EDUCATIONAL EFFECTS OF THE VANGUARD ENGINEERING PROGRAM: DEVELOPING THE NEXT GENERATION OF GLOBAL LEADERS

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Abstract

The Ministry of Education, Culture, Sports, Science, and Technology in Japan (MEXT) has highlighted the need for drawing up “regional revitalization strategies.” In addition, MEXT has been demanding that every educational institution should collaborate with local companies and promote the cultivation of advanced human resources to solve today’s complex and various challenges. The terms “regional revitalization” and “globalization” are, in other words, keywords in the development of human resources. Under these circumstances, MEXT has started a grant-in-aid for the “KOSEN 4.0 Initiative” project. Two project proposals from our college were accepted; one was the “Vanguard Engineer Fostering Program” to support and lead the development of regional industries internationally, and the other was the “NaDeC (Nagaoka Delta Cone) Entrepreneurs Fostering Program,” a regional revitalization project based on “Nagaoka Rejuvenation.” Along with the two new educational programs and system design educational program, we also began work on a new human resources development program with the goal of nurturing next-generation leaders. The system design educational program has already embedded its roots deep in our college. The new program focuses on fostering the ability of students to solve problems, develop an entrepreneurial mindset, and to have a global mindset that is able to develop better communication, relationships, and understanding among colleagues and global partners. In this research, we introduce the “Next-Generation Engineers Fostering Course Programs” and “Vanguard Engineer Fostering Program.” In addition, we discuss the educational effects of the aforementioned engineering program.

Keywords: Globalization, Global Leader, Innovation, KOSEN 4.0

Introduction

The terms “regional revitalization” and “globalization” are keywords in the development of human resources in Japan. The Japanese Ministry of Education, Culture, Sports, Science, and Technology (MEXT) has emphasized the requirement of “regional revitalization strategies.” In addition, MEXT has been demanding that every educational institution, in collaboration with local companies, must promote the cultivation of advanced human resources to solve today’s various complex challenges (MEXT, 2015). Under these circumstances, MEXT has started a grant-in-aid for the “KOSEN 4.0 Initiative” project (MEXT, 2017).

KOSEN4.0 is one of the competitive grants offered by the Japanese government, and targets all KOSENs in Japan. The fund is aimed at projects that promote the three directions of “human resource development leading the new industry,” “contribution to the region,” and “acceleration and promotion of internationalization.” Therefore, based on these policies, we must renovate our educational system.

Our college proposed two innovative projects that were both accepted, namely, “Vanguard Engineer Fostering Program” to support and lead international development of regional industries, and the “NaDeC (Nagaoka Delta Cone) Entrepreneurs Fostering Program,” a regional revitalization project based on “Nagaoka Rejuvenation.” In this regard, we began working on a new human resources development program with the aim to nurture next-generation leaders.

In the present research, we introduce “Next-Generation Engineers Fostering Course Programs” and “Vanguard Engineer Fostering Program.” Additionally, we discuss the educational effects of the educational program.

Outline of Next-Generation Engineers Fostering Course Programs

The Next-Generation Engineers Fostering Course Programs were created for fostering innovative human resources who can respond to the internationalization and impact of the social economy in Japan. The programs are based on the professional education of various departments, and consist of “System design educational
program” (Toyama, 2015), “Vanguard Engineer Fostering Program” and “NaDeC Entrepreneurs Fostering Program” (Fig. 1). The new program is focused on fostering the students’ abilities to solve problems, develop an entrepreneurial mindset, and have a global mindset that is capable of developing better communications, relationships, and understanding among colleagues and global partners.

The three course programs consist of a “basic course” that will be available for 4th- and 5th-year regular students, and an “expert course” that will be available for 1st- and 2nd-year advanced course students. However, first-year students can also opt for some of these courses. Each course program is composed of subjects that are common to all departments. Thus, all students can take the courses, regardless of the department.

In addition, course students can learn various educational methods from faculty members beyond their departments.

Figure 1. Next-Generation Engineers Fostering Course Programs.

