2006-393: DEVELOPING GLOBALLY-MINDED ENGINEERS THROUGH EDUCATION AND EXPERIENCE: A PANEL DISCUSSION ON INTERNATIONAL CO-OP/INTERNSHIP PROGRAM MODELS

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Debbie Gulick is the International Practicum Coordinator at the Georgia Institute of Technology. Her responsibilities include developing and sustaining a large, broad-based program of international internships and cooperative education opportunities for students. Debbie has worked in the field of international education with a specialization in international technical internships for the past five years. She has sent students from over 50 universities to internships in approximately 40 countries. Debbie earned a Master's degree in International Communication from American University's School of International Service in Washington, DC. Her focus and research was on international education, leadership, and cross-cultural communication.

Debbie Pearson, Georgia Institute of Technology
Debbie Pearson, Assistant Director in the Division of Professional Practice at the Georgia Institute of Technology for the past eight years, works with cooperative education students in the aerospace and mechanical engineering fields. Her responsibilities include counseling students, developing jobs, and assessing the effectiveness of co-op assignments. Having traveled to various countries, Debbie is interested in cross-cultural issues and the benefits that international experiences hold for engineering students. Debbie completed a Master's Degree in English and counseling certification requirements from Troy University. Before joining Georgia Tech, she served various educational institutions through teaching, counseling, administration, and project coordination.

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Gayle Elliott earned BS and MS degrees from University of Cincinnati and is currently assistant professor in UC's Division of Professional Practice. She is the faculty advisor for students in the International Co-op Program (ICP) and for mechanical engineering students in the class of 2008. Initially part of the College of Engineering, Gayle has worked with the International Engineering Co-op Program since 1993. In 1998 she created and began working with similar programs in the College of Business and the College of Design, Architecture, Art and Planning. Under her direction the ICP has grown from ten engineers, working in Germany and Japan, to over 30 students, working annually in Germany, Japan, Mexico, and Chile. Gayle's responsibilities with the international program include: - Teaching Orientation to International Co-op, a class to prepare students for the challenges and opportunities of living and working abroad - Development of international co-op learning modules - Individual student teaching to help guide students toward integrating classroom and co-op learning experiences with personal goals for an international co-op assignment - Identifying companies and developing partnerships to create co-op job opportunities with international companies in the US and abroad - Working with language faculty to develop specialized intensive language and culture programs that prepare students to work abroad - Program evaluation and assessment

Jennifer Oliver, IAESTE United States
Jennifer Oliver is currently the Outbound Program Manager and East Regional Coordinator of IAESTE United States, a membership and exchange organization dedicated to developing global skills in tomorrow’s technical leaders. Ms. Oliver is also a member of NAFSA, the Association of International Educators.

Prior to her current role with IAESTE, Ms. Oliver worked with the Center for Cultural Interchange, as a Program Manager for the Academic Year in America program. She received her M.A. in Discourse and Argumentation Studies from the Universiteit van Amsterdam and her B.A.
in English Literature and Communications from the University of Wisconsin-Madison. Ms. Oliver has also lived and studied in the United Kingdom.

**Karl Zimmer, General Cable**

Karl Zimmer graduated from the University of Cincinnati with a B.S. in Industrial Engineering in 1999. While in school, he had a number of co-op assignments in materials management, sourcing, and manufacturing with General Electric in Cincinnati, Ohio. Through participation in the University’s International Co-op Program, Karl also worked for six months in Munich, Germany in the GE program office at Daimler-Benz Aerospace.

After graduation, Karl was accepted into GE’s Operations Management Leadership Program (OMLP), where he completed four 6-month assignments in operations, sourcing, and human resources. Following completion of the OMLP program, he moved into a Six Sigma Blackbelt position, driving service improvements in the $1+ billion spare parts business.

Starting with General Cable in 2001, Karl led the supply chain organization for the $300M communications product division prior to moving into a general management role heading the company’s $30 million harness & assembly business. During his 18-month tenure in the assembly business, sales increased by more than 25% and profitability more than doubled. Currently, Karl runs a Datacom manufacturing plant located in Jackson, Tennessee. Employing more than 300 people, the plant produces over 150 million feet of category 3 and category 5e cables annually.
Developing Globally-Minded Engineers through Education and Experience: An Examination of International Co-op/Internship Program Models

Abstract

No longer can technical education be the sole or only defining factor in tomorrow’s technical leaders. Technical knowledge in a vacuum limits the impact of the best students and limits their potential to make substantial improvements to the overall quality of life and human development. Today’s engineering students must develop global skills to be effective and contribute to decreasing worldwide environmental and human problems. International practical training is essential for educating tomorrow’s engineering leaders. The need for globally-minded engineers is no longer the question; the new question is how to prepare today’s engineering students for the workplace. International engineering co-op and internship programs allow students to gain global competencies required by today’s industry. Such programs assume various forms but share many of the same benefits and challenges.

