

Developing Global Engineers through International Cooperative Education: The University of Cincinnati Model

Abstract

International experiential education is essential to create global skills needed by today's engineering professionals; but integrating this into the engineering curriculum can be difficult. The University of Cincinnati worked across academic units and created the International Co-op Program (ICP) to respond to this need. Students work three co-op semesters in the US then complete over 250 hours of language/culture instruction in preparation for an eight-month capstone co-op experience in Japan, Germany, or a Spanish-speaking country.

The ICP offers students the opportunity to learn Japanese or German language/culture in preparation for an eight-month capstone co-op assignment abroad. A small Spanish option is also available. Some ICP students complete additional coursework, above that required to participate in the ICP, and also earn a certificate in Asian Studies or a minor in German. This paper focuses primarily on the Japanese program and describes: a) background and curriculum of the ICP at Cincinnati, b) development of the Japanese language/culture program including prior study results with regard to characteristics of engineering students and the suitable syllabus types for ICP students, c) the ICP Japanese course curricula with the description of preparation for co-op assignments, and d) the future direction of online materials using the words included in the engineering terminology dictionary in order to develop ICP students' autonomous learning abilities and Japanese language proficiency at co-op sites, and e) a guide for a textbook to be written for engineering students which includes the fundamentals of technical and business Japanese while at the same time covering basic cross-cultural differences, e.g. work ethics and etiquette. All three language programs are similar, with minor variations between them.

Introduction

ABET criteria for accrediting engineering programs state that students must attain "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context."¹ A reflection of the changing role of engineering, such criteria are deemed a necessary aspect in educating the "Engineer of 2020."² Our interdependent global society requires engineering skills to address issues related to health, security, and the environment, as well as international commerce.³

A major RAND research study in the 1990's concluded 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.⁴

Work abroad experiences prepare students for the global market, improve foreign language ability, and enhance employability upon graduation. Programs like Cincinnati's International Co-op Program, which combine language and culture preparation with an international experience, help to develop students who are willing to take risks, adaptable to new environments, and highly motivated to succeed. Through this experience they grow personally and professionally. They develop an appreciation for cultural differences and strong cross-cultural communication skills.

Employers benefit by developing strong relationships with key universities and by attracting highly-motivated young professionals. Through these graduates, they gain employees who have technical expertise as well as a global perspective and second 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. Students participating in these programs are highly sought after at graduation; often for positions that take them abroad again for short or long-term assignments.

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. Many of the students participating in XXX's ICP state that they selected XXX primarily because of the option to participate in this program.

Students in the University of XXXXX College of Engineering and Applied Sciences (CEAS) found it difficult to integrate study abroad into the existing curriculum. The mandatory cooperative education (co-op) program, which alternates discipline-related work experience with coursework, had already extended the traditional four-year baccalaureate program to five years. In addition, students are either in class or on co-op every semester, including summers, from the sophomore through the senior year. CEAS believed it was unlikely that many students already in a five-year program would be willing to add another year to study abroad. International experience through the co-op program was the model that XXX chose to

pursue. This paper will provide an overview of the XXX Co-op Program and examine one of the language models available, Japanese, in-depth.

XXX Co-op Program

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The Co-op Program provides students with multiple alternating work experiences which are integrated into the middle three years of a five-year baccalaureate curriculum. Ideally, the experiences will provide professional growth by progressively increasing breadth or depth of knowledge in their academic field through each co-op experience. Through multiple progressive work terms, students can transfer learning between the classroom and workplace and prepare for future career paths.

Almost ninety years after the Co-op Program was created the International Co-op Program (ICP) was created as an option for (initially engineering, and later all co-op) students to gain second language proficiency and international experience. It was believed this program would attract students to XXX and would meet the needs of potential employers for students with this skill set. A number of articles support these expectations, and two are cited below. One focuses on student interest, the other on employer needs.

In their report titled “Public Experience, Attitudes and Knowledge: A Report on Two National Surveys about International Education” (2001), Hayward and Siaya discussed results of a survey of 500 high school students planning on going to college. Ninety percent of students surveyed felt that international education would give them a competitive edge in the workplace. In the early 1990’s, the availability of international options for engineering students was rare. XXX became a pioneer in the area of international engineering education, and the program has proven to attract highly motivated students, with a variety of academic options, to XXX. In their article titled “Employer Attitudes toward Study

Abroad” (2007), Trooboff, Vande Berg and Rayman cited a survey distributed to 352 companies across the US. Twenty-nine percent of those receiving the survey responded. Eleven percent of respondents were CEO’s, presidents, or their designee. Eighty-nine percent of respondents held other positions within their company; and sixty-five of these were campus recruiters or human resources representatives. The survey indicated that internships or study abroad were valued higher than any other (non-degree) college experience with the exception of completion of a foreign language major or minor.

