American universities produce engineers capable of competing internationally.

5. I think it’s an incredible experience, it offers some fantastic opportunities, and memories to last a lifetime.

6. Overall, although improvements can be made, the Eurotech Exchange Program provides an invaluable and outstanding experience. It can be argued that overcoming these obstacles I mentioned are ultimately up to the responsibility of the student; therefore overcoming them and succeeding on one's own just adds to the sense of accomplishment and overall worth of the Eurotech Program and the study abroad experience.

The Eurotech Program may be able to provide more guidance through the many stages of the entire experience, however, the students are also faced with the opportunity to grow and learn on their own. Further recommendations and feedback by the participants are provided in Appendices F and G.

Conclusion

This study collects, analyzes and discusses assessment data from the self-report of Eurotech students. The goal is to see if the Eurotech Program is running as planned. The study examines whether the students are given adequate preparation in German language and culture before they go abroad, if they gain language and cultural understanding as well as internship experience during their time abroad, and if they benefit from their experience by having opportunities in the job market after graduation.

An expected finding is that foreign language instruction prior to going abroad is generally recommended and valued by the participants of this study. This finding can most likely be generalized to all study abroad programs. Not only is knowledge of the language of the country where one studies fundamental to everything else, language knowledge and use advances during the study abroad experience. Another finding is that Eurotech students who apply for internship opportunities while abroad receive them. This is no small accomplishment since the application and interview process is in German. The internship experience serves to enhance language use and cultural understanding as well as technical training. It is a great confidence builder according to the students' reports and plays an indirect, if not direct, role in future employment after graduation, thus satisfying one of the major goals of the program.

At the end of an academic semester final examinations are a form of assessment of whether the goals of a course are achieved. In the same way, at the end of a study abroad program it seems valuable to have an assessment of whether the goals of the experience abroad are achieved. This study is a step in the direction for an ongoing assessment of the Eurotech Program. In the early stages of this study, it seemed that only objective measures, such as formal tests of language and cultural competency that compared study abroad participants with students who do not study abroad, as well as similar comparisons in job opportunities after graduation, could accurately evaluate whether the goals of the Eurotech Program were being met. However, such an undertaking was beyond the scope of this study. The practicalities of identifying and organizing control groups and administering tests could not be satisfied. Nevertheless, it would be valuable to do so in the future.

The course taken in this study was to use self-reports of Eurotech students and graduates about their experience. The similarities across participants' responses suggest that the outcomes are reliable. More importantly, the contents of the students' responses to questions about language instruction, description of internships, and recommendations for the program attest to their growth and accomplishments and to the Eurotech Program's success in meeting its goals.

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Appendices

A. Eurotech Regular and Alternate Plan of Study

Regular EUROTECH Schedule

This is a general description of the German Studies Major and how you incorporate it year-by-year with your engineering course work. By sticking to the courses listed here, you will get your German Studies major in the most efficient way as many of these courses also fulfill General Education requirements (see the previous page for details). There is some flexibility with those courses marked by an *, how you can move these courses around is explained below:

FALL	SPRING
First Year	
Germ 1131 (4 credits)	Germ 1132 (4 credits)
Second Year	
Germ 1133 (4 credits) Germ 3220 (1 credit)	Germ 1134 (4 credits) Germ 3221 (1 credit)
Third Year	
Germ 3233 (3 credits)	Germ 3234 (3 credits)

(the sequence 3233-3234 is direct preparation for your study or work abroad period; in these courses you discuss cultural differences and practical issues of coping with the experience of a different culture)

Germ 3222 (1 credit)

Fourth Year

Work/Study Abroad Germ 3292 (6 credits, see pages 22-23 for how to get them) Germ 3293* (x credits, study abroad courses you can transfer as UConn credits, see p. 32 for the rules) Engr 3289 (no credits)	Germ 3261W* (3 credits)

Fifth Year

Germ 3251* (3 credits)

Germ 3252W* or 3253W* or 3254W* or 3255W* (3 credits each)

Notes on * designated courses:

Germ 3251 is offered every Fall semester and has no prerequisites; you can take it during the fall of any one of the five years.

Germ 3261W is offered every Spring semester and can be taken any Spring once you have started with 3233.

Germ 3252W, 3253W, 3254W, 3255W are not offered on a regularly alternating schedule, they might be offered in Fall, too, you can take these courses whenever they are offered and once you have started with 3233.

Germ 3293 are credits you transfer to UConn for courses taken abroad. Depending on what courses you have taken, they can be applied towards credit for a number of the 3000-level German courses. As outlined under "Transferring Credits, make sure the courses you intend to take match courses offered at UConn and that you save the appropriate paperwork!

