CO-CREATIVE EDUCATION BEYOND CULTURES AT KANAZAWA INSTITUTE OF TECHNOLOGY

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ABSTRACT

Everyone recognizes the value of young students from all over the world understanding each other beyond cultures in order to solve the problems the world is facing. In addition, universities must exist as a central place to foster such global discussion and creation. However, Japanese universities are gradually losing their global position. In response to this situation, since 2014, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan has been developing the “Super Global University Creation Support” project to promote the globalization of universities. In order to strongly advance the globalization of education at Kanazawa Institute of Technology (KIT), the president developed the framework “co-creative education beyond cultures” in September 2016. In this co-creative education, we have divided the problem of globalization as “Outbound” and “Inbound” and created various programs to address both. As a representative program of “Outbound,” KIT developed a new dual degree program with Rochester Institute of Technology (RIT) in 2017. In this program, students of both universities can earn degrees from both schools by spending one year at RIT and one year at KIT and exchanging the units earned at each school. As a representative “Inbound” program, KIT developed a joint internship education program for students of Vietnam Japan Institute of Technology (VJIT) and KIT. In this program, VJIT students prepare for the internship in Vietnam, as well as in Japan. After that, they participate in an internship with a Japanese company for several weeks. During this program, both during the education portion at KIT and during the internship, each VJIT student is paired with a student from KIT. KIT intends to strongly promote globalization by enhancing these programs, as well as developing new joint programs with international universities and companies in the future.

KEYWORDS

Global Education, Dual Degree Program, Joint Internship Education Program, Standards: 4, 5, 8, 11, 12

INTRODUCTION

Everyone recognizes the value of young students from all over the world understanding each other beyond cultures in order to solve the problems the world is facing. In addition, universities must exist as a central place to foster such global discussion and creation. However, Japanese universities are gradually losing their global position. According to the

university rankings by Times Higher Education in 2017, there are only 2 Japanese universities (Tokyo and Kyoto University) in the top 100 universities in the world. Also, these two universities are no longer the top universities in Asia.

This change in education ranking seems to overlap with changes in the global position of engineering companies in Japan. For example, from the 1960s to the 1980s, Japanese industrial products led the world market (Vogel, E., 1979), but in the 1990s, the presence of Japanese companies gradually became smaller. Since the beginning of the 2000s, Japanese companies have not been competing with global companies, such as Apple, Google, and Amazon. The reason for these changes in the global positions of Japanese engineering companies and Japanese universities appears to be same – lack of innovation based on a global perspective.

In the 1970s and 1980s, Japan had the advantage of a diligent and simple ethnic workforce that provided high quality industrial products at low cost. In addition, engineering education at universities had the advantage of educating diligent employees, who shared the same high level of knowledge and skills, to produce high-quality industrial products. Meanwhile, from the 1990s to the 2010s, the quality of engineering in Asian countries increased, and the price competitiveness of Japanese industrial products decreased somewhat. In addition, companies have been required to create innovative products that not only have high quality and low prices in the global market, but also provide a new user experience that creates undeveloped markets. Apple, Google, Amazon, and Facebook are considered the most successful companies in this respect (Deighton, J. & Kornfeld, L., 2013).

In contrast to the success of such global companies, many Japanese companies have been unable to change corporate governance because of past success (IMD, 2017). Japanese higher education has also not changed its antiquated method of cultivating diligent human resources with a homogeneous set of knowledge and skills. As a result, human resources capable of producing innovative products that can be acquired by global markets have not been developed. This is one reason why Japanese companies and universities have lost their global positions.

In response to this situation, in 2014, the Ministry of Education, Culture, Sports, Science and Technology in Japan (MEXT) began developing the “Super Global University Creation Support" project to promote the globalization of universities. In this initiative, the ministry selected 13 universities as “Top-Level” universities aiming to be within the top 100 in the world university ranking and 24 universities as “Globalization-Driven” universities that will promote the globalization of universities as soon as possible (MEXT, 2014). For each selected university, various programs have been developed. For example, Shibaura Institute of Technology developed multiple Project Based Learning (PBL) courses jointly with overseas affiliated schools and developed engineering education from various perspectives (SIT, 2014).