The ICP was created as an academic option available to students in the XXX Co-op Program. To participate, students are required to maintain a 3.0 GPA and be in good standing in the Co-op Program. The acceptance criteria ensures that students who undertake the language training are comfortable and successful with their existing academic program. Following initial acceptance, the rigors of the preparation program increase the likelihood that students will succeed overseas. XXX believes once the acceptance criteria are met, the program is self-selecting. Course content and the commitment required to complete the preparation program ensures that students eligible for international placement are highly motivated to succeed and have realistic expectations about living and working abroad. The two main language options available are Japanese and German. A very small, specialized Spanish program is also available. The program is designed to fit into the students existing curriculum, with one co-op semester shortened for intensive language instruction.

The ICP provides students in the Japanese group with the opportunity to learn the Japanese language and culture in preparation for an eight-month capstone working experience in Japan. However, sufficient Japanese language class hours cannot be scheduled due to time constraints with their major fields of study, as seen in other Japanese language courses for professional purposes. Thus, an online learning community and a flipped class were attempted for the purpose of effectively enhancing learning opportunities after semester conversion at XXX.

The first format - the online learning setting - is noted for its ability to enhance global views and cross-cultural understanding, using online components that emphasize social formation. Therefore, online

learning communities play important roles as networks of social relationships, in which engagement and interaction are critical to the online courses. Second, according to the guiding principles of a flipped class, fundamental and foundational content can be more efficiently delivered outside of class by utilizing technology. As a result, active learning and engagement, which fosters abilities of analysis and applies knowledge, can be emphasized in class by spending more time on rapid, reflective, proactive, and presentational activities rather than passively listening to lectures and mechanically practicing new structures. Thus, flipped curricula can produce a meaningful and productive learning environment in classroom settings.

The two formats were utilized to attempt to solve ICP students' scheduling problems, to foster cross-cultural understanding and global views, as well as to develop skills based on the results of analyzing students' discussion of culture homework and their feedback. Integration of the online learning community enabled students to (a) gain insight into their native culture as well as the target culture and to mediate and explain differences between the two, and (b) critically or analytically understand their own and other cultures through conscious processes. The flipped curricula were beneficial for the development of students' active learning skills, autonomous learning, and life-long learning abilities. Viewing video lectures prior to class in flipped modules could efficiently lead to meaningful learning opportunities by allowing students to have opportunities of more profoundly understanding and actively analyzing new materials as well as mentally having more capacity to memorize the supplementary vocabulary and expressions they encountered during class hours.

Through the ICP, students are provided not only with workplace skills but also with opportunities to develop effective communicative skills, problem solving abilities, life-long learning abilities, and global views through language/culture courses. This combination of academic experience in language and in their field as well as practical work experience in the US and abroad, enables graduates of the ICP to contribute to employers in the US as well as the international community after graduation.

Preparation Begins with Culture in Co-op Education Context

As students prepare to participate in the XXX Co-op Program, they enroll in a course titled “Introduction to Cooperative Education”. This course enables students to be successful in the job search and work place environments by preparing them to write a resume, interview, and perform as a professional when they enter the workforce. These are the skills students need to succeed as they embark on the first steps of their career. Similarly, the first component of the ICP preparation program is a course titled “Orientation to International Co-op”. Like the Intro to Co-op course, the ICP course is offered through the Division of Professional Practice and Experiential Learning (ProPEL) and is intended to provide students with skills they need to successfully live and work in a foreign country. The course is designed with several objectives in mind. First, to ensure students understand the requirements of the ICP and will be eligible for placement in a co-op job overseas; and second, to give students an overview of the cultures represented by the ICP. Development of a multi-cultural view is imperative to a successful international assignment. In addition to developing an understanding of other cultures as they relate to the US culture, the course provides students with information which enables them to develop realistic expectations of their upcoming experience living and working abroad; and provides them with coping mechanisms to adapt to their new culture.