An Alternate EUROTECH Schedule

Below is an example of how you can finish the program on time even if you start late with the German coursework. This is just an example; there are other ways of doing this. These other ways mainly depend on what language courses individual students are able to take over the summer or during intersession (between Fall and Spring semester) or during their study/work abroad period.

Example: Starting with German in your third year

FALL SPRING

Year 1

just engineering, no German

Year 2

just engineering, no German

After having completed two years, lightning strikes and you realize that you want to go global. Here's what you can do:

Summer Preceding Year 3

Take the equivalent of First Year German (1131-1132; 8 credits) during summer session here or elsewhere or at the Goethe Institute (see below)

Year 3

Germ 1133 (4 credits)
Germ 3220 (1 credit)
Germ 3251 (3 credits)

Germ 1134 (4 credits)
Germ 3221 (1 credit)

Year 4

Study Abroad:
Take the equivalent of Germ 3233-3234 (6 credits)
as "Deutsch als Fremdsprache" courses offered at a German university and, for example, one
course under 3293 that counts as a literature course.

Work Abroad
Germ 3292 (6 credits)
ENGR 3289

Year 5

Germ 3222 (1 credit)

Germ 3261W (3 credits)

OTHER WAYS OF GETTING YOUR GERMAN LANGUAGE TRAINING that can make your schedule more flexible and/or speed up your progress in the program:

1. The German section offers first year German as Germ 1111-1112 Intensive Beginning German in Spring and second year German as Germ 1113-1114 Intensive Intermediate German in Fall.

2. The Deutsche Sommerschule am Atlantik: The University of Rhode Island's German Section offers a six-week German immersion program. During these six weeks, you can take a full year of German at the first, second, or third year level. Upper-level courses are offered as well. Students live in URI's IEP (International Engineering Program) house. For these six weeks, German is the only language you will use.

3. Depending on enrollments and availability of instructors, UConn's German section will offer intersession courses (between Fall and Spring semester), summer session courses, and fast track (one year in one semester) courses in Spring at the first year level. Course offerings will be announced to the engineering advisors to make interested students aware of them.

4. Study Abroad, see the example above and F. Weidauer for a variety of alternatives to this example.

5. The Goethe Institute, German language and cultural institutes located all over the world, offer German courses in all major US cities as well as across Germany and in the rest of the world. Go to www.goethe.de for current course schedules. It is possible to get these courses transferred as UConn credits.

6. Other commercial and non-profit language schools. Credit transfer depends on the quality of the individual program.

B. Information Sheet for Study Participants

Principal Investigator: Sebastian Wogenstein
Student: Daisy Michaels

You are invited to participate in this survey of the University of Connecticut's Eurotech Program. You are being asked to participate because you are or were a Eurotech student at the University of Connecticut. I am a graduate student at the University of Connecticut, and I am conducting this survey as part of my course work. I am interested in finding out the experiences of students in their study and internship abroad as part of the Eurotech Program and to learn how the program experience affects their job searches after graduation.

Your participation in this study will require completion of the attached questionnaire. This should take approximately 15 - 30 minutes of your time. You will not be paid for being in this study. You will need to return the questionnaire to the sender's email address. Once the completed questionnaire is received, you may be contacted with follow up questions. Your participation will be confidential. When no further follow up questions are needed, your questionnaire will be downloaded without any link to your name or email address. Additionally, all emails will then be deleted. The University of Connecticut Institutional Review Board (IRB) requests that you be informed that email is not a secure method of transmission. If this is a problem for you, please consider sending your responses anonymously by mail to the following address:

[address was given]

The benefits of your participation may impact society by helping increase knowledge about student experience in study and internships in Germany and how it contributes to experience in the job market after graduation. The understanding gained may lead to improvements in the program for future students.

Participation in this study is voluntary. You do not have to participate. If you do participate you are free to answer only questions you are comfortable with. If you have questions about the project, you may contact me, Daisy Michaels (the student) at [number was given] or my advisor, Sebastian Wogenstein at [number was given]. We will be happy to answer any questions you have about this study. If you have any questions about your rights as a research participant you may contact the IRB at [number was given]. The IRB is a group of people who review research studies to protect the rights and welfare of research participants.

We hope you will participate. In any event, thank you for considering our request. If you do participate, please complete the attached questionnaire and return it by February 20, 2012.

Thank you.