In order to advance the globalization of education at Kanazawa Institute of Technology (KIT), the president developed “co-creative education beyond culture” in September 2016. Originally, KIT began educational reform in 1995 and developed the student-centered education program to foster “engineers who think and act on their own” (KIT, 2016). During the reform process, KIT introduced active learning into the whole school and tried to enrich students’ subjective learning.

As for globalization, KIT's only effort was the implementation of an exchange program that provided language study. In engineering education, globalization was hardly considered. In order to change this situation, the working group of co-creative education beyond culture divided the problem of globalization into "Outbound" and "Inbound" and have created various programs to address both.

As for Outbound programs, we have been developing joint educational programs with overseas affiliated schools such as a dual degree program and "Learning Express." Also, we have been developing the "English Language Immersion Camp" where students engage in various activities using English for a short period of time.

As for Inbound programs, we have been enhancing language programs with affiliated universities and developing short-term engineering programs for Asian students. In addition, we have been developing the joint internship program with Vietnam Japan Institute of Technology (VJIT).

By implementing these programs, we will promote KIT's globalization, which has been delayed thus far. Moreover, we will combine this globalization with our original education style and CDIO standard (4, 5, 8, 11 and 12) to foster students who can realize innovation from a global perspective. In the following two sections, a representative Outbound and Inbound program are described.

OUTBOUND PROGRAMS

In Outbound programs of co-creative education beyond culture, KIT has been trying to create opportunities for KIT students to travel outside of Japan and to engage in innovative engineering activities through interactions with students from various countries. The programs in development are listed below:

- Dual or joint degree program with Rochester Institute of Technology and other overseas affiliated schools
- "Learning Express" where students of Asian universities visit rural places in Asian countries in order to solve local problems using the design thinking method
- "English Language Immersion Camp" aiming to improve language skills during a short time period
- Introduction of English education in specialized subjects in each department to enhance practical language skills

Among these programs, KIT developed a dual degree program with Rochester Institute of Technology (RIT) in 2017. KIT and RIT had a history of partnerships for over 20 years and both schools share a common strength of student-centered engineering education. After the celebration of the 20-year partnership, both institutes discussed the next 20 years and agreed to develop a new program to foster global students. It took more than two years to develop this program, in order to ensure consistency of the programs and to coordinate the semester schedule. The memorandum of agreement between the two institutes was finally concluded in June 2017.

The outline of this program is as follows. Students in the master's program at KIT and RIT spend one year at each institute and acquire credits by taking the necessary courses. In addition, each student is supervised by a faculty member from KIT and RIT and completes a

master's research project. Units acquired at both universities are transferred respectively, and it is possible to acquire a master's degree from both KIT and RIT if the student satisfies the graduation requirements. Figure 1 shows the list of unit acquisition.

For RIT Degree (30 credits)	For KIT Degree (30 credits)
Courses taken at RIT = 15 credits • Analytical Topics (3 credits) • Flexible Cores (6 credits) • Graduate Elective (3 credits) • Thesis (3 credits)	Courses taken at KIT = 18 credits • Thesis (6 credits dual enrolled) • Technical Subjects (6 credits) • Global Innovation (4 credits) • International Internship/Business (1 credit) • Professional Ethics in Engineering (1 credit)
Transferred courses = 6 credits (from KIT) • Global Innovation (4 credits) • International Internship/Business (1 credit) • Professional Ethics in Engineering (1 credit)	Transferred courses = 6 credits (from RIT) • Analytical Topics (3 credits) • Flexible Cores (3 credits)
Dual-enrolled credits = 9 credits (from KIT) • Thesis (6 credits) • Technical Subjects (3 credits)	Dual-enrolled credits = 6 credits (from RIT) • Thesis (3 credits) • Flexible Core or Graduate Elective (3 credits)
Additional courses taken at KIT or RIT =6 credits	Additional courses taken at KIT or RIT =3 credits

Figure 1. Classes and credits should be acquired at RIT and KIT

The total number of units that must be acquired at both universities is 30, and 15 to 18 units are acquired at the student's home institute. Of these subjects, some course were newly developed for this program from the CDIO standard 5 and 8 point of view. One such course is "Global Innovation," which is offered at KIT. In this course, PBL will be implemented in a short-term Hackathon style, utilizing the new campus of International College of Technology (ICT) in Hakusan City. Students of KIT and RIT, as well as companies, local residents, and governments participate in this course. These participants propose a solution to global and local problems from diverse perspectives. "KIT Hackathon," which is the prototype of this course, has already been conducted several times (Figure 2). In this activity, various participants have proposed diverse solutions, but more advanced and deeper solutions will be produced by adding global perspectives.