The Japanese program presents a unique set of challenges somewhat different from the other languages. Many students studied German, or Spanish in high school; rarely does the ICP have a student who has studied Japanese. (Although the popularity of anime has resulted in a few students with slight Japanese instruction recently.) Students in the other programs often have family roots or have traveled to Europe or Latin America; but few students with Japanese backgrounds or experience have participated. In addition, students in the Japanese program must not only develop an understanding of different cultural aspects but also different sentence structures and three new writing systems (kanji, hiragana and katakana) to effectively communicate in Japanese.

Included in this paper is a discussion of the importance of strengthening simultaneously Japanese language study and students’ academic field, development of Japanese courses for ICP including prior study results with regard to characteristics of engineering students, description of phases of preparation for co-op

assignments in Japan, and the future direction of online materials using the words included in the engineering terminology dictionary in order to develop ICP students' autonomous learning abilities and Japanese language.

International Co-op Program Japanese Courses

The sequence of Japanese language courses for the ICP students is designed using the proportional approach. Yalden (1980) originally developed a proportional syllabus for second language learners. In this approach, the study of grammar remains in sharper focus throughout the first level than the study of functions and discourse skills. Linguistic form gradually becomes de-emphasized, and communicative functions and discourse skills are given more prominence as teachers and students progress toward the end of the advanced level. Adopting the notion of this proportional syllabus, the goals of four phases of Japanese program are gradually changing from establishing fundamental abilities of creating language structures, preparing for daily interaction with business people, and practicing communicative language use in real life situations overseas.

The sequence of the phases of Japanese language training is as follows:

<i>Course</i>	<i>Duration</i>	<i>Materials</i>
Spring Semester at University of XXXXX	15 weeks 3hrs/ week Total: 45hrs	-Genki 1: Integrated Course in Elementary Japanese (Banno, E., Ono, Y., Sakane, Y., Shinagawa, K., & Tokashiki, K., 2011)
Summer Intensive in Tokyo, Japan	6weeks 30hrs/ week Total: 180hrs	-Original curriculum using Can-do-statements developed based on CEFR (Common European Framework of References for Languages: Learning, Teaching, Assessment)
Fall Semester at University of XXXXX	15 weeks 3hrs/ week Total: 45hrs	-Getting Down to business: Japanese for Business People (Yoneda, R., Fujii, K., Shigeno, M., & Ikeda, H., 2006). -Video, websites etc.

First Phase (Spring Semester Beginners Course—Fifteen Weeks from January to May)

During the spring semester, the students develop fundamental skills and knowledge of the Japanese language and culture. The language component is designed in the analytical approach with considerations of communicative goals. Because college students (especially students in the engineering field) are usually able to intellectually analyze language structures, new grammatical items are taught with English explanations delivered by lecture videos prior to class sessions. In class, functional and communicative exercises are conducted so that students will be ready to live in Japan and work in a professional environment. This course also adopts a content-based curriculum and involves language acquisition that integrates the contents of the learners' academic fields such as engineering and the target language.

Second Phase (Summer Intensive Course—Six Weeks from July to August)

The summer intensive course consists of language and culture components in immersion settings. The goal is to provide students with functional Japanese language skills. The course builds on skills learned in the spring course and combines Japanese language instruction in the morning with Japanese cultural activities held most afternoons. On the first day of class students are tested to determine proficiency levels. Depending on their level, the XXX students may not be placed in the same classroom for language instruction, but they participate in cultural activities together with other students studying at the school. Students move forward according to individual progress, so may be in a class with a different group of students each week. Many of the students stay with host families during all or part of the six-week program. The experience enables them to begin to develop strong language skills while also experiencing the Japanese culture through the afternoon activities and the host family experience. While this component of the ICP preparation program is currently held in Japan, it may be moved back to campus in the future due to cost issues.

Third Phase (Fall Semester Language Enhancement Course—Fifteen Weeks from August to December)

During the fall semester, the students start to use a textbook which enables the students to master conversational expressions that are usual in a business environment. Additional materials (such as videos)

are used to expose students to a wide range of social and cultural aspects of interest by viewing foreigners' experiences in Japan. The proportion of linguistic form exercises is reduced, whereas the proportion of oral practice in a larger discourse is increased. This is accomplished by using integrative activities in various business situations. Interview projects are assigned so that the students have opportunities to communicate orally with members of Japanese language communities. In addition, students learn how to write Japanese email messages in business settings.