C. Questionnaire for Eurotech Graduates

1. When did you graduate from the University of Connecticut?

   ☐ May 2007

   ☐ May 2008

   ☐ May 2009

   ☐ May 2010

   ☐ Other:

2. What degree(s) do you graduate with from the University of Connecticut with?

   ☐ BA in German and BS in Biomedical Engineering

   ☐ BA in German and BS in Chemical Engineering

   ☐ BA in Germany and BS in Computer Science & Engineering

   ☐ BA in German and BS in Mechanical Engineering

   ☐ Other:

3. Did you complete the program in 5 years?

   ☐ Yes

   ☐ No, I completed the program in this many years:

4. How many semesters of German did you complete before going abroad?

   ☐ 1

   ☐ 2

   ☐ 3

   ☐ 4

   ☐ Other:

5. Would you recommend more/less semesters of German before studying abroad? If so, how many?

   ☐ 1 semester more

   ☐ 1 semester less

☐ 2 semesters more

☐ 2 semesters less

☐ Other:

6. How many semesters of engineering did you complete before going abroad?

   ☐ 1

   ☐ 2

   ☐ 3

   ☐ 4

   ☐ Other:

7. Would you recommend more/less semesters of engineering before studying abroad? If so, how many?

   ☐ 1 semester more

   ☐ 1 semester less

   ☐ 2 semesters more

   ☐ 2 semesters less

   ☐ Other:

8. Where did you study abroad?

   ☐ Freiburg

   ☐ Heidelberg

   ☐ Karlsruhe

   ☐ Stuttgart

   ☐ Other:

9. In what academic year did you study abroad?

   ☐ September 2005 – July 2006

   ☐ September 2006 – July 2007

   ☐ September 2007 – July 2008

☐ September 2008 – July 2009

☐ September 2010 – July 2011

☐ Other:

10. Where did you live?

☐ Student dormitory

☐ Off-campus apartment

☐ Other:

11. Who did you live with?

☐ Foreign students

i. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

☐ German students

ii. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

☐ U.S students

i. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

12. What language was spoken where you lived?

☐ 100 % English

☐ 100 % German

☐ 75 % English and 25 % German

☐ 50 % English and 50 % German

☐ Other:

13. How many Deutsch als Fremdsprache classes did you take in Germany?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

14. How many mainstream university courses did you take in Germany?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

15. How many of your mainstream university classes were taught in German?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

16. How many of your mainstream university classes were taught in English?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ Other:

17. How much of the time did you use German socially?

- ☐ 0 %
- ☐ 50 %
- ☐ 100 %
- ☐ Other:

18. Did you complete an internship abroad?

- ☐ Yes
- ☐ No

19. If you did **not** complete an internship, why not?

- ☐ No time
- ☐ No offers
- ☐ Did not know how to apply
- ☐ Did not feel confident enough in German
- ☐ Other:

20. If you **did** complete an internship abroad:

a. What company did you intern for?

b. How long did you intern?

- ☐ 3 months
- ☐ 4 months

☐ 5 months

☐ 6 months

☐ Other:

c. Was it difficult to arrange the internship?

☐ No, I had enough guidance and it was manageable

☐ Yes, but I had enough guidance

☐ Yes, and I would have liked more guidance

☐ Other:

d. Did you feel confident enough in your German language abilities to intern in Germany?

☐ Yes

☐ No

☐ Other:

e. What language did you use while interning?

☐ 100 % English

☐ 100 % German

☐ 75 % English and 25 % German

☐ 50 % English and 50 % German

☐ Other:

21. When did you start applying for jobs?

☐ I have not started applying for jobs

☐ While I was still at the University of Connecticut

☐ After I graduated from the University of Connecticut

☐ Other:

22. When you started applying for jobs:

a. How many jobs did you apply for?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

b. Were potential employers interested in your Eurotech experience?

☐ Yes

☐ No

☐ Other:

c. How many jobs were offered to you?

☐ None

☐ 1

☐ 2

☐ 3

☐ Other:

d. Had your Eurotech experience played a role in your job search?

☐ Yes

☐ No

☐ Other:

23. Are you currently working?

☐ No

☐ Yes

☐ Other:

24. If you are currently working:

a. What company are you working for?

b. When did you get this job?

- ☐ I got the job before I graduated
- ☐ I got the job this many months after I graduated:
  - ☐ 1
  - ☐ 2
  - ☐ 3
  - ☐ 4
  - ☐ Other:

c. Did you have any other jobs before this one?

- ☐ No
- ☐ Yes, I had this many jobs before this one:
  - ☐ 1
  - ☐ 2
  - ☐ Other:
- ☐ Other:

d. Does your Eurotech experience play a role in your current job?

- ☐ Yes
- ☐ No
- ☐ Other:

e. Does your current job involve working in Germany or with Germans in the U.S.?

