

The Internationalization of Engineering Education: A Tale of Two Countries

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Abstract—Two international exchange programs in engineering between universities in Japan and Canada, are described in order to explain the significant benefits gained by the undergraduate and graduate students, as well as the academic staff who participate, and to highlight key principles generally followed in the design and execution of exchange programs. One notable and successful engineering exchange program is between the University of Waterloo, located in Southern Ontario, Canada, and Tottori University in Japan, while the other is between the University of Waterloo and Kyoto University in Japan. Both of these programs include foreign students taking courses for credit or audit at the host university, and, for the case of graduate students, also receiving guidance in their research. Moreover, upon completion of one academic semester in Japan, all of the undergraduate Waterloo students studying at Tottori University are employed in Japanese industry for three to four months before returning to Canada. Of paramount importance to the education of the participating undergraduate and graduate students is the opportunity to learn, by first-hand experience, the language and culture of a foreign country. In fact, one of the key findings of a survey completed by Canadian and Japanese students who took part in the exchange programs, is that living in a different culture greatly enhanced their own personal development. The addition of this international perspective to a solid education in engineering opens many doors of opportunity for exchange program alumni, who are well prepared to fully participate in the global marketplace of the 21st century, and to assist society in responsibly reaching an equitable and sustainable future.

Index Terms—Cultural awareness, engineering education, foreign work experience, international exchange programs, pedagogy.

I. SONG OF GLOBALIZING ENGINEERING EDUCATION

DURING the second half of the 16th century, when the Ashikaga shogunate was collapsing, three great leaders emerged to unite Japan: Oda Nobunaga, Toyotomi Hideyoshi, and Tokugawa Ieyasu. The different personalities of these remarkable visionaries is aptly portrayed in a verse known throughout Japan:

What if the bird will not sing?

Nobunaga responds, “Kill it!”

Hideyoshi answers, “Make it want to sing.”

Ieyasu says, “Wait.”

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Our philosophy in founding and running two exchange programs, between Canada and Japan, is closely aligned to that of Hideyoshi, whose able leadership inspired a prosperous period of *renaissance* at a crucial time in Japanese history [11]. At our universities in Japan and Canada, engineering students are regularly encouraged to add an international and cultural dimension to their education by volunteering to participate in exchange programs between our two countries. Just as the late 16th century Japan saw many dramatic changes take place, so too, the world today is undergoing fundamental transformation, as societies interact globally in an ever-expanding international marketplace. We can think of no better experience for our students to learn and adapt to this new global order than by living, studying, and even working in a foreign country as part of their undergraduate or graduate university education. Academic staff are also able to enhance their research and teaching expertise, while gaining international experience, by helping to run exchange programs and by visiting foreign universities.

The main objectives of our paper are to explain how our Canada/Japan exchange programs have greatly enriched the education and cultural understanding of our students, how they provide a vehicle for our academic staff to expand their international academic projects, and how the wisdom we have garnered can be encapsulated into a set of principles for designing and operating a successful international exchange agreement. As explained in detail in Section IV, two international exchange programs between the University of Waterloo, located in Southern Ontario, Canada, and Tottori University, located in Japan, as well as a second one between Waterloo and Kyoto University came into operation in 1988 and 1992, respectively. At the present time, only graduate students from the two Japanese universities have studied at Waterloo, while Waterloo has sent only graduate students in engineering to Kyoto University. Additionally, each year undergraduate engineering students from Waterloo study the first semester of their third year at Tottori University followed by a three to four month workterm in companies located throughout Japan. However, it should be pointed out that these two programs are open to both undergraduate and graduate students in engineering at all three participating universities. We are pleased to report that all of the 132 Canadian and Japanese students who have lived abroad under these two programs, have successfully completed the program requirements.

The main objective of the international exchange programs is to furnish our students with the opportunity to learn the culture and language of another country, by means of hands-on experience. Within the classroom setting, students are able to compare the differences in pedagogy between Canada and Japan. A

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