Introduction

ABET criteria for accrediting engineering programs specifically states that students must attain “the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.” A reflection of the changing role of engineering, such criteria are deemed a necessary aspect in educating the “Engineer of 2020.” Our interdependent global society requires engineering skills to address issues related to health, security, and the environment, as well as international commerce.

As a major RAND research study concluded in the 1990’s, both universities and corporations now believe that students must understand the global nature of economics, speak other languages, and be able to assess decisions in more than one culture. The research results suggested that universities must do more than “tinker with the edges of the curriculum.” A comprehensive approach is needed, and relevant work experiences should be a prime component.

Work abroad experiences allow students to prepare for the global economy, improve foreign language ability, and enhance employability upon graduation. Students grow personally and socially, as well as gain vital cross-cultural exposure and communication skills, by living and working in an international location.

Employers benefit by attracting highly-motivated students, establishing close ties with key universities, and gaining employees who have not only technical expertise, but also a global perspective and language skills. When employers hire co-ops or interns to work internationally, they are investing in potential leaders that can impact their growth around the world.

Universities that provide work abroad options gain world-wide visibility, strengthen ties with major industry players, increase the flow of technology between the institution and industry, and position themselves to attract students who want a value-added education.
The benefits are clear, but the models for bringing about work abroad objectives are extremely varied. The challenge is for universities to coordinate these efforts and to open dialogue with industry on how to better prepare tomorrow’s workforce through international co-op and internships.

Which models are available for universities to follow and how can such programs be funded? How can industry balance the rewards of hiring international co-ops and interns against the planning and cost involved? When are third-party providers the best option? How do we assess the effectiveness of work abroad programs? These are some of the questions to be addressed.

This paper will examine work abroad programs at the Georgia Institute of Technology, the University of Cincinnati, and the International Association for the Exchange of Students for Technical Experience (IAESTE). For each, the discussion will include the program’s origin/history, goals, model or design, obstacles and successes, and funding source(s).

**Georgia Tech’s Work Abroad Program**

**Origin/History**

Georgia Tech has been sending students to work abroad for decades. However, Georgia Tech launched a new initiative in the fall of 2005, the International Plan, which allotted financial and human resources to formalize the Work Abroad Program. The International Plan offers a challenging academic program designed to develop a deeper level of global competency within the context of the student’s major area of study. There are four main components to the International Plan: foreign language competency, globally focused course requirements, an overseas experience (minimum of six months), and a capstone course. Students who complete the requirements for the undergraduate degree in their major and who complete the International Plan requirements will be recognized by the designation "International Plan" on their transcript and diploma. A major goal of the institute is for 50% of students to have an international experience by the year 2010, and work abroad is a vital component of the International Plan.  

Georgia Tech’s Work Abroad Program is part of the Division of Professional Practice, thus all international work experiences are facilitated through the Division. The Division of Professional Practice’s cooperative education program began in 1912 and since then the Division of Professional Practice has added the Graduate Co-op and the Undergraduate Professional Internship programs in addition to the Work Abroad Program.

**Goals**

There are four main goals for the Work Abroad program:
1. To give Georgia Tech students a global understanding in their field of study through work-integrated learning.
2. To provide quality international and cross-cultural experiential education for Georgia Tech students.
3. To connect international companies and Georgia Tech students.
4. To assist Georgia Tech students in finding satisfaction and success as a life-long, globally-minded learner.

Design

The Work Abroad Program includes co-op, internship, graduate, and undergraduate work experiences - the qualifier being international. These international work experiences are designed for the ultimate experience to include practical training and cross-cultural exposure and learning. The first model at Georgia Tech is for a student to complete an international co-op program. The final two work terms are completed at an overseas location, thus serving as a capstone work experience. See diagram below for more details.