- ☐ Yes
- ☐ No
- ☐ Other:

25. Do you have any recommendations for the Eurotech Program?

D. Questionnaire for Current Eurotech Undergraduate Students

1. When do you plan on graduating from the University of Connecticut?

    ☐ May 2012

    ☐ December 2012

    ☐ May 2013

    ☐ December 2013

    ☐ Other:

2. What degree(s) do you plan to graduate with from the University of Connecticut with?

    ☐ BA in German and BS in Biomedical Engineering

    ☐ BA in German and BS in Chemical Engineering

    ☐ BA in Germany and BS in Computer Science & Engineering

    ☐ BA in German and BS in Mechanical Engineering

    ☐ Other:

3. Will you complete the program in 5 years?

    ☐ Yes

    ☐ No, I will complete the program in this many years:

4. How many semesters of German did you complete before going abroad?

    ☐ 1

    ☐ 2

    ☐ 3

    ☐ 4

    ☐ Other:

5. Would you recommend more/less semesters of German before studying abroad? If so, how many?

    ☐ 1 semester more

☐ 1 semester less

☐ 2 semesters more

☐ 2 semesters less

☐ Other:

6. How many semesters of engineering did you complete before going abroad?

   ☐ 1

   ☐ 2

   ☐ 3

   ☐ 4

   ☐ Other:

7. Would you recommend more/less semesters of engineering before studying abroad? If so, how many?

   ☐ 1 semester more

   ☐ 1 semester less

   ☐ 2 semesters more

   ☐ 2 semesters less

   ☐ Other:

8. Where did you study abroad?

   ☐ Freiburg

   ☐ Heidelberg

   ☐ Karlsruhe

   ☐ Stuttgart

   ☐ Other:

9. In what academic year did you study abroad?

   ☐ September 2005 – July 2006

   ☐ September 2006 – July 2007

☐ September 2007 – July 2008

☐ September 2008 – July 2009

☐ September 2010 – July 2011

☐ Other:

10. Where did you live?

☐ Student dormitory

☐ Off-campus apartment

☐ Other:

11. Who did you live with?

☐ Foreign students

i. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

☐ German students

ii. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

☐ U.S students

ii. If so, how many?

☐ 1

☐ 2

☐ 3

☐ Other:

12. What language was spoken where you lived?

☐ 100 % English

☐ 100 % German

☐ 75 % English and 25 % German

☐ 50 % English and 50 % German

☐ Other:

13. How many Deutsch als Fremdsprache classes did you take in Germany?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

14. How many mainstream university courses did you take in Germany?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

15. How many of your mainstream university classes were taught in German?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

16. How many of your mainstream university classes were taught in English?

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

17. How much of the time did you use German socially?

☐ 0 %

☐ 50 %

☐ 100 %

☐ Other:

18. Did you complete an internship abroad?

☐ Yes

☐ No, I'm currently in Germany and applying for internships

☐ No, I'm currently in Germany and received an internship offer which will start on:

☐ Other:

19. If you **did** complete an internship abroad:

a. What company did you intern for?

b. How long did you intern?

☐ 3 months

☐ 4 months

☐ 5 months

☐ 6 months

☐ Other:

c. Was it difficult to arrange the internship?

☐ No, I had enough guidance and it was manageable

☐ Yes, but I had enough guidance

☐ Yes, I would have liked more guidance

☐ Other:

d. Did you feel confident enough in your German language abilities to intern in Germany?

☐ Yes

☐ No

☐ Other:

e. What language did you use while interning?

☐ 100 % English

☐ 100 % German

☐ 75 % English and 25 % German

☐ 50 % English and 50 % German

☐ Other:

20. Have you already started applying for jobs?

☐ No

☐ Yes, I have applied for this many jobs:

☐ 1

☐ 2

☐ 3

☐ 4

☐ Other:

21. If you have already started applying for jobs:

a. Were potential employers interested in your Eurotech experience?

- ☐ Yes
- ☐ No
- ☐ Other:

b. How many jobs have been offered to you?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ Other:

c. Has your Eurotech experience played a role in your job search?

- ☐ Yes
- ☐ No
- ☐ Other:

22. Do you have any recommendations for the Eurotech Program?

E. Participant Internship Descriptions

1. For my internship, I was working on a prosthetic leg that a user could learn to control using nerve impulses in his "stub" (yes, that's generally the accepted term). I performed a literature review about the acquisition and analysis of electromyographic signals (nerve signals in muscles). Then I wrote a program in Matlab which took signals from an array of electrical sensors, pressure sensors, and a gyroscope. The program calculated mathematical features of the electrical signals and ranked which electrical sensors had the cleanest signal. It then combined them according to this rank and regularly updated the rank. The pressure and gyroscope data just got passed through to the next stage. It wasn't my task, but the other intern was supposed to write an artificial intelligence script to interpret the signals and make the leg actually move based on the inputs.

2. Analyzed oil pressure tests on the 65 engine series. Determined maximum allowable pressure on bearings. Generated a floor plan for improved communication within my group.

