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Today, educational institutions seek ways to increase global awareness among students and provide them with opportunities for real-world application of what they learn in the classroom. At the University of Cincinnati, our International Co-Op Program attempts to do both of these things, by providing students with work opportunities in Germany, Japan and Latin America, as an integral part of their undergraduate program. This article describes how this program was developed for our engineering students.

Globalizing Engineers through International Co-op

Increasingly, Americans have little choice about whether to be globally engaged. Soon, most of us will either work for an international organization, sell to or buy from one, or compete with one. As a result, we are now more directly involved than ever before with the array of differences presented by the world's cultures. Whether we plan to be global collaborators or competitors, we know that Americans are generally ill-equipped, in training and experience, to deal with other cultures. Pico Iyer (1994) put it this way:

Inssofar as we aspire to be our brother's keeper, we have to acknowledge that we have five—soon eight—billion brothers, and that they are in Borneo and Bolivia and Benin. Inssofar as we try to love our neighbors as ourselves, we have to admit that our neighbors are people with whom we share no common language or past, or value. And the smaller the distance between people, Freud reminded us, the greater, often, the dispute (p. 13-16).

Research (Ferraro, 1990; Carlton, 1997) shows that an alarming number of international ventures don't work out. The causes of failure often arise from the simple inability—of individuals and organizations alike—to adapt to a different way of doing things. Dealing with cultural difference is therefore likely to be the major challenge of the new century. The philosopher Reinhold Niehbur (in Kaplan, 1997) put it this way:

The same strength which has extended our power beyond a continent has also... brought us into a vast web of history in which other wills, running in oblique or contrasting directions to our own, inevitably hinder or contradict what we most fervently desire. We cannot simply have our way, not even when we believe our way to have the "happiness of mankind" as its promise (p. 60).

The University Response

Our universities have always been good at delivering what might be called content knowledge, the specifics of processes, operations, and formulae essential for getting things done. Today, however, universities are being asked to provide an understanding of context as well: to develop in students and faculty an understanding of when and how to apply content knowledge effectively in a specific situation.

As someone once remarked, people with content knowledge will always be able to find jobs. They will get their jobs, he added, from people who possess context knowledge. In a sense, we've always known this. But context, now much wider than the horizons of a specific sector, industry, or group of companies, involves cross-cultural understanding as well. Although skill in finance, technology, or management, for example, will still be important, intercultural competence will also be needed in the global environment.

Table 1. Intercultural Competence

<i>Attribute</i>	<i>Description</i>
Global knowledge	A base of facts about international situations and issues; an understanding of global systems in general and the specifics of business, politics and culture from a global perspective.
Empathy and appreciation	The ability to see an issue from another cultural standpoint; a positive attitude toward cultural difference.
Intercultural skills	Foreign language skills; an understanding of how differences affect how things get done; skills in working together with people from different backgrounds.
Task performance skills	The ability to get things done in a foreign environment.
Intercultural experience	In-depth experience with foreign culture.
Ability to learn	The ability to identify, analyze, use and remember information emanating from other-cultural sources and situations.

Adapted from: Adler 1995

Designing Cross-Cultural Learning

One key to creating intercultural competence lies in the design and management of cross-cultural learning situations.

This can be complex. Cross-cultural experience involves operating under a degree of pressure in a new or different frame of reference, with people who do not necessarily share your goals, assumptions, or values. It usually implies a high degree of initial ambiguity and uncertainty. It requires the learner to be highly flexible and tolerant, and to develop quick and effective methods for learning in, from, and about the new context.

Cross-cultural experience often presents itself as a rite of passage (Van Gennepe, 1960) involving personal change, often accompanied by an element of anxiety. My own work with Peace Corps volunteers and others (Nolan, 1985) indicates that there are several stages in cross-cultural learning.

- *Acquiring new perspectives.* The individual begins to become aware of, and in contact with, different systems.
- *Discovering how it works.* The individual begins to grasp some of the principles that govern how the different system works.
- *Operating within it.* The individual starts to interact successfully with the other system, which produces more learning.
- *Using it.* The individual learns how to manage the other system in mutually acceptable ways, and learning accelerates.
- *Integrating it.* Finally, the individual may incorporate selected elements from the other system into a personal operating framework.

Cross-cultural learning can be organized in many different ways, but experience has shown that three elements are essential: place, people, and project. Learning, in other words, takes place in a specific context, among specific groups of people, and with reference to some common activity or task. This, of course, is the underlying structure of many service learning programs. In this article, we describe one program of cooperative education at our university that incorporates these key elements of service learning within a highly structured academic program.