<table>
<thead>
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<th>Year</th>
<th>1</th>
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<td>Academic Studies</td>
<td>Work Term</td>
<td>Study Abroad</td>
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<td>Academic Studies</td>
<td>Work Term</td>
<td>Academic Studies</td>
<td>International Work Term</td>
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<td>Optional</td>
<td>Academic Studies</td>
<td>Work Term</td>
<td>International Work Term</td>
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A second model is for students to complete a summer, semester, or year-long internship overseas. It is highly recommended that students have previous work experience before their international work assignment. The third model is for a student to complete a domestic summer internship followed by an international internship at the same company thus completing two work terms – one domestic and one abroad at the same company. This model is not as intensive as international co-op yet provides a great foundation for learning and the ability to compare and contrast their work experiences. The fourth model is for a student to study abroad for a semester and then complete a work assignment in the same country. This model allows a student to immerse themselves fully into a culture while increasing their language skills to prepare to work in a foreign language and country.

All students completing an international work assignment through the Division of Professional Practice receive full-time audit credit. The Division of Professional Practice also prepares students for their international work experience in regards to information on health and safety abroad, health insurance, cultural and country information, culture shock, as well as pre- and post-assessments.
Obstacles and Successes

The first challenge for universities, employers, and students is the location of the Work Abroad Program on campus. At universities, work abroad programs can be facilitated through the Office of International Education, Career Services, Division of Professional Practice, Modern Languages, and/or through individual faculty members. The variety of departments involved has created a challenge for employers, students, and faculty to find the most effective way to coordinate such an effort. Due to the variety of options for international opportunities for students, the need was identified to hire an international practicum coordinator at Georgia Tech to coordinate all international work opportunities on campus. Through the creation of a centralized work abroad program, Georgia Tech has overcome one of the largest obstacles for a successful work abroad program. After a centralized location has been chosen to house a work abroad program on campus, it is imperative to market and promote the program across campus so that all necessary parties understand what services the department can offer to assist in international work assignments. Communication across campus, as in any organization, is an ongoing challenge.

Another immense challenge is that work abroad programs by nature are labor intensive. In study abroad programs, a university can send 30 students on a program to a university in China while most companies are interested in taking only a handful of students at most. In addition, pre-departure orientations, country and company information, and requirements for visa/work permits vary from company to company and country to country - making the program more time consuming. Human capital and financial resources are necessary to start and operate an effective international work program.

Lastly, there is not a large data pool on outcomes of work abroad. Hard assessment data is needed to justify the funding needed for work abroad and to identify ways to strengthen such programs. Data on work abroad could serve as a way to seek additional funding for programs and to illustrate the benefits to employers to assist in job development. Georgia Tech will be conducting pre- and post-assessments in order to gather data from its work abroad participants in an effort to add to the field’s understanding and to illustrate the need for more work abroad programs in the U.S.

Funding

Creating work abroad experiences is quite expensive as it is imperative to have dedicated staff and a travel budget to facilitate meetings and site visits. Georgia Tech has overcome this challenge through making international experiences for students a primary component of its Quality Enhancement Program (the International Plan is part of Georgia Tech’s Quality Enhancement Program). For the next five years, Georgia Tech has budgeted over $4 million for the Institute’s International Plan. The Work Abroad Program receives a portion of this funding to assist in finding international work experiences for students.
The University of Cincinnati

Origin/History

The International Co-op Program (ICP) was developed at the University of Cincinnati in the College of Engineering in the early 1990’s. Now, almost 15 years later, the program has expanded to include students from UC’s four main co-op colleges (Engineering; Applied Sciences; Business; and Design, Architecture, Art and Planning). The program is under the auspices of the Division of Professional Practice, which is responsible for Cooperative Education at the University of Cincinnati.

The concept of Cooperative Education was developed and founded at the University of Cincinnati in 1906 by Dr. Herman Schneider, Dean of the College of Engineering. The UC program has grown to place approximately 4000 students with 1500 employers annually. Most students are undergraduates, but graduate co-op is now being offered in some colleges. Since its creation, “Co-op” has been adopted by institutions of higher education around the world.

Goals

The International Co-op Program responded to the need to improve the ability of American students, particularly engineers, to understand and deal with other cultures. Initially programs were created in German and Japanese. A Spanish program was added later.

The goals of the program are two-fold: To improve students’ knowledge of a second language and culture and to familiarize them with the social, economic, and industrial structures of the country in which they will co-op. After a successful international co-op assignment, students will have gained skills that enable them to adjust and adapt to a new culture in personal and professional situations. These skills can be utilized to achieve success in the future in almost any new environment.

