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RETAINING ENGINEERING STUDENTS THROUGH A JANUARY TERM GERMAN IMMERSION STUDY TOUR

ABSTRACT:
Retention of engineering students is a national and international concern, since a globalizing world needs ever more culturally competent and technically adept graduates to fulfill the work force demands of companies operating globally. The data on retention of engineering students agrees that the freshman year is of critical importance; we find that only about 40 to 50% of the students graduate with an engineering degree. The International Engineering Program (IEP) organizes a 10 to 14-day German Study Tour during January break, which is an effective retention tool for students enrolled in The University of Rhode Island's demanding five-year dual degree German IEP program, working toward a BS in an engineering discipline, and a BA in German.

KEYWORDS: international engineering, engineering and language, languages across the curriculum, retention of engineering students, retention of language students in upper-level classes, immersion in language and culture, global work force, cross-cultural skills, experiential learning in immersion environment, peer-to-peer advising, faculty approachability

The International Engineering Program (IEP) at the University of Rhode Island organizes a 10 to 14-day German Study Tour during January break. It offers International Engineering and International Business students a full-immersion program to further expand their study of German language and culture. At the same time, it is a great incentive for students enrolled in The University of Rhode Island's five-year dual degree German IEP program, working toward a BS in an engineering discipline, and a BA in German. Students in this program spend their fourth year studying and interning abroad. The IEP has a demanding curriculum, and the annual study tour is one of its most effective tools to retain motivated students.

This German Study Tour serves several purposes: first, it introduces students to Germany as an attractive site for science, technology, and culture.

Highlights of the study tour are visits to German companies as a means of preparing students for their internships in the fourth year. At companies such as Bayer, BMW, Conti, Hilti, Lufthansa Technik, Siemens, or ZF (automotive engineering), students can use power tools and admire transmission systems or classical car collections. Second, students tour science and art museums, and historical sites to become more immersed in the culture. Third, they use their language skills to talk to their German counterparts while visiting institute labs at the partner university. Last, students use their teamwork, language, and problem solving skills to contribute to a case study sponsored by a company. They work in teams with young trainees from the German Rail company (Deutsche Bahn) on solving a real world problem, such as designing new cars for the next generation of InterCityExpress trains. To achieve this, students need to take into consideration the technical specifications, customer demands, and budget restrictions, or find the best logistics solution for transportation of goods from Germany to Italy via rail, truck, or ship.

The German Study Tour is an effective and attractive tool for retaining students in the IEP and IBP (International Business Program), reaching out to our industrial partners, and recruiting freshmen into the program. This innovative study module also closely ties in with the regular curricular offerings in the German department and with The University of Rhode Island's strong focus on globalizing the curriculum as part of the Academic Plan's focus area on "Global Citizenry" (DeHayes et al.). The study tour is usually organized by the director of the IEP who can take advantage of the program's extensive company network in order to schedule corporate visits and tours. Outside funding comes from the German Academic Exchange Service where faculty members can apply for a group study visit that supports up to 15 students and one faculty member for up to 12 days with a maximum of 9.600 Euros (DAAD). Additional support comes from the Van Meeteren Foundation. To keep the costs low participants in the tour stay in youth hostels and use public transportation whenever possible. Thus student charges are kept at a minimum, which allows the university to offer the study tour every year. Between 20 and 30 students usually participate, most in international engineering, but also business or pharmacy majors. All students need to be enrolled in a German class to apply for the trip. The two accompanying faculty members are either German professors or German-speaking engineering faculty members.

Retention of engineering students is a national and international concern, since a globalizing world needs ever more culturally competent and technically adept graduates to fulfill the work force demands of companies operating globally. The data on retention of engineering students agrees that

the freshman year is of critical importance (Moller-Wong and Eide; Bernold et al.); we find that only about 40 to 50% of the students graduate with an engineering degree (Vogt; Anderson-Rowland). Many students who excelled in high school in the STEM disciplines (Science, Technology, Engineering, and Mathematics) do not have a good understanding of what engineering entails when they begin their engineering studies, nor do they know much about a career in engineering. Similarly, within the realm of language studies, enrollment in language courses is always high in the lower-level courses, and then usually begins to dwindle in the intermediate sequence with the highest attrition rate in the upper-level courses. Students often begin with a foreign language because of a language requirement (like at The University of Rhode Island), but then they do not continue beyond the required courses.

At the same time, the internationalizing of the curriculum is of increasing concern. The world needs multi-lingual professionals to fulfill the communication demands of an increasingly "flat world," people who can tackle the challenges of global teams in businesses operating all over the world. To make language learning more meaningful and purposeful the American Council on the Teaching of Foreign Languages (ACTFL) recommends contextualization of language learning and came up with the five "C" standards: Communication, Connections, Communities, Culture, Context (*National Standards*). Teachers should be aware of the standards and use them in their daily teaching strategies, through community involvement, or through immersion programs abroad. The hope is that the learner becomes more engaged in learning the language when his/her language learning ties in with actual communities and contexts.

