International exchange between Thai and Japanese students as a part of an environmental research project

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Abstract

The National Institute of Technology, Yuge College (NITYC), and Nakhon Phanom University (NPU) have formed a partnership and been participating in short-term exchange programs. During a short-term exchange reported here, we worked on a project to develop a system for conducting surveys of the Mekong River. The present project focuses on the development of an Arduino-based water supply and water quality survey system. Our students are also engaged in research, presentations, report writing, and recreational activities with Thai students to enhance their skills as international engineers. Here we also report a survey conducted to evaluate the project's effectiveness.

Keywords: *International exchange, Cooperative study, Environmental research, Technical cooperation, Water-quality survey*

Introduction

National Institute of Technology, Yuge College (NITYC) has signed an agreement with Nakhon Phanom University (NPU). NITYC is located near the Inland Sea, while NPU is near the Mekong River. For this reason, the two schools have continued to engage in international exchange activities related to environmental studies and participated a joint development project of an "autonomous research vessel". In recent years, NPU students from the Department of Electrical Engineering and Technology and NITYC students from the Department of Information Technology and the Department of Electronic and Mechanical Engineering have also collaborated on research projects in NPU's Nursing Department.

In the project reported in this paper, the students tackled a new issue focusing on the water quality of the Mekong River, which is undergoing remarkable environmental changes due to dam construction and other factors. The students from both schools have developed a water quality survey system and conducted an on-site survey of the Mekong River's water quality. They have created a "water supply system" and a "pH survey system" using Arduino, and conducted a survey on the water quality of the Mekong River. In addition, they carried out a review on related research papers, gave presentations on their findings, and prepared reports. Besides that the participated students have had experiences correlated with becoming international engineers as they had local cultural exchanges such as dinners and temple visits.

In this paper, we report an overview of the international exchange and the current status of the Mekong River. Next, we report on the results of the most recent water quality survey and other exchange projects. Furthermore, the results of the awareness survey questionnaires conducted on students before and after the international exchange will be presented, and a summary of this project will be given.

NITYC and NPU

NITYC is a college located on an island of Seto Inland Sea in Japan, and is located next to the sea, as shown in Figure 1.

Figure 1. Sea near NITYC

Figure 2. Mekong River near NPU

The NPU is located near the Mekong River in Thailand as shown in Figure 2. Both schools have continued to conduct research utilizing the characteristics of their respective locations, such as the development of an environmental research boat, through short-term student study abroad projects. In this project, students from the two schools exchanged techniques on issues related to water quality research.

Thailand and Mekong River

The Mekong River flows from southern China through the borders of Thailand and Laos, passing through Cambodia and Vietnam before emptying into the South China Sea. The Mekong River is the longest river in Southeast Asia, with a total length of 4,620 km. It is an important river for the Thai people, who need it for fishing and agriculture.

In recent years, many dams have been constructed upstream of the Mekong River, which has drastically changed the environment of the Mekong River basin. Water quality has also begun to change drastically in some places, and the river, which previously was brown, has now turned blue. Therefore, monitoring of environmental changes is essential for the sustainable development of the Mekong River Basin. NITYC and NPU are continuously developing environmental survey boats to monitor the Mekong River's topography.

Past exchange results

Yuge College and NPU have exchanged 5 times. Table 1 shows the implementation years, the number of students of Yuge College and major developments. We have been developing the environmental research boat continuously for 10 years since we started this program. In 2013, we had reported the results of this ongoing project. Also, we reported at an international conference in 2015.

Table 1. Exchange results

Implementation year	Number of students	Major Developments
2012	7	Environmental Research Boat
2014	7	Environmental Research Boat
2016	4	Nursing Equipment
2019	6	Nursing Equipment
2022	4	Water-quality survey

In order to carry out the 2022 exchange program reported here we had a round trip from Fukuoka to Bangkok and Nakhon Phanom, Thailand. During our stay in Bangkok, we also visited Ayutthaya and learned about cultural differences.

In Nakhon Phanom, the students from NITYC and NPU worked together to survey the water quality of the Mekong River with an "Environmental Survey Boat," in which students from NPU's Department of Electrical Engineer and NITYC's Department of Electronic and Mechanical Engineering and Department of Information Technology collaborated to develop a water quality survey system and as a result they assessed the quality of the river.

Below is an introduction to our project.

Results of Existing Projects

1. Development of environmental research boat

Based on the autonomous navigation algorithm developed by Prof. Tabusa et al, a new algorithm was developed to survey the river bottom of the Mekong River. The development is still ongoing.

Figure 3 shows past experiments on the Mekong River.

Figure 3. Experiment on the Mekong River

2. Joint Development with the Department of Nursing

In 2016, we developed a massage pillow for pregnant women, as shown in Figure 4. In 2019, we developed a nursing device for people with leg injuries, PUSH IT UP, as shown in Figure 5. In this project, we first interviewed students in the Department of Nursing about the challenges they faced, then the actual hardware was created by students in the Department of Electrical Engineer, the software control was done by students in the Department of Information Technology, and the device design was created by students in the Department of Electronic and Mechanical Engineering.

