Study Abroad for Engineering Students

When Bad News is Good News... by Joan Solaun

During the bygone years of U.S. economic dominance which followed W.W.II and up through the 1980s, American scientists, business people, technical advisors and professional experts were able to move around the world calling the shots–in English–while working on their own terms, living in a protective bubble of U.S.-style comfort and going home at the end with a nice profit.

Granted, many individuals made a genuine effort to learn the language and know the cultures in which they worked. But generally speaking, such efforts were the exception rather than the rule.

Now, the U.S. trade deficit and declining position in the world economy have led to mounting pressures from all sides to "do something about it." This bad economic news is good news for study abroad--and getting better!

Administrators and faculty who would not have considered allowing course credit for engineering study in a foreign classroom ten years ago, are casting around for quick solutions to the years of ignorance imposed upon their students in the name of national accreditation norms and academic conservatism.

New times, new faces, and new priorities: the Clinton administration exhorts the U.S. to be the world leader in the area of high technology, building the "high-wage, high-growth economy that the American people deserve."

Around the world, competitors are after the same goals.

In order to successfully expand into foreign markets, two basic questions must be answered, "who are the customers?" and "what do they want?"

To answer these questions, engineering students need to really experience life in a foreign culture; living, studying, and working alongside their foreign counterparts. They need to develop confidence in a foreign language, to travel to develop a comparative sense of the differences between many cultures and acquire perspective on how we are perceived by others. All of this is challenging, invigorating and humbling.

The most recent Institute of International Education/IIE statistics (1990-91) indicate that while 74,000 foreign engineering students studied at U.S. institutions, only 1,000 U.S. engineering students studied abroad during the same period.

Equally startling is the obvious fact that the foreign students studied in the U.S. for an entire degree, usually at the graduate level, while the average U.S. professional student spends less than an academic year abroad.

Furthermore, the IIE numbers do not reflect the kind of experience to which these engineering students were exposed. Of the 1,000 U.S. engineering students abroad, we can be fairly certain that less than half of them actually studied any engineering courses in a classroom sitting next to their foreign peers.

Typically, these students gravitate toward packaged programs, taught in English, with curricular offerings limited to humanities and social sciences, i "electives." The reasons for this are ob ous–no room for foreign language in the tightly packed U.S. engineering curricula, and lack of knowledge about differences in focus between European and U.S. educational systems.

Q. What are the biggest barriers for students who want to take engineering courses at a foreign university?

It is hard to rank the difficulties, as each one is enough of an obstacle to prevent the average engineering student from trying. Lack of specific information about available courses makes it difficult to obtain course approval in advance; lack of confidence in foreign language capability in demanding coursework; and in some cases, lack of a sufficient background in mathematics. Only 5% of all students in higher education study at the best engineering schools in the European system. Mathematics is the great "sieve" used as a filter for quality in entrance exams. As a result, a high level of competency in mathematics is assumed and it pervades coursework throughout the entire curriculum.

Q. Why don't engineering colleges in the U.S. work with Liberal Arts to develop programs that allow for additional coursework in area studies and language, courses that can be studied abroad more easily?

Students vote with their feet, and will go for the four-year degree program every time. Dual degree programs, or programs beefed up with more international content courses, currently require five years. This is not popular. Once students have been abroad, they are more enthusiastic about the benefits of that experience. But the trick is to get them to go in the first place. Post-baccalaureate study options are not popular either. Students would rather not put off entering the job market. Every year, Illinois engineers win coveted Churchill scholarships for study at Cambridge University in England. And every year we have to convince them to accept the scholar-

ship instead of the great offers from industry or graduate schools in the U.S.

Q. What about special study abroad programs for engineers that provide language, culture, and even internships during the summer?

Summer programs are popular with engineering students because they do not interfere with the tight curriculum of the academic year. Illinois currently runs seven of these programs in as many languages at various levels of proficiency, and is developing more. The obvious drawback is that the time abroad is too short for anything more than a taste of the culture. Most foreign employers do not know what to do with a short-term, part-time intern who can barely communicate in the language.

Q. How much mathematics is needed to succeed in the European engineering programs?

For the elite engineering institutions in France and Spain, and technical universities in Germany, at least one course beyond differential equations. One of our students currently enrolled at the Technical University of Munich took four mathematics courses this past year in preparation, including probability theory.

Q. How can we over come the foreign language hurdle to encourage students to study in countries or programs other than those with instruction in English?

In surveying our student body, it became apparent that engineering students are equally qualified to pursue studies in a wide variety of fields, making them ideal candidates for study abroad. They are unusually gifted and multi-talented, and many have had at least four years of foreign language in high school. This is something that can be built on.

Q. Is it just as difficult to study engineering at a British university?

It's always easier to perform in one's native language. In addition, the mathematics requirements are not as great. Our faculty advisor in the College of Engineering tells me that it is still advisable for students to have at least taken advanced calculus before departure.

Q. Is it absolutely necessary for the courses abroad to cover exactly what they cover at home?

No, obviously that is not always possible. It becomes a problem only when faculty are not familiar with the course structure abroad. This leads them to make incorrect assumptions about the amount and quality of material covered, and award too much or not enough credit.

Q. How can we immerse our students in the technological culture of the host country?

There are short-term solutions in the form of special programs for engineers, such as the ones Illinois has developed. Other creative solutions are being developed as well to respond quickly to the need to internationalize, such as the EAGLE consortium's (Georgia Institute of Technology; UC Berkeley; University of Michigan; University of Wisconsin; Rose-Hulman Institute of Technology; North Carolina State; University of Texas, Austin; Temple; Lehigh; Texas A&M; Vanderbilt; SUNY Buffalo; and Illinois) intensive program in Japanese language and internship placement in Japan. Georgia Institute of Technology has a campus in France. Many of us have reciprocal exchange programs (predictably, under-utilized by the U.S. students). The University of Rhode Island has an excellent five-year program in German for engineers, but the length of the degree keeps numbers low. There is also the International Association for the Exchange of Students for Technical Experience/AIESTE, the work exchange program. I am sure there are other programs out there of this nature.

The long-term solution should be to develop mechanisms to enable our undergraduates–and graduates as well--to have an immersion experience through direct enrollment in engineering programs abroad. This will generate peer friendships for future industrial and research links, and a solid sense of another culture.

Q. How can we move this forward?

It is essential that engineering faculty involved with undergraduate education be knowledgeable about the curricula at engineering institutions overseas. This requires that a mechanism for collaboration with colleagues abroad be developed and support obtained for this kind of "program development." Even reciprocal student exchange programs in engineering have been predominantly one way–students coming to the U.S. and few going out.

After watching this imbalance grow over the past ten years, I am leaning toward "packaged programs"–not free-standing courses for the American group but a set of courses that have been approved on both sides, with known prerequisites that can be taken early in the student's academic career. This lowers the perceived risk for potentially interested students; too many have returned with a great experience and too little credit to show for their efforts. Word gets around.

We need to develop "international tracks," which include language courses and summer internships abroad, to help prepare students for a full year's challenge.■