Vanguard Engineer Fostering Program

In recent years, the globalization of the market and the subsequent multi-nationalization of companies has progressed rapidly; hence, it is necessary to encourage human resources that can play an active role internationally. In this course, opportunities to develop communication skills, a challenging spirit, and intercultural understanding considered necessary for global human resources are provided by Global Project-Based Learning (Global PBL), with Nagaoka or various foreign countries as the location for learning.

Having a wide range of experiences and connections, both domestic and international, as well as deepening the understanding of the local culture of Nagaoka, regional cultures, or cultures of other countries will be great assets in the future. In this college, one can expand their social circle to include people from all over the world, and aspire to become engineers who can play an active role on a global scale.

Some new subjects in this course were included; one of them is a “Global PBLI,” in which mixed teams are created with local companies, Nagaoka Delta Cone (NaDeC) (Fig. 2), as well as foreign partner universities and international students, to work towards resolving various issues. “Global PBLII” is almost the same as PBLI, except the learning takes place overseas. Furthermore, “global debate” subjects for acquiring the debate skills necessary for discussion have also been arranged. The course encourages students to become engineers with leadership skills who have the ability to think appropriately for the international community and can also proactively expand the superiority of local culture and industries overseas.

Figure 2. Nagaoka Delta Cone plan.

Global PBLI

The new subject is a program to address solving regional issues at our college along with students of international partnership colleges. As an example, we introduce the activity done with Far Eastern State Transport University (FESTU, Russia). This program aims at training IT human resources in the Nagaoka area as well as improving robotics education at FESTU. The students from both our college and FESTU created a self-propelled robotic AI system to learn about an automatic delivery system that attracted worldwide attention. Additionally, they discussed technical issues in the automatic delivery system during the activity (Fig. 3, 4). The subject was demonstrated as being useful for nurturing their practical programming and program solving skills in English.

Figure 3. The atmosphere of PBL activities.
Global PBLII

This subject differs from Global PBLI in that it is conducted overseas. We introduce the program with Guanajuato and Salamanca KOSEN in Mexico (Akazawa, 2017).

In March 2017, we conducted Global PBLII in Mexico, along with students of the KOSEN course in the University of Guanajuato and Salamanca in Mexico. We worked on solving local problems (e.g., the problem of graffiti, effective use of rainwater) in English. After these activities, we created a questionnaire for both the students and faculties. As a result, it became apparent that the project was highly appreciated by them, and all attendees and participants of the program were highly motivated. It has been obvious that this program was extremely effective in encouraging a global mindset and problem-solving skills of students (Fig. 5, 6).

Global debate

“Global debate” collaborates with NaDeC students to nurture their ability to debate in English.

First, the students learn the basics of debate using e-learning. Then, they discuss familiar subjects with each other, after which they attempt to debate against social problems. Finally, the students debate in English with NaDeC students, including students of the Nagaoka University of Technology.

All faculty members can watch the English debate stage. It is revealed that the educational effect is quite high for students (Fig. 7).

Development of overseas partnerships

As part of spreading international exchange activities, new overseas academic agreements have been formed. We visited the Metropolia University of Applied Sciences and the Turku University of Applied Sciences (Turku AMK) in Finland in March, 2018. Our KOSEN concluded a Memorandum of Understanding (MOU) with Turku AMK, and the student exchange program has started since May this year (Fig. 8). Furthermore, we are promoting the preparation of a double degree program with Turku AMK.

As other activities of the projects, we improved the learning commons, produced a brochure summarizing international activities, and prepared for participation in the CDIO (Conceiving-Designing-Implementing-Operating) initiative, which involved the development of an innovative educational framework for producing next-generation engineers.
Furthermore, to increase the global skills of faculty members, providing them with overseas work experience as well as encouraging them to participate in international conferences are being attempted. Through these activities, we are fostering “vanguard engineers,” and promoting the internationalization of our College.

Conclusions
We developed novel educational programs for fostering vanguard engineers who are capable of debating with foreign students in the English language, as well as improved the learning commons. In addition, we concluded a new MOU with a foreign university, having been attempting to increase the global skills of faculty members. Through these activities, we facilitated a novel human resource educational system called the “Vanguard Engineer Fostering Program.”

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References