Directions for Future Improvement

At the end of the six-week summer intensive course, most students are able to respond to questions on the most common features of daily life and convey meaning to interlocutors. This satisfies the standards of the Novice High level, according the oral proficiency guidelines of the American Council On the Teaching Of Foreign Languages.

When they return to the University of XXXXX for senior year, following the international co-op experience in Japan, the language proficiency levels are varied. At the completion of the program, most of them can reach the Intermediate level, where they can participate in conversations on general topics and satisfy personal needs and social demands. In our observation, as would be expected, students' levels of proficiency are directly related to the opportunities they had to utilize the language in Japan. Some students work in environments where little to no English is spoken. These students are thrust into the language and benefit significantly in the long run. Others work in environments where the English of their colleagues is better than their Japanese. If students are not diligent about insisting on using Japanese as much as possible, it is easy to fall into the habit of communicating in English, and their Japanese proficiency does not see significant improvement. We also find that one reason many Japanese companies are attracted to the program is the opportunity to expose their employees to English-speakers. Therefore, we have been developing materials especially for students who are assigned co-op jobs in Japan and want to continue to study Japanese while they are there.

An English-Japanese Quick Reference Dictionary, which was compiled to assist the engineering student or intern in learning vocabulary, has been being developed by ICP instructors with the assistance of engineers and students majoring in engineering. This dictionary includes words that were chosen based on English vocabulary from domestic co-op sites and input from students that have traveled to and worked in Japan in the engineering field. Two needs analysis surveys about this dictionary were conducted several years ago with students who had co-op assignments in Japan. Based on the students' feedback, it has been revised and published at the ICP website. Additionally, online materials using the words included in this dictionary have developed so that students who have already completed the language courses prior to their co-op assignments in Japan can individually continue to learn new technical words and develop their language skills at their work and further be able to meaningfully develop their language proficiency.

Language learning and multiple-level cultural understanding should involve various aspects of language, not simply focusing on vocabulary. It is necessary to further develop materials which enable the students to compare the concepts of their home and target culture based on five elements of National Standards for Foreign Language learning (communication, culture, connections, comparisons and communities). We developed materials for General Electric (GE) and students were able to utilize the same materials on a website to learn new terms in engineering and business fields and develop an understanding of Japanese industries. The theme of Material A (Appendix A) is enterprises in Japan. The sequence of activities of this part is as follows. First, students comprehend engineering terms in the passages. Second, students compare and contrast each enterprise at GE Japan. Third, students develop critical thinking skills by reviewing the manufactures of enterprises. In Material B (Appendix B), listening to interviews of female employees, students understand and develop the multiplicity of cultural perspectives on Japanese working women in Japanese companies. In addition, students further gain an insight into views of career-oriented women in a country, which is still considered as male-dominant, by interviewing them in Japanese. Judging from piloting these activities with ICP students previously, it would be necessary to create a website or a course management system for measuring students' learning motivation and assessing progress of their

projects overseas. Furthermore, various types of activities should be developed in order to satisfy a variety of students' specialties.

Conclusion

A Hart Research Associates study ("Raising the Bar: Employers Views on College Learning in the Wake of the Economic Downturn, 2010) found that in a survey of 302 employers in organizations with at least 25 employees, sixty-seven percent felt that colleges should place greater emphasis on learning outcomes which include "the ability to understand the global context of situations and decisions." Sixty-five percent felt greater emphasis should be placed on outcomes which include "global issues and developments and their implications for the future." In addition, seventy-nine percent felt the "ability to apply knowledge and skills to real-world settings through internships or other hands-on experiences" was important.

Callanan and Benzing (2004) determined that recent college graduates who completed an internship were 4.43 times more likely to secure a job after graduation than those who did not. Students who develop second language proficiency and complete their internship abroad increase their marketability exponentially. The International Co-op Program responds to these needs. Students bring experience and a skill set to their careers that students without international experience cannot comprehend. A few examples can be found in quotes from ICP students.

"I know I can succeed no matter what I encounter because at least I know it will be in English!"

This comment puts the experience into a different perspective. How many seniors, graduating *without* international experience, would even recognize this "advantage"?

"No one event has changed my life as much as the ICP experience. I now fear no map, subway, adventure, entrée, beverage, or [highway]. My tolerance is now my strongest trait." This two-part statement is the epitome of what occurs when students go abroad. They realize they are flexible, adaptable, willing to take risks, and can succeed in a new environment. They also, while still young enough to have it make a strong impact, develop an understanding of and appreciation for cultural differences.