For the UC ICP, strong emphasis was placed on second language competency. Historically, UC has found that students with strong communication skills are usually given higher levels of responsibility at work—a direct goal of the co-op program. Sending students with consistently strong language skills enables employers to develop expectations about the level of language proficiency a UC international co-op student will have.

The program also responds to the increasingly important need of employers to hire graduates with cross-cultural competencies that are qualified to work in a global environment.

Design

The ICP is an optional program for qualified students within the UC Co-op Program. Participating students complete a series of language and culture courses in preparation for an international co-op assignment in Germany, Japan, or a Spanish-speaking country. Most students will complete four co-op quarters in the US prior to embarking on a six-month capstone co-op assignment overseas. A sample schedule is shown below. Numbered blocks are co-op
quarters. Remaining blocks are academic quarters. International co-op preparation program components take place during several academic quarters.

The program is designed to ensure students are as well prepared for a co-op assignment overseas as they are to work in the US. Much effort is invested to ensure they have strong technical skills, functional language skills, and an understanding of the culture in which they will be living. The course “Orientation to International Co-op” is designed to ensure students understand and can accept the challenges and opportunities they will encounter living and working abroad. UC’s Office of International Programs provides pre-departure orientations and information on health and safety.

Obstacles and Successes

Creating and placing students in international co-op jobs is expensive and time-intensive. Universities must be willing to invest funding and time, particularly at the beginning. A strong commitment to allow adequate time to “grow” the program is essential. Each institution will have specific strengths, and should create a program that utilizes those strengths and fits into an existing structure that already works. At the University of Cincinnati, the rigid engineering curriculum combined with a mandatory co-op program would make it difficult to integrate a study abroad experience into the curriculum. The co-op program provides an avenue for international experience, while complimenting an existing structure.

For institutions pursuing work abroad programs, once a quality “product” has been developed, the likelihood of success will be increased by approaching employers who already participate in
and understand the value of their (domestic) co-op or internship program. Some will be willing to take it to the next level and accept students for international assignments. Students need to be well prepared to meet the needs of new employers, so the employers will continue to participate in the program after the first students have completed their international assignments. Graduates who have gone through the program can also be valuable to their alma mater. They can serve as resources for current students, and may someday be in a position to hire co-ops themselves. They will understand the benefits of an international experience to both the students and the employers, and can become “champions” for their international program.

Funding

Funding to create the ICP was provided by a three-year FIPSE (Fund for Improvement of Post Secondary Education) grant through the Department of Education, with the University providing matching funds. When the grant expired, the University allocated permanent general funds to support the program. Small amounts of additional funding are provided by supportive donors. Students are also eligible to apply for $500 travel grants, available from UC’s Office of International Programs.

The International Association for the Exchange of Students for Technical Experience (IAESTE)

Origin/History

The International Association for the Exchange of Students for Technical Experience (IAESTE) program was founded in 1948 by 10 European countries as a means to promote better understanding between countries by providing paid, technical work exchanges for university students. Since 1948, the association has grown to include more than 80 countries worldwide and facilitate the annual exchange of approximately 6,000 students. IAESTE United States joined the association in 1950. The program is now part of the Association for International Practical Training, a not-for-profit organization in Columbia, Maryland. For many years, IAESTE United States focused on international internships, identifying domestic internships for international interns and sending U.S. students abroad on internships. During the mid 1990’s, IAESTE United States began its evolution towards becoming a premier international organization for technical students, with Local Committees (student chapters) established at top science and engineering universities across the country. Though the international internship remains the flagship program of IAESTE United States, student members can also participate in a variety of national and international conferences, local activities, and short-term programs abroad aimed at developing the global competencies needed for science and engineering professionals. IAESTE United States operates under the mission of “developing global skills in tomorrow’s technical leaders.”

Goals

There are three main goals of the IAESTE United States international internship program:
1. To provide students in higher education with international technical experience relevant to their studies.
2. To offer employers well-qualified and motivated international interns.
3. To develop the global skills of science and engineering students.