Figure 2. Pictures in KIT Hackathon

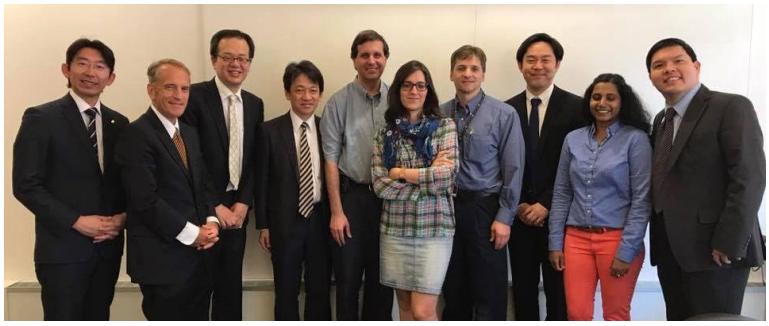

Figure 3. Team members of dual degree program at RIT and KIT

Also, in this program, professors at both institutes (Figure 3) supervise each student's research project. In this project, students will solve global problems from an engineering perspective. RIT has strengths in fields such as computer hardware, security, and machine learning. KIT has strengths in fields such as IoT, human computer interaction, big data, and virtual reality. By fusing these fields, we can foster students with global and diverse research perspectives.

Through this program with RIT, KIT will globalize the institute's teaching system, facilities, and human resources. After that, KIT is considering expanding international partnerships with more universities.

INBOUND PROGRAMS

For Inbound programs of co-creative education beyond culture, we have been developing various programs in order to make KIT a global learning place. In the programs, students from around the world can learn about engineering in Japan and experience internships with Japanese companies. The programs in development are listed below:

- Japanese language training program that includes various engineering activities
- Short-term engineering program for Asian students
- Joint internship program with Japanese companies between VJIT and KIT

In these programs, VJIT and KIT have jointly operated the internship education program since 2016. VJIT opened in 2015 with the aim of fostering students who will become a bridge between Vietnam and Japan. At the opening the school, KIT's project design education was exported, and KIT has been supporting its implementation thus far (Figure 4).

Figure 4. Curriculum of VJIT and pictures in the class

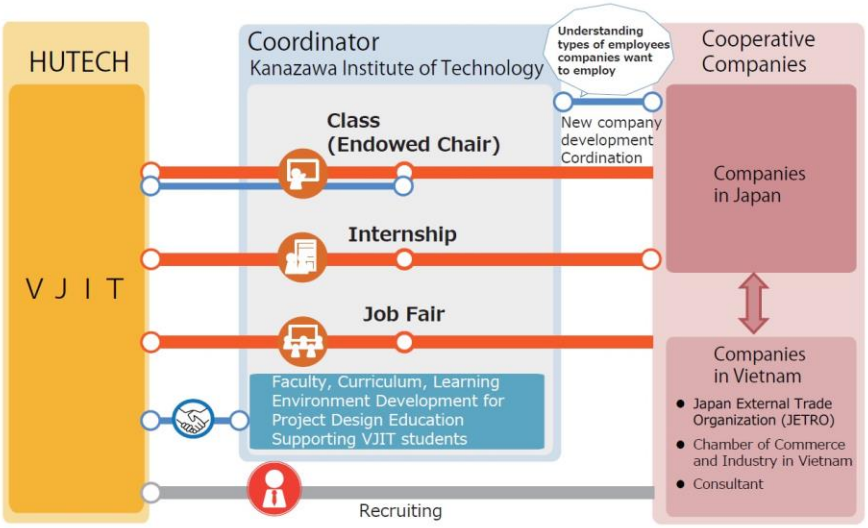

Figure 5. Framework of cooperative education between VJIT and KIT

Students who entered in 2015 became third years in 2017, and these students hope to get a job in Japan or with a Japanese company in Vietnam. In order to assist students with obtaining future employment, KIT has been supporting VJIT students as a coordinator since 2016 with support from AMEICC (AEM-METI Economic and Industrial Cooperation Committee in Japan). Figure 5 shows the framework.