Programs like the ICP provide valuable learning experiences for students, particularly in schools like University of XXXXX where the student population has traditionally been drawn largely from Ohio. Many come from rural Ohio, and this is their first time away from home. Although XXX now attracts more students from out-of-state and students are more “well-travelled” in recent years, many have never been outside the US. Some, prior to going halfway around the world for their international co-op assignment have never been on an airplane. Through their co-op experience in general and the ICP in particular, they grow into strong professionals with the knowledge that they can do anything they choose. They develop a tremendous amount of self-confidence from the experience of moving alone to a foreign country and being required to function as a professional in a language they began learning only six months to one year before.

The ICP provides students with a significant advantage when they begin searching for full-time positions. Interviews often begin with the recruiter saying something like “I see you worked at XXX in Japan. Tell me about it.” From there students often find the majority of the interview is consumed with this discussion. It enables students to relax and be more animated as they’re discussing an experience of which they feel passionate and find it easy to come up with responses to questions like “tell me about a time you faced a challenge.” As full-time hires, ICP students have accepted indefinite assignments in countries speaking the same language they learned through the ICP as well as countries speaking a third language. To potential employers, a student’s proven record of success overseas is a strong indication that they can be placed anywhere and succeed. This often places them on a fast track for highly sought after international assignments. ICP alumni have worked in Japan, China, Canada, South America, Europe, and the Middle East. And finally, students who participated in the ICP have a strong loyalty to the program and willingness to help create similar opportunities for the students who follow them. They promote the program to their employers and facilitate establishment of co-op programs utilizing students in the US and abroad. International programs are expensive, time intensive, and require a tremendous amount of energy and patience to establish. But universities which have successfully developed these programs understand the strong benefits they bring to their students, faculty, employers and the community.

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Appendix A

Material A: Reading Material on Understanding Japanese Industries (Excerpt)

1. GEアドバンス・マテリアルズ事業

日本GEプラスチック

革新的な高機能エンジニアリングプラスチックを開発製造・販売しています。製品ラインナップは、耐熱性、耐候性、耐衝撃性、耐薬品性、高強度、難燃性といった特質を備えて多岐にわたり、お客様にとっての最適な材料を常に提案し続けてきています。

Listening ・ Writing Exercises (Examples)

読む前に

A ゼネラル・エレクトリックは、どんな企業ですか。日本語で書いてください。

B 日本のゼネラル・エレクトリックには、11の事業部門があります。

Material Aを見て、下のリストに書いてください。

- 1 GEアドバンス・マテリアルズ事業
- 2 GEインシュアランス事業
- 3 GE[]事業
- 4 GE[]事業

Part 3: 「GEエネジー事業」のセクションを読んで答えてください。

- i) ガスエンジンで有名なのは、どの事業部ですか。

_____ 事業部

Part

- 4: 「GEコンシューマー&インダストリアル事業」「GEトランスポーターション事業」「GEヘルスケア事業」のセクションを読んで、あなたがどのセクションで仕事がしたいか、その理由を書いてください。

Appendix B

Material B: Listening Material on Understanding Japanese Industries (Excerpt)

GE

コンシューマー・ファイナンスコレクション（管理企画）アシスタントマネージャー
黒澤直美

Interviewer (R): 黒澤さんは、今までどのようなお仕事をされてきましたか。

Interviewee (E):

1992年にミネベア信販に契約社員で入り、千葉にある回収センターでオペレーター業務をしました。その後、ミネベア信販が信販・カード事業をGEの営業に移し、1994年12月にGEグループ企業になりました。1996年に信販会社で初めての集中オペレーション・センターが府中にでき、その時に正社員になりました。

Listening Exercise • Interview Project (Examples)

聞く前に

A 日本へ来る前、会社にいる女の人は、どのような仕事をしていると聞いていましたか。

B

日本に来てから、日本で仕事をしている女の人はアメリカで仕事をしている女の人と何が違うと思いましたか。

Part 1:

GEで仕事をしている三人の女の人のインタビューを聞いて、ブランクに書いてください。

Part 2

:日本で仕事をしている三人の女の人にインタビューをして、次のことを調べてください。

- a) 仕事で問題があったとき、どうしたか。
- b) 仕事をしていてよかったことは、何か。
- c) これからどのようなことをがんばってみたいか。