The International Engineering Program (IEP) at The University of Rhode Island is an example of how such contextualized and content-based learning can be achieved by an integrated curriculum. It offers an award-winning five-year dual degree program, through which students receive two simultaneous degrees, a BS in an engineering discipline and a BA in German, French, Spanish, or Chinese. The fourth year is spent entirely abroad, first for a semester of studies at a partner university, followed by an internship in a company in the target country. About 25% of all engineering students participate in the IEP. Over the last seven years, an average of 38% of all women engineering students were enrolled in the IEP while women engineering students were only 16% of the enrollment of the College of Engineering (COE). Over the same period of time, an average of 22% of minority students were enrolled of the IEP while minority students were only 13% of the enrollment of the College of Engineering. This rigorous program places the highest demands on students and yet has a very high retention rate. In fact, it attracts the best

students, as we note that 55% of IEP students receive a centennial scholarship, which is awarded to the upper echelon of the incoming class. Students' chances of achieving a high GPA in their first year, which in turn is a crucial indicator of successfully completing the engineering curriculum (Moller-Wong and Eide; Bernold et al.), are very high.

At the same time, these students fill the foreign language "pipeline," because their language learning has a purpose strongly related with their other interests: science, engineering, and technology. In fact, the model of integrated learning that the IEP provides has a tremendous impact on enrollment figures at The University of Rhode Island. While many American universities are discontinuing German language courses, this program is thriving, thanks in part to the partnerships with the university's engineering and business programs. About 135 students major in German, most of whom also major in another academic discipline. In certain years, up to 90% of the German majors have been engineering students! It is easy to see that The University of Rhode Island is retaining engineering students in both engineering and languages because they study with the goal of going abroad in their fourth year, using the language in the target country, and doing their internship at a world-renowned company like BMW, Bosch, or Bayer.

It is not always easy, however, to stay on this challenging course at all times. Consequently the attractive yet highly demanding curriculum needs to have supplementary offerings that allow students to learn in the "off-season," add incentives, and lead to student-student bonding and faculty approachability provided by:

- Special courses across the disciplines like German for Engineers.
- An excellent advising structure (IEP students have an engineering advisor and also an advisor from the Foreign Languages Department who serves as IEP Director. The IEP directors often know the student already as a prospective student, then accompany him/her on the 5-year program, which includes placement in a company for the internship).
- Immersion courses (a 3 to 6-week German summer school; an 8-week Chinese summer school with 4 weeks spent in China; a Chinese winter immersion at The University of Rhode Island; the German Study Tour (10 to 14 days spent in Germany).
- A special Living & Learning Community where IEP students live together, solve problem sets, and get free tutoring in their languages from foreign exchange students. This also serves as headquarters for the IEP housing coordinator, IEP director, and coordinator.

Incentives like the faculty-led German Study Tour keep students enthusiastic, motivate them to study harder than their engineering peers in the regular curriculum, and generate a feeling of belonging to a special group. It raises their self-confidence and time-management skills as they work to stay on top of a demanding curriculum. During the study tour, students can readily approach the two faculty leaders and explore the two disciplines in which they are majoring, general German culture and German engineering culture. According to Vogt, faculty distance from students lowers self-efficacy, academic confidence, and GPA, while academic integration and faculty approachability have a positive effect on effort, confidence, and critical thinking. It also encourages help-seeking and peer-learning. Students on the study tour can bond with faculty mentors and with their peers, decide to take up-coming classes together, enroll in summer immersion programs, and finally go abroad together.

Looking back at several years of study tours, we observe that all of the IEP and IBP students who participated are either still in the program or have successfully graduated. Many of them also chose to enroll in the German summer school, and thus got a head start in proficiency before going abroad for the year. Freshmen who went on a tour often returned a second time. Students not only reported satisfaction with the technical and cultural programs, but they also noticed that they were more quickly attuned to German speech. They became excited about understanding natives, and being able to speak short sentences, like ordering food in a restaurant or buying train tickets. "Speaking German with native speakers really helped my language skills," said Peter Edwards, a junior studying German and business. "It was a good way to learn and absorb the language. I'm hoping to work internationally, and studying German is a great stepping stone in that direction" (McLeish). Studies about learning outcomes through study abroad immersion programs indicate that there is a strong correlation between long-term immersion studies and gains in language proficiency (Davidson). As a first step toward the longer-term stay abroad, however, the short-term trip also has great value. It keeps students excited about learning the language because they experience it in the context in which it is actually spoken, and become motivated by initial small successes in handling everyday situations.