Sending Engineers Overseas

Engineering at the University of Cincinnati

Founded in 1819, the University of Cincinnati is a Class I research university with seventeen schools and colleges, and nearly 35,000 students. Although the university is urban-based and serves a largely urban constituency, it has nationally recognized programs in a range of professional fields, including engineering, architecture, planning, design, art, law, music and medicine.

The College of Engineering offers majors in aerospace, chemical, civil and environmental, computer, electrical, industrial, and mechanical engineering, as well as engineering mechanics and materials science. The college has 2,000 undergraduate students, 1,100 graduate students and 154 full-time faculty who conduct sponsored research worth almost \$18 million annually. The engineering program, like that of several other UC colleges, is based on cooperative education, or “co-op,” combining study with periods of work outside the university.

Co-op at the University of Cincinnati

The first cooperative education program in America originated at UC, in 1906. This approach to learning changed twentieth-century education, and is now practiced worldwide. In the U.S., an estimated 80,000 employers and 225,000 students participate in co-op education. Today, the university conducts the nation's largest mandatory co-op program at a public university.

The co-op baccalaureate degree alternates three- to six-month study periods with work assignments of equal length. After students complete the first year of study, the co-op curriculum alternates academic quarters with work quarters, in which students apply classroom learning in a practical work environment. Co-op is a feature of some of our best schools, including business, engineering, planning, architecture.

The undergraduate engineering degree is a five-year program, in which students complete twelve quarters of class work and six to seven quarters of co-op work. These co-op quarters can take place in Cincinnati, or elsewhere in the U.S. For students choosing the International Co-op Program, the last two co-op quarters are combined to form a five-month overseas work experience.

To accommodate the co-op program, the college of engineering offers classes twice each year. Students follow a rigid curriculum, and must take classes during the designated quarter to remain in good standing. Students have space in their curriculum for only a limited number of humanities and social science courses.

The International Co-op Program

The International Co-op Program began in 1990. At that time, the college of engineering recognized a need to improve the ability of American engineers to understand and deal with other cultures. The decision to focus on two countries, Germany and Japan, was made because those countries had manufacturing capabilities similar to those in the U.S. The goal of the program was twofold: to improve students' knowledge of the language and culture; and to familiarize them with the social, economic, and industrial structures of these countries.

The international co-op program was initially supported by a three-year FIPSE grant from the Department of Education and matching funds from the university. After three years of grant support, the program became self-supporting. In 1998, the program was moved to the Institute for Global Studies and Affairs, and expanded to include other colleges.

Currently, the program allows students to learn either Japanese or German to a functional level, and to spend five months overseas in either Germany or Japan, working in a company at a professional level. Plans are now underway to offer a Spanish language component, and to involve other colleges.

The International Co-op Program is similar to many service learning programs in that it involves students in ongoing work assignments, but there are some important differences. First, to qualify for overseas work, the co-op students must, as mentioned above, complete previous domestic co-op assignments. Second, the work must be directly relevant to their field of study, and third, they must be paid for their work.

Program Structure and Philosophy

A small number of students are admitted on a competitive basis at the end of the first year of study. Early planning is required to integrate program requirements into the existing engineering curriculum. They then spend three years preparing for their overseas assignment, as they follow the regular engineering curriculum.

Students receive over 300 hours of language and culture training. Providing engineers with language and culture skills is difficult because of the rigidity of the curriculum, so we do this in stages:

- *Introduction to International Co-op* (10 hours): A weekly seminar course offered sophomore year to introduce students to the opportunities and challenges involved in undertaking an overseas work assignment.
- *Summer Intensive Language/Culture* (180 hours/ 6 weeks): A beginner's course focusing on functional language to enable non-language majors to successfully communicate in workplace situations.
- *Fall and winter quarters Language/Culture Enhancement* (60 hours): Continuation courses that help students retain and improve language skills and to understand workplace culture, local systems, current events.
- *Spring Intensive Language/Culture* (70 hours/ 2 weeks): Expansion of previous material with increased focus on practical skills.
- *Informal language/culture sessions* (up to 20 hours): Optional weekly sessions to increase skills.
- *Electives*: A minimum of two electives related to the host country.

The program culminates in a five-month international co-op assignment in the junior year.

Program Strategy

Most of our students have never been abroad. We adjust the content and timing of preparation to build skill and confidence in stages. For this, we use an approach derived from Maslow's hierarchy of needs. We begin with survival issues, and move gradually into discussions of workplace effectiveness.