3. As an intern at HLRS [High Performance Computing Center Stuttgart] I was asked to find a way to automate a very manual record keeping process. As they install new computers and retire older ones their computing capacity changes. This then has an impact on how much time can be billed to both the academic and commercial groups that use computing time. Since those customers are billed and taxed differently, it's quite important to keep track of which computers were running for what periods of time and what computing time they then allocated. Gathering all this information at the end of the year would take weeks of paper-based calculations. My task was to automate as much of this record-keeping as possible. Through regular meetings and a lot of trial and error, I was able to build a web application that would allow a user to input a set of that data and then access it with a yearly view. This experience was incredibly valuable to me and helped me to grow both personally and professionally. Working and learning outside of my comfort zone forced me to adapt and has made me a stronger individual.

4. I had a 3 month internship. It was at University of Konstanz and I was working on the Konstanz Information Miner project. It is a software tool that takes data sets as input and you can manipulate the data by moving it though different nodes. I worked on making two of these nodes. One of them generated a heat map of sets of numeric data and the other tried to find clusters in otherwise random data using an algorithm that they gave me. I spoke with them later after the internship and they said that they even put the heat map node in the released program.

5. I had to help various bosses with certain tasks, keeping track of tests, ordering samples, helped prepare a training for quotation process, did a study on the different customers, and write reports.

6. I completed a 6 month internship at Daimler in Stuttgart-Moehringen. The position was with Daimler's Altfahrzeugverwertung group (End-of-Life Vehicle Recycling) in the Environmental Health and Safety department of the company. I found the position advertised online, and, with help of the BW Exchange, prepared my Lebenslauf for the online application. I had an over-the-phone interview prior to an interview at the office. I was offered the position and accepted. I worked directly with my supervisor to manage a database of Autohouses and scrap yards to ensure that they maintained up-to-date registration certificates in accordance with European law regarding vehicle recycling quotas. I would call the "*Verwerters*" [recyclers] and ask them to send updated certificates. Occasionally I would have to consult the regulations with questions from other team members regarding various topics, as well as updating the records with new regulations which were issued. Other responsibilities I had included updating presentations regarding the program and preparing for a conference of automakers hosted by Daimler. The internship wasn't very technically challenging and was not an Engineering job in the traditional sense, but it did offer a great opportunity to practice German in a business setting. I spoke German exclusively, although for the aforementioned conference which was conducted in English, my native speaking ability was definitely useful to my employers. My vocabulary and conversational abilities definitely improved greatly as a result of this internship.

7. High Performance Computing Center Stuttgart (HLRS), Visualization Department Intern: Developed, coded, documented, and debugged a reliable multicast communication system for a high performance visualization cluster which enabled synchronous message passing between a master and several slaves, improving on the existing TCP-based communication scheme. Implemented pedestrian traffic in a driving simulator including basic motion patterns, mutual acknowledgement and avoidance, navigation of a road map, and cooperation with vehicular traffic in crosswalks; as part of an ongoing partnership with Porsche, visited a Porsche research center to install and troubleshoot the latest codebase of the driving simulator.

8. My internship was at the *Inst. für Chemische Verfahrenstechnik* [Chemical Engineering Department] where I helped a graduate student build a test stand for catalytic converter testing. I spent some of my time researching about catalysis and taking some samples. I spent time learning how to write MATLAB code to be used for data analysis. I also spent some time on small projects for the class my

professor taught on process control. I built a few small circuits to that demonstrated PID Control for his class. Researched 30% of the time, built/tested equipment 40% and wrote code 30% of the time.

9. I worked in the Microsystems Energy Harvesting Laboratory at the University of Freiburg. I worked with a PHD student who was developing a medically implantable fuel cell. The part of the project that I worked on was the carbon nanotube cell membrane. Daily tasks included mixing the membrane solution of carbon nanotubes and suspension solution, 8 hour process. I then using a filtration system, created a film of carbon nanotubes, 4 hour process. I then tested the film/membrane for conductivity, thickness, and durability. I used many methods of membrane preparation, creation and testing to determine the best methods for our application. While in the lab I also helped write lab procedures as well as some classroom demonstrations in English, in addition to helping the other students in the lab with some editing.

10. At Robert Bosch GmbH my internship was with a group that developed chemical coatings for a wide variety of applications. I was involved in a few projects, the largest of which was the testing of countless formulations of a UV-curing paint that was being developed to keep critical parts clean in harsh and dirty environments. I used a custom-built robotic device to apply the paints to test pieces and then subsequently perform qualitative and quantitative tests in the laboratory. My results would be reported back to the engineer in charge of the project as I finished each batch of testing, with 100% of communication in German.