In the framework, VJIT provides a PBL class where students propose a solution for the company where they will be employed, and that considers the CDIO standard 4, 5, 8. Students who participate in such a class then come to Japan and intern with the Japanese companies. Finally, KIT provides a job fair to match VJIT students with Japanese companies. Figure 6 shows the process of the internship, which is the main activity in this framework.

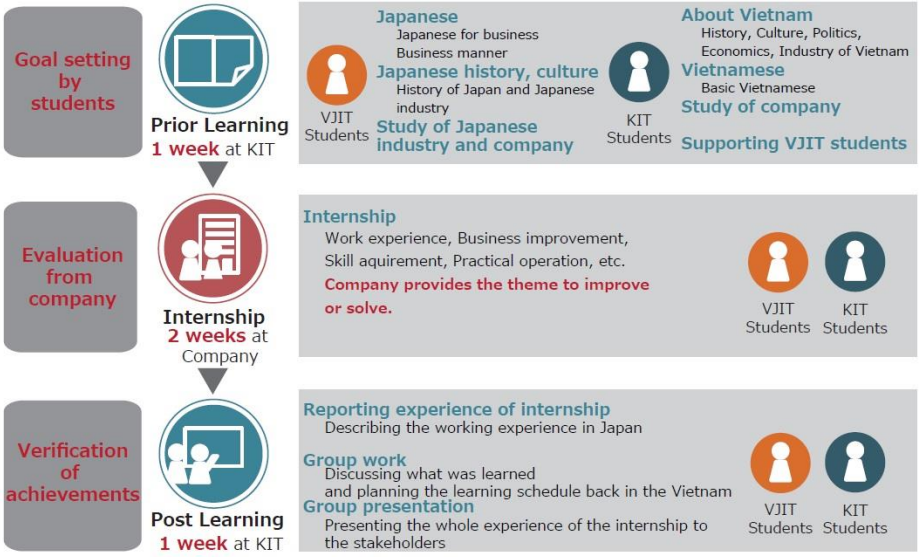

Figure 6. The internship process for VJIT and KIT students

Figure 7. Prior learning for VJIT and KIT students

In this program, VJIT and KIT students are paired together for an internship with a Japanese company. Through this approach, Japanese companies can reduce communication costs associated with hiring Vietnamese students. In addition, KIT students can enhance their communication skills with foreign students. Of course, VJIT students receive a lot of support from KIT students. In this program, for the first week before going to a company, VJIT students conduct a Japanese language training, as well as a preliminary course on Japanese history and industry. At the same time, KIT students learn Vietnamese language, history, and culture and also support VJIT pre-learning. Figure 7 shows the pictures of the first week, and these activities provide introduction to engineering (CDIO standard 4).

After this pre-learning, VJIT and KIT students intern at the company for a one or two-week real work experience (CDIO standard 5). During the first program in the summer of 2017, six VJIT and six KIT students interned with companies. The themes for the internships were "creating an academic version of a software product developed by a company and proposing it to the university," "picking work and its improvement," and "practice and evaluation of metal processing." After work and on the weekend, KIT students shared their social lives with VJIT students, and VJIT students were, thus, less anxious while in Japan.

Figure 8. Pictures of internships at several companies

Figure 8 shows the pictures of internships at several companies. All VJIT students were enthusiastically engaged in the work, and companies highly evaluated the students' attitude toward the work. Although the internship period was short, some students have improved significantly in Japanese, and most of the students' desire to find employment with Japanese companies increased to some degree.

In this program, after completing the work experience, post-learning was conducted from the CDIO standard 11 point of view. During post-learning, students reviewed their employment experiences through group work. During pre-learning, each student evaluated his/her ability about employment based on a rubric (5-stage evaluation) as shown in Figure 9.