Table 2. A Hierarchy of Cross-Cultural Learning

<i>Levels</i>	<i>Requirements</i>
Mastery	Able to perform at a high level, showing steady improvement
Task	Has essential skills for adequate performance in the culture and workplace
Group	Able to collaborate with others to reach both common goals and personal ones
Self	Re-establishing, creating, or maintaining a satisfactory personal identity
Survival	Able to take care of basic needs.

Adapted from: Maslow 1987, Nolan 1999

Growth of the Program

The program has grown steadily since 1994, the year of its first graduating class. Then, we had ten students; for 2001, we anticipate over 30.

Company participation in the program has also increased. A dozen Japanese and nearly 40 German companies have provided paid co-op assignments to students so far, and new companies are added almost yearly. Significantly, many companies agree to take a second co-op student after their first experience.

Outcomes

UC's international co-op program is highly unusual. Only about twenty schools in the U.S. offer work-abroad programs in foreign languages, and of these, only five operate in more than one country. Because of the innovative nature of our program, it is doubly important to measure quality and performance. We do this in a number of ways:

- Student evaluations;
- Proficiency tests to track language improvement;
- Follow-up sessions after overseas assignments;
- Company feedback on student preparedness; and
- Informal feedback from instructors and students.

Overall, the international co-op program is highly successful. It provides companies with technically competent graduates who also possess intercultural skills and cross-cultural experience. Program graduates receive good offers, which often include assignments in the international arena usually reserved for more experienced employees. Students and program staff have been interviewed for professional and educational magazines, invited to meet international visitors, and have worked with the Cincinnati Chamber of Commerce to help promote Cincinnati internationally.

This success is probably due to a combination of factors:

- Extensive preparation and individualized advising;
- Specialized coursework compatible with the existing curriculum;
- A year's worth of domestic co-op experience prior to going overseas; and
- The program's high faculty/student ratio.

Student Benefits

Student benefits appear at several levels. In the most basic sense, the program has strong appeal to students because it helps them get good jobs with good companies, doing interesting work. Because co-op jobs, both domestic and overseas, are paid at a professional rate, students also appreciate the chance to earn income while learning.

The specifically international or intercultural benefits, although more diffuse, appear in many of the comments made by both students and their employers. Students tend to mention the excitement and utility of learning about another way of life. They—and their employers—also note a clear growth in self-confidence and the ability to perform in new and difficult situations. Finally, many students mention that the overseas experience has given them new insights into American culture.

One student now working for a Cincinnati company wrote:

My IEP [International Engineering Program; until last year, this was the program name] experience has been invaluable to me in this new role. Not only did it help me to get the position in the first place, but it virtually eliminated the learning curve associated with functioning in German social and business culture. As a result, I was able to be productive almost immediately upon my arrival...

Another wrote:

The IEP really provides students with a once-in-a-lifetime experience to learn and grow. I found that the more I put into the program, the more I got out of it. I still consider my IEP experience as one of the most wonderful experiences in my life. I learned about German history, culture, people, daily life and language—but the most invaluable things I learned were about myself. The IEP was a challenge, and I overcame the challenge—and ENJOYED it the entire time.

A co-op student to Japan said:

Though it was intensive and very demanding, I have no regrets [about my] decision to both complete an undergraduate mechanical engineering degree and participate in the IEP. Previously, my ‘understanding’ of Japanese thinking and behavior was based solely on what I had read or heard; today, it is based on what I have experienced.

Another Japanese co-op veteran commented:

Once an IEP participant graduates they have a background that sets them apart. An engineering degree, domestic co-op experience, intense study of a foreign country, and an international co-op assignment are key ingredients for the making of an international engineer—which is what every engineer ought to be.

For some students, time overseas is an interlude. They return to the U.S., join a domestic firm, and may or may not be directly involved in international matters. For others, international work is clearly going to be central to their careers. Most program alumni identify strongly with the program. Indeed, they are its strongest advocates, and have been instrumental in recruiting later graduates into their firms.

Company Benefits

Company reactions have also been very positive. After graduation, companies hire co-op graduates readily, and those with international experience tend to perform at a high level. Interviews with U.S. company managers indicate that they notice a clear increase in self-confidence, adaptability, and tolerance in these students, as well as skill in communication.

Companies continue to accept co-op students year after year, and their evaluations of student performance are high. In some instances, companies in both Germany and

Japan have commented that our students are better trained in engineering than some of their regular employees. Many companies have also commented on the ease with which co-op students fit into the local work environment.

From the company perspective, the strength of the program is the extensive language and culture training that students receive prior to going overseas. They see this as directly linked to successful adaptation and job performance.