11. I worked as a test engineering intern in the Manufacturing and Materials Engineering group at Daimler AG World Headquarters in Stuttgart, Germany. Specifically, I worked on the performance degradation of silicone and rubber seals in automotive hydrogen fuel cells due to physical and environmental stresses. My responsibilities included the organization and inventory control of certain experimental parts. In conjunction with other engineers, I conducted a series of high stress compression tests, long term relaxation tests, and combinations of the two. Along with my supervisor, I carried out environmental test of experimental parts, exposing them to acidic environments and high temperatures for extended periods of time. I obtained and compiled the results of these tests and measured all pertinent extraneous data, allowing myself and others to extrapolate conclusions about the materials effectiveness and suitability, and offering insight into appropriate fabrication processes. I fabricated experimental parts in Daimler’s state of the art fuel cell laboratory, assembled and modified test equipment, checked design dimensions of custom parts prior to their fabrication,

and analyzed discrepancies in the results of Nuclear Magnetic Resonance (NMR) spectroscopy experiments on the rubber and silicone materials. The internship was conducted exclusively in German with very few exceptions.

12. My internship at Mahle was short, one month in total. I worked as an engineering intern in the air systems department. I performed pressure drop measurements and particle separation rate measurements on loaded air filters. The pressure drop measurements are representative of how well an air filter lets air through even when it needs to be changed (ideally, the pressure of the air stream should not drop over the filter). The particle separation rate measurements show how well the air filter actually filters particles out - you put through a known number of particles and weigh the air filter before and after loading it. Knowing the total mass of particles in the air you've been feeding the filter, you can weigh it afterwards and compare. For example, if the filter contains 99% of the mass of particles you know the air stream contained, then the filter is 99% effective at filtering particles.

13. At the Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB) I worked side by side with other researchers and engineers to develop hydrophilic polymer membranes for pressure retarded osmosis, a process that generates electricity from the mixing of fresh water with salt water. My daily tasks included preparing polymer solutions, casting and testing membranes, and analyzing data for the updating the research plan. I attended weekly research group meetings, presented my research to the research group, proof-read papers for the research group. In addition, I helped other researchers on their projects, and therefore directly learned new skills and techniques while acquiring new vocabulary and further developing my relationship with my colleagues.

14. During my internship at Behr GmbH & Co. KG in Stuttgart I was doing thermal calculations for aerospace heat exchangers using Behr's own software. This included landing gear hydraulic coolers for the Airbus A350XWB & an oil cooler for an MTU turbine engine. On one occasion I was able to test the results of a simulation with a prototype in the lab. It was a great internship!

15. I participated in an internship at the *Orthopädische Universitätsklinik* Heidelberg (Laboratory of Biomechanics and Implant Research) in Schlierbach, Germany. The duration of the internship was approximately 5 months. During this time, I designed a program in NI LabVIEW for a uniaxial endurance system that performed various tests on artificial hip joints. The idea behind this project was to test the fatigue of artificial implants so that researchers would better understand implant failure before implantation.

16. Internship at Bosch basically boiled down to: CAD design of oxygen sensors (*Lambdasonde*). Running CFD software to model exhaust flow through said sensors. Create evolutionary algorithm for adaptive design of sensor geometry depending on exhaust geometry.

17. My internship was at Daimler in Untertürkheim in the PAC-IS (*Produktion Achsen-Instandhaltung* or something like that). For the first 3 months of the internship I was responsible for the analysis of maintenance data for a certain type of machinery. The end-game was to identify problem areas and suggest ways to save money. For the second half (last 3 months) I still worked in the PAC-IS, but this time with the measurements team (*Messtechnik*). My main job there was to locate and identify all the measurement devices under the purview of the team in the factory, and then enter information about those devices into a user friendly data base that an earlier intern had created.

18. My internship with Zueblin was supposed to be in the field of construction management, but in reality turned into a menial labor type job. Zueblin was renovating a large office complex and approximately 30 residential homes on a US Army base. Most of my duties involved cleaning, running errands, picking up trash, yard work, painting, installing door knobs, etc. I would not recommend that future Eurotech students apply for internships here, several other interns I spoke with were also very disappointed with Zueblin. [This participant applied for a second internship]. My internship with Kuhlmann was excellent, it was in structural engineering. I spent my time building a 3D computer model of the internal structure of a large industrial building (sand refinery I think), defining various loading conditions, and running static and vibrational analyses. I would highly recommend an internship here. It was very pleasant and educational.

19. I worked at Trumpf GmbH in Stuttgart as a Structure Design intern. I took part in the re-design project for one of the TruPunch machines (sheet metal processing machine), specifically for the load/unload automation module. The task involved design conception & rendering using SolidWorks (3D modeling software), documentation of various configurations with weight and cost estimations, and presentation of concepts to engineering staff members. The most challenging aspect of the job was communication; at my request the work was conducted entirely in German, but the Schwabish dialect was particularly difficult to grasp during the first few weeks. Fortunately – since majority of the work involved numbers and graphics the language issue did not hinder my work too much. This was not only my entry to the engineering industry, but a one-of-a-kind exposure to the German culture.