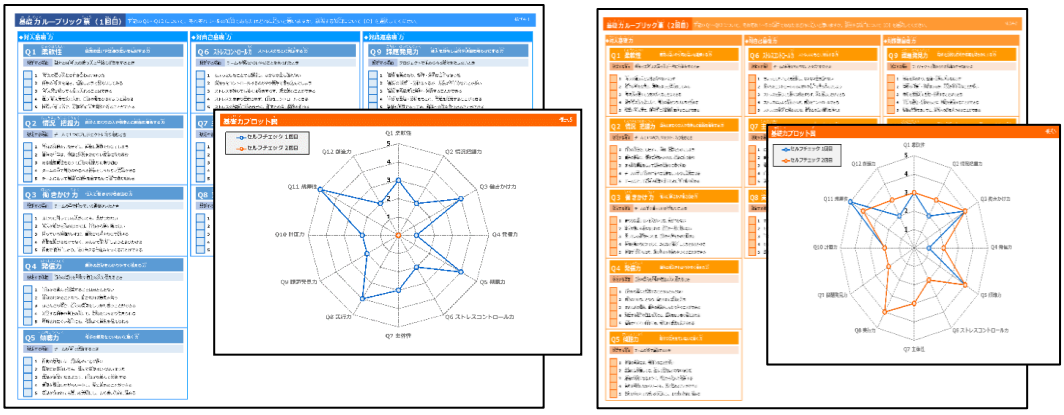

Figure 9. Rubric of business abilities for VJIT and KIT internship

Figure 9 shows an actual rubric, which consists of items such as “ability to step forward,” “ability to think thoroughly,” and “ability to work in teams.” Both VJIT and KIT students evaluated their own abilities for each item at pre-learning, and after that, they decided how much they sought to improve these abilities during the work experience. After the work experience, the companies evaluated the students’ abilities using the same rubric.

During post-learning, students evaluated their abilities again after the work experience. Figure 10 shows the averages of all of the evaluation values of the rubrics before and after the work experience. A significant difference was observed ($p > 0.01$) as a result of the Wilcoxon rank sum test on these average values. Based on these results, students from both universities recognized that their ability has grown through the internship. In the individual questionnaire, students provided several positive comments, such as “I understood the way of working in Japan” or “I learned the importance of team work.” Also, students provided many comments about further study, such as “I really want to improve my Japanese” or “I want to acquire more specialized knowledge.”

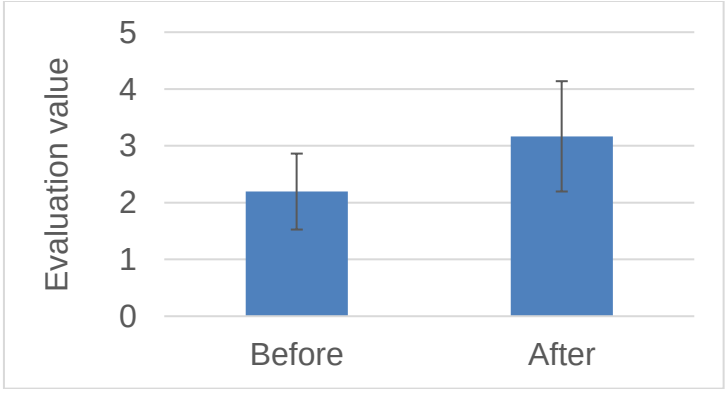

Figure 10. The result of self-evaluation from the rubric

At the end of this program, each student made a presentation about their achievements in Japanese. Figure 11 shows a picture of the final presentations. All staff was surprised at the improvement of Japanese in every VJIT student exhibited during the presentations. At the same time, it was quite impressive that the KIT students reported that the internship program was very fulfilling.

Figure 11. Picture of final presentation of the program

However, it was also revealed that the workload of supporting staff was very high. Students of VJIT had received Japanese language and basic engineering education in Vietnam, but there were individual differences between student knowledge. In carrying out various activities of the program, sometimes the staff had to cover material that was not part of the planned program. In order to solve this problem from the CDIO standard 12 point of view, it is necessary to review both educational programs.

Overall, this program between VJIT and KIT matches the needs of both schools, as well as the needs of Japan, which is currently short of labor, and is being considered for further development in the future. KIT hoped to extend the program to other universities in Asia.

CONCLUSION AND FUTURE WORK

In this paper, the contents of KIT's current co-creative education beyond culture" were described. Specifically, as an Outbound program, a dual degree program with RIT was explained. In addition, as an Inbound program, the joint internship program with VJIT was explained.

KIT will promote globalization by improving these Outbound and Inbound programs in the future. To achieve this, KIT will cooperate with more foreign universities and enhance its relationship with Japanese engineering companies. Moreover, it is necessary to develop the ability of KIT's involved staff to ensure rapid globalization.

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