Design

The IAESTE program is reciprocal; therefore, IAESTE United States must identify paid domestic internships in order to send U.S. students abroad. Most of the internships available to U.S. students are 8-12 weeks during the summer, but longer internships are also available. All IAESTE interns are paid a salary that covers the cost of living in country. Most of the available internships do not require a foreign language. Accommodation is arranged by the IAESTE counterpart and most students will have the opportunity to participate in a variety of organized cultural and social events with other IAESTE interns. A general timeline for the program is below:

- **Register**: Students apply online with basic information about the type of internship they are seeking (September 1 through January 1).
- **Review**: A list of all available internships is posted to the registered students on January 31.
- **Update**: Students update their applications by selecting up to 6 internships for which they would like to be considered (early February).
- **Selection**: IAESTE United States will notify all applicants as to whether they have been nominated to an internship in mid to late February.
- **Finalize**: Students who have been nominated into internships will have their credentials sent to their prospective overseas employers, who have the final decision as to whether to accept the student for an internship (March and April).
- **Departure**: Once students have been accepted by their employers, visa/work permit arrangements are finalized and students leave the US to begin internships. Pre-departure and health/safety information is provided by IAESTE United States. Accommodation and cultural activities are organized by IAESTE in the host country.

Obstacles and Successes

The main obstacle for a reciprocal program such as IAESTE is finding the domestic internships for international interns. Until the mid 1990’s, 100% of the domestic internships that IAESTE United States identified were found by our professional staff. Now, 75% of the internships are found by the Local Committee students. Local Committees have found great support in identifying domestic internships from their universities. Some universities have helped Local Committees make contacts with off-campus employers, as well as with professors on campus who are interested in hosting an international student. Other universities have been able to provide grants to the IAESTE Local Committees, which the Local Committees use to subsidize the employer hosting fee. IAESTE United States’ most successful Local Committees have found 10-14 positions per year, thereby sending approximately 10-14 students from their Local Committee abroad.
Non-profit organizations such as IAESTE United States must also balance between keeping costs low for students and charging participation fees that help cover the cost of administering the program. This has become increasingly difficult in recent years as the visa/work permit processes have become more complex; IAESTE United States spends more time assisting students in receiving the appropriate documentation than ever before.

Providers must also ensure that they are adhering to the visa/work permit regulations for the countries to which they send students. The IAESTE network consists of more than 80 countries, each with their own government regulations concerning students working in the country. IAESTE United States spends a great deal of time helping U.S. students navigate the ever-changing visa requirements for each country. The work permit and visa world is growing increasingly complex, and it is important that the provider have the contacts necessary to assist with the process. Additionally, the provider should make both the student and employer aware of the timeline for obtaining the necessary work permit/visa documentation.

Health and safety issues are of utmost concern to IAESTE United States. IAESTE United States reviews its health and safety policy, along with the crisis response plan on a yearly basis. IAESTE United States’ health and safety policy is also considerate of NAFA’s (the Association of International Educator’s) health and safety recommendations. In most cases, IAESTE interns have a local IAESTE contact or contacts for the duration of their program; these local contacts can readily assist the students in case of emergency and help them with any culture shock issues which may arise.

Most third-party internship providers are unable to provide in-person pre-departure orientations for students, due to the fact that the providers are working with students from across the country with departure dates which vary greatly. IAESTE United States offers students a multitude of valuable pre-departure resources and encourages students to take advantage of the pre-departure courses and materials that are available at their home universities. IAESTE United States staff is also available for pre-departure counseling.

Funding

IAESTE United States is a not-for-profit program, funded by its program fees. Member applicants to the internship program are charged a $35 nonrefundable program fee ($50 for nonmembers). Member students who are placed are charged a placement fee of $350 ($500 for nonmembers). U.S. employers are charged a hosting fee of $600-$1750 (depending on the length of the internship), which not only covers the administration of the J-1 visa, but also medical insurance and National Office support. The program fees paid by international employers vary depending on the country.

IAESTE United States is able to offer several scholarships to program participants; these scholarships are designed to help cover the international flight costs. Each year these scholarships include three nontraditional destination scholarships, three underrepresented groups in science and engineering scholarships, a Scandinavia scholarship, and three Germany scholarships.
Conclusion

Employers today are demanding technically qualified graduates who also possess the global skills necessary to be effective leaders in worldwide markets. At the same time, the competition among universities to attract the highest quality students is increasing. Successful universities will respond to these demands and take advantage of the opportunity to enhance their academic offerings with international experiences. International programs assume various forms but share many of the same benefits and challenges. To meet the needs of students and employers, universities must respond by identifying their strengths and opportunities and then finding ways to integrate international experiences into their curriculum. Some will create programs managed and operated completely in-house. Others can benefit by working with third-party providers to achieve their goals. It is essential for universities to create dialogue with industry as well as between universities for needs and best practices in work abroad to continue to develop international experiential education. Successful universities will assess their goals for international work experiences and allot the resources necessary to implement programs to develop globally-minded engineers through education and experience.

References