20. Six month internship with Mercedes-Benz-Daimler AG, Stuttgart, Germany in the Transmission and Power Train Development Department. Assisted testing and simulations for 7 Gear Transmission. Used Dymola and Simulink to build engine models and compare data. Basically I worked for just my direct supervisor. He provided me data from engine testing and showed me how to manipulate/analyze it using the programs described above. I did not have much direct responsibility with any of my projects, and I never had to present to a team or group of people. My communication was 99% in German- my boss described everything in German the first two, three times, and if I was having a hard time understanding what he meant he would use a few English words. This proved useful as I was able to associate more German vocabulary to what I was doing. On a daily basis I worked on the computer and provided calculations in the engine models accounting for the different variable elements like gear size, engine horsepower, wheel diameter, etc. The purpose of my data-manipulation was to illustrate differences from test values and computer calculated values. For lunch I often went with my boss or fellow intern to the cafe, which was nice because I was able to semi-participate in German conversations non-work related. My favorite part of the job was working with my fellow intern. He was German but spoke English pretty well, and since we spent time together on several projects we were able to talk a lot.

21. I worked as an intern in the Procurement Department at MTU Aero Engines. During the week I had a few standard tasks, for example, at the beginning of the week I would create a report in SAP on parts that were overdue or were falling behind schedule and at the end of the week I would create a progress report on those parts. I also assisted the purchasing team in making presentations for suppliers and standard English letters. My intern project which I also worked on at MTU was to create a tool that the team could use in order to evaluate the cost of a part. I researched prices of materials, labor, and energy costs in the different countries we outsourced to and came up with an application for everyone to use.

22. I worked for a small pharma-tech company that specialized in stopper processing for the pharmaceutical industry. This includes the automation systems responsible for washing, drying and sterilizing rubber and aluminum bottle closures for drug containers that will be directly used to treat patients. I spent 5 months performing research to determine the most effective wash parameters for removing macro-scale particles--things like hair or fibers. The project had a direct application, as a customer of theirs required this information in order to purchase the equipment. Interesting to me, the customer was a Japanese pharmaceutical company, which has the strictest pharmacopoeia standards in the world to uphold.

23. What follows is a description of my responsibilities and daily tasks, as well as occasional and intermittent goings on, at my internship at the Mercedes-Benz *Qualitäts-Produkt/Langzeit-Qualitäts-Sensor* (QP/LQS) division in Sindelfingen:

    - daily
        - internet research in front of a company laptop into the quality of various internet forums as indicators of long-term quality problems in Mercedes production automobiles
            - took place in the physical presence of mentor (my desk was adjacent to his) and one other rotating employee
            - German was the primary language of communication
        - bag lunch in the company canteen with co-workers
            - discussion of work
            - discussion of politics
            - cursory
            - generally conservative-leaning
    - intermittent
        - attendance of automobile inspection in adjacent garage
        - delivery of mail (while department secretary on vacation)
    - occasional
        - attendance of office parties for departure of parties
            - usually catered
            - traditional parting gift of model car paid for and signed by co-workers
        - attendance of Canstatter Volksfest with co-workers
        - cleaning of department refrigerator
        - drawing of mock-up of department promotional posters
        - academic discussion of legal implications of internship project with lawyer at Mercedes's legal department
        - riding in passenger seat of car on Mercedes test track and road course
            - brief period of operation at speeds approaching 250 km/h (150 mph) on test track
            - careful observation of road noise over varied terrain, including an engineered bumpy track on test track
        - presentation of 15-minute PowerPoint summarizing internship project findings

    It was certainly an experience, and I'm glad I did it, as it gave me considerable insight into corporate culture at a large, traditional company.

F. Participant Recommendations

1. I certainly wouldn't go to Germany with any less than four semesters of German language classes. I'd recommend six semesters.

2. There was a course about German business etiquette and other such topics that I took after my time abroad. This course should be recommended to future Eurotech interns before they go abroad.

3. Learning about German art and literature is important, I admit, but German engineering and business are as much part of their culture as art and literature.

4. Offer German LTLs for the courses that most or all engineers take. Examples are Phil 1104, Calc 1, Calc 2, probably Chem 128 and 129, Bio 108 and 109.

5. Accountability for achieving proficiency in the language could be improved.

6. Difficult to determine how many courses I was required to take, how much credit I could earn for them, what they would be transferred as, and what the grade conversions would be, etc.