Figure 4. Maternity pillow

Figure 5. PUSH IT UP

Outline of this project

In this project, NITYC students and faculty traveled to Thailand for 10 days from December 18, 2022 to work on a project with NPU students and faculty. The flow of this year's project is as follows.

1. Presentation to introduce the schools
2. Discussing the water quality survey system to be developed
3. Construction water supply system and pH survey system
4. Water sampling and water quality survey in the Mekong River
5. Summary and presentation of results
6. Preparation of report

In addition, international exchange recreation and facility tours were conducted during the project. In addition, the students were given questionnaires before and after the project.

Water Quality Survey Experiment and Development of Water Supply System

Using arduino, a microcomputer device, the students from both schools developed an automatic water supply system shown in Figure 6 and conducted a water quality survey experiment on the Mekong River. The software control was done by the students of the Information Technology Department, and the design of the device was done by the students of the Electronics and Mechanical Engineering Department. The students of NPU created a pH investigation device and shared their procedures. The water quality survey scene is shown in Figures 7 and 8.

In the experiment, water samples were collected at two points in the Mekong River, one where domestic wastewater flows and the other where clean water flows, and water quality was investigated. The items investigated were pH, chemical Oxygen Demand, Iron, Total Hardness, Nitrite, and E. coli. The students presented these findings in English and compiled them into a report. The results of this survey will be studied as basic data for future exchange projects.

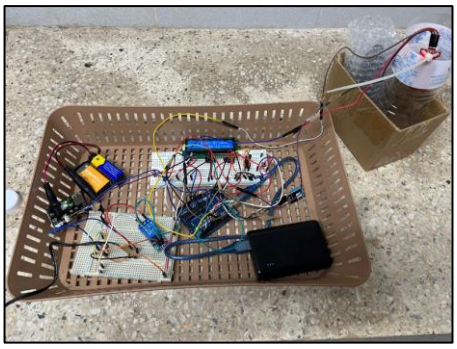

Figure 6. Automatic water supply device developed

Figure 7. Water sampling at the Mekong River

Figure 8. Water quality survey

Cultural exchange and tours

In addition to the projects described in the previous chapter, the students also participated in cultural exchanges and facility tours. Our students visited facilities on the NPU campus, the temple in Nakhon Phanom, and the New Year's Festival. This short-term program took place in December, a special time of year when the New Year's Festival is celebrated.

Our students interacted with NPU students as part of an international exchange by observing the festival lights, walking around the town, and having meals together. NPU students also gave a lecture on how to visit temples in Thailand.

Figure 9 shows a scene from the exchange meeting.

Figure 9. Scene of students being taught how to visit Thai temples

Questionnaire Results

Questionnaires were administered to students before and after their short-term study abroad. This chapter summarizes the results of the questionnaires before and after the study abroad program. This questionnaire was compiled with reference to the Japan Student Services Organization's (JASSO) questionnaire for exchanged students, which was answered on a 5-point scale (1. Disagree to 5. Strongly Agree). The questionnaire is presented below, with results for students supported by JASSO from 2016 to 2022.

a. Able to take the initiative in finding issues that need to be addressed
b. Able to reach out to peers and take action to improve problems together
c. Think about the solution process for an issue and execute it in a planned manner
d. Able to take a leadership role in different places and within one's own cultural background
e. Able to actively communicate the meaning of a foreign language, even if it is inadequate
f. Understand and accept people who have different faiths and cultural backgrounds from their own

g. Have a strong motivation to study their area of expertise
h. There is motivation to study linguistics
i. Have a clear idea of the future direction and career path

A graph summarizing the average results of the 13 students' questionnaires is shown in Figure 10. Comparing the results before and after our project, all items were confirmed to have improved. In particular, items d and e have improved significantly. This indicates that the students have grown to be able to communicate actively even if they are not sure about their foreign language skills.

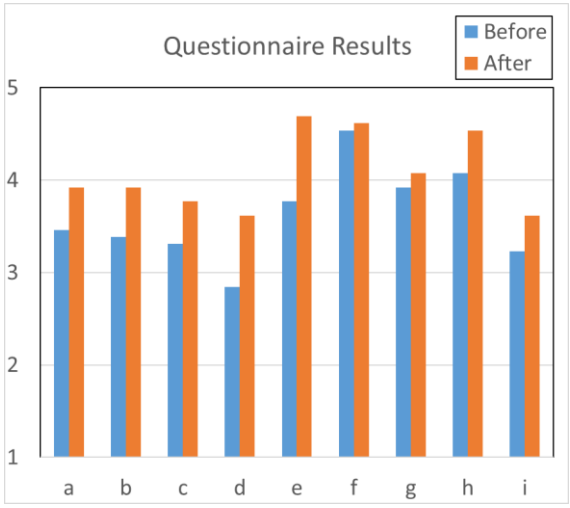

Figure 10. Questionnaire Results

Conclusions

This paper summarizes the results of the short-term exchange program between NITYC and NPU. In this project, we developed a new initiative to study the water quality of the Mekong River.

Through our exchange program, our students gained international communication skills, leadership, and important experience to become international engineers.

Acknowledgements

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