As expected, there is a wide range of workplace situations, and an equally wide range of adaptations. Companies have varying expectations of students, and consequently, assignments turn out very differently. One company may value a young American engineer primarily as a cultural informant or broker, to help the local management team better understand how to deal with a North American partner. In other cases, however, students have been given original research to do, and in several cases, this has resulted in product improvements and publications.

Only one student has left an international co-op assignment early, for reasons not connected to workplace issues. Generally speaking, German speaking students attain more fluency than do Japanese speakers, but adaptation hinges on a variety of other things. We are continuing to look closely at the factors that promote success in work assignments.

What We've Learned

Working with Stakeholders

Perhaps the most important thing to be said about the international co-op program is that it is a collaboration among a fairly large number of stakeholders. Developing and implementing these programs required collaborative effort among the college of engineering, the department of German, the division of Professional Practice (which manages co-op university-wide), and the Institute for Global Studies and Affairs (which manages the international component).

Outside the university, other stakeholders include U.S. and overseas companies. Crafting the relationships which knit these groups together has taken time and energy.

To develop the program, an advisory committee was created to help coordinate these interests, which included:

- Ensuring that in-house language expertise was both available and used;
- Maintaining the rigor and basic structure of the existing engineering program;
- Adhering to established university-wide co-op program standards; and
- Making the program affordable and relevant to participating international companies.

Program Management

In terms of management, this is a high-maintenance program. Advance planning is required to create realistic expectations among students, and to ensure that they complete all preparations on time. We must insist on performance and quality from our instructors as well.

The key is to meet regularly with instructors and university program managers, and to provide good advising and follow-through to students. Students meet regularly with the program administrator to make course selections, discuss academic progress, establish learning goals, explore connections between domestic and international co-op assignments, and plan future activities.

As the number of students in the program increases, new overseas co-op assignments are always needed. This requires continual identification of new companies overseas. Because most of them are unfamiliar with the University of Cincinnati and the concept of cooperative education, overseas marketing trips are a necessary part of promoting our program.

Conclusion

There's an Asian proverb that says, in effect, "Do not attempt to teach a pig to sing. It is a waste of time, and it annoys the pig." It might be supposed that teaching engineers to be cross-culturally sensitive is contrary to proverbial wisdom. But, as our program demonstrates, it is both possible and highly desirable to do this, provided the effort is approached with care and professionalism.

An international co-op work experience is only one of a number of ways that our colleges and universities can provide students with the cross-cultural experience that seems to be so important for promoting intercultural competence. As our experience shows, it is possible to create such experiences even within the context of an otherwise rigid and constraining curriculum, among a group of students who, at first glance, might not seem likely candidates for an overseas sojourn.

Time will teach us more about what works and what does not to improve intercultural competence, but our experience so far shows that:

- Cross-cultural experiences need to fit in with the core requirements and values of the existing academic programs from which students are drawn. We did not set out, in other words, to change engineering education at UC. We set out to make it better.
- Cross-cultural learning is more effective if students have an agenda for language and culture use, and if training is specifically geared toward that agenda. We continually revise our training in small ways to make it more compatible with the community and workplace situations that our students actually encounter.
- Co-op students learn, not just from instructors, but from each other about the new culture they will enter. As was the case for Peace Corps volunteers in Africa (Nolan, 1985), students pay particular attention to the experiences of those who have gone before them, and the strategies of adjustment that they have employed. The continuing involvement of former co-op students with our program is, in these terms, a major asset for promoting effective cross-cultural learning.

What might we do differently, if we could begin again? In a sense, we re-invent the program for each cohort, because, as all international educators know, cross-cultural

learning is an adaptive problem. Feedback from each student cohort, as well as information from employers, helps us change and develop the program each year. We have, for example, learned to put increased emphasis on language learning, and to look for new and better ways to teach intensive language combined with cross-cultural awareness. We have learned to pay particular attention to advising and orientation, to ensure that expectations are realistic, and that survival issues are dealt with promptly and effectively. Finally, we've learned that efforts to develop long-term relationships with overseas companies pay off by creating a supportive and positive learning climate for our students.

Based on the positive experiences of our co-op students, the University of Cincinnati is planning to expand its overseas programs, and in particular those involving service learning. Our new global studies program, run in collaboration with the university honors program, will offer third-year students a service learning opportunity overseas, and we are now in the process of identifying appropriate placements. The International Co-op experience has been instrumental in these efforts to connect the classroom to the wider world.

Suggested Readings

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