7. It might be nice to find courses that will transfer.

8. More emphasis needs to be placed on the engineering side of Eurotech.

9. Ensure that both engineering and German courses are taken in the correct order and that all requirements are met to graduate in 5 years.

10. A schedule or process developed to streamline the application process.

11. Plan the 5 year schedule so that the students have a whole year abroad.

12. It really needs to be rigidly structured, with the trip abroad in the 4th or 5th year ONLY.

13. With proper preparation and support this process can even be painless.

14. The program needs to be coordinated between the German and Engineering schools so that classes are offered on days / at times that make it feasible to stay on track for both degrees. There should almost be a pre-set schedule for Eurotech students.

15. Get the German exchange students more involved with the undergrads before they go abroad… would provide a good first network when beginning abroad.

16. Have students that already went to Germany to meet with students who are ready to go.

17. Make it aware to the student how different German Universities operate from American ones.

18. I would recommend somewhat more guidance in the internship search process so that all of the options that are available are made apparent as choices.

19. Support students when they looking for an internship in Germany or even when graduating from college to find positions that match the skills that were acquired during the program.

20. I would recommend steps be taken to make the Eurotech student feel more comfortable with and confident in the idea of applying for a job [i.e. internship] in Germany and I would recommend framing the idea of applying for jobs [i.e. internships] in Germany as a perfectly normal, rational thing to do, perhaps through better explanation of some of the advantages in work environment and lifestyle that Germany may have to offer over the United States.

21. More help with the internship application process.

22. Better guidance and organization in arranging the internships.

23. Help navigating the paperwork that is associated with setting up an internship.

24. If you're doing an internship, start applying in November.

25. Have students start looking for internships very soon after they get to Germany, if not scope out some companies beforehand.

26. Send a string of reminders for students to get started on their applications early!

27. While trying to attain an internship in Germany I found it very difficult. I would recommend having some more guidance for students trying to intern.

28. Ensure to students that an employer will not expect you to speak perfect German (something I was afraid of).

29. Most internships are about basic engineering/organization principles, so doing an internship outside of their major would still be beneficial.

30. Better guidelines could be constructed denoting where certain majors would have a better or worse time finding internships.

31. The senior courses should allow you to reflect on your entire college experience… A "W" course on German technology, business, etc. would have been more appealing to me.

32. More opportunities for students to interact with people in the industry.

33. More business contacts outside of the traditional mechanical engineering sector.

34. Form a consolidated database of German companies, or even create a mini job fair event where students can talk with prospective employers, this would help the networking process.

35. Provide more career support after returning from Germany.

36. Although spending a year abroad is an incredibly valuable experience, prospective Eurotech students should be warned of the added costs of completing a 5 year program.

37. Biggest regret is that I was too timid to join organizations.

38. There needs to be someone on campus [UConn] who represents the program and is accessible during the week.

G. Participant Feedback

1. The Eurotech program was a very enriching experience and I will say that the life lessons I learned and the travelling I was able to do was a once in a lifetime opportunity.

2. Overall the program was well-organized and prepared.

3. I did figure it out on my own, and since I like a challenge, I view the whole thing as a good experience.

4. The Eurotech program is great. You guys got me a great internship that was useful with both German companies and oil/gas companies. My current job is exactly the same kind of work I did as an intern. Although I currently don't use German, it is always a standout item on my resume. I am planning to apply to a German oil/gas company called Choren (based in Northeast Germany) sometime in the future, so I will be using both my oil/gas experience and my German.

5. Overall I had a great experience and would not change anything.

6. I think the program is great and I hope it continues for many years! Thanks to everyone who runs the program!

7. It was the experience of a lifetime.

8. I think the Eurotech program is amazing, a monumental and hugely successful effort by people who obviously care about students. The German department always did their best to give students guidance on how to arrange their courses.

9. I think the Eurotech program is amazing, a monumental and hugely successful effort by people who obviously care about students.

10. It was a great learning experience. It helped me to expand my horizons of foreign cultures.

11. I enjoyed my experience with the Eurotech program. I thought that the opportunity to take a weeklong trip to Germany with a cohort of students and to visit companies that offer internships as well as potential schools was a great experience.

12. This survey asked for recommendations hence the constructive criticism found herein. I have to be clear that I greatly enjoyed the experience, would do it again in a heartbeat. I have many good things to say, and was fine to figure things out for myself (part of study abroad is figuring things out for yourself).

H. Participant Raw Data: Responses to Selected Questions

Eurotech Graduates

3	4	5	6	7	8	10	11i	11ii	11iii	12	13	14	15	16	17	20b	20c	20d	20e	21G	22Ga	22b	22c	22d	23G	24b	24c	24d	24e
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Current Eurotech Undergraduates

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