Often, the study tour reminds some students in a powerful way why they joined the German section of the IEP in the first place, since they are attracted by the brand "made in Germany." There is a reason why German, which has the oldest program, has the largest IEP program. Students, who have to opt for one of the available languages, often start with German even if it means starting at the lowest language level rather than continuing what they have

studied in high school, because they connect German with engineering excellence. They join the GIEP because one day they want to work for, say, BMW, and the prospect of getting placed in the company as an intern is extremely motivating. Yet four years are a long time until the goal is reached, and so the study tour serves as a powerful reminder of the long-term goal, and helps maintain students' enthusiasm for the "brand." When students get a special tour through the BMW Classic Collection, a private ride on a German high speed train (DB) ("German Study") or on a test track for tires (Conti), use one of the powerful diamond-coated Hilti drills made for the construction industry, watch how a plane is being overhauled in a Lufthansa hangar, or how steering and driving is simulated at ZF, they understand why they are putting such an effort into their studies. They reconnect with the original purpose of joining the IEP, and feel excited about soon being able to have an internship in the company they visited. "The study tour gave me a rare behind-the-scenes view of German engineering companies," said Matt Hooks, a junior computer engineering major who will spend the next school year studying and interning in Germany (McLeish). The relaxed and exciting environment created by the faculty adds to student motivation, performance, and persistence.

The highlight of each tour is a case study workshop, which always combines cultural and cross-cultural exploration with technical problem solving, with young employees or trainees of the German Rail company. A recent workshop topic was "The Ideal Mobility Comfort." IEP students joined with trainees from DB in several interdisciplinary teams. They had to put together a whole train with several cars, and decide on designing the interior, which included where to place the private and group compartments, dining cars, toilets, bike racks, and family compartments. In addition they designed where to place first class and coach cars, complete with (or without) Internet access, on-train entertainment, areas for communication, and networking. It was a great exercise in learning to use team-working and analytical skills as well as business know-how. Students had the opportunity to observe how people from a different culture approach problems in a different way, and use their language skills in the process. This culturally diverse group situation provides the ideal context for effective learning, since it provides (1) access to a new community, (2) communication that is driven by a real world scenario or context, and (3) connection with German peers, first by trying to find a solution and win a prize together, then afterwards by celebrating their achievements. This experiential learning opportunity is well suited to our technologically competent students, and it also allows them to delve deeper into cultural understanding.

In evaluating the case study teams, IEP faculty and DB management on the jury observed several differences between IEP students and DB young employees in their way of problem solving. Generally, the German participants were more direct in their comments compared with their polite US counterparts. They tended to plan farther ahead and then strived for fast execution while their US peers usually approached the problem by experimenting with various solutions and correcting them along the way as needed. Looking at the differences between university and corporate culture we observed that IEP students were much younger than their German program counterparts and showed well-trained analytic skills and impressive presentation techniques. They were group-oriented, openly sharing their problem solving approaches with others and showed a noticeable "can-do" attitude. Their less restricted approach and readiness to jump immediately into problem solving led them to very creative solutions. On the other hand, DB's young employees were much more calculating in forming conclusions based on the variables of the situation and environment. They usually focused more on content and background information with less emphasis on analysis techniques. Though they did not come up with radically new approaches, it was remarkable how DB employees moved beyond analysis and progressed to the implementation of their ideas. They often elaborated practical solutions that easily fit into a given corporate culture and thought hard about how to convince stakeholders.

The role of intercultural awareness, understanding, and competence in language learning has received increasing attention in foreign language acquisition theory (Vogt; Anderson-Rowland; *National Standards*). The study tour illustrates well that whenever possible, immersion modules should be integrated into the language teaching curriculum. Data from a recent survey on teaching culture in the German-language classroom show that teachers did not feel adequately prepared. The low ratings for adequacy of preparation given to pedagogical approaches for teaching cultural awareness, understanding, or competence (56.7%) or how to use the standards for teaching culture (43.5%) demonstrate that these are difficult to convey in a classroom (Vogt). Immersion modules like a study tour, especially when prefaced by a pre-departure orientation on which cultural products, practices, and perspectives to watch for, provide first-hand access to the cultural environment and consequently raise the students' level of awareness. In the case of our study tour, students could also gain one credit by writing a reflective paper on either differences in US-German culture or any engineering or technical feature that impressed them. The academic framework with steps ranging from linguistic preparation geared toward engineering students in the German-language classroom,

"German for Engineers," to a pre-departure cultural orientation, the immersion in Germany, post-immersion reflection, and integration of study tour material in the classroom makes the most effective pedagogical use of this innovative module. At the same time, the study tour and related mentoring by faculty leaders engages and empowers the student learner, increases self-efficacy and persistence (Eris et al.), and provides a strong incentive to counter the high drop-out rate in STEM fields (Boundaoui), so students stay in a challenging dual degree engineering or business program.

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