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# The held report of International Engineering Design Challenge

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**Abstract:** Authors conducted a workshop as an experiment to improve the engineering design ability and international sense of college students. Six Japanese students and 11 Thai students participated in the workshop. 17 students were divided into 4 teams and they proposed a new communication medium for each team. The students received several lectures and group work for the proposal. The students answered a questionnaire before and after participating in the workshop. As a result of analyzing the questionnaire, Japanese students realized that their ability was improved more than Thai students. In addition, students in other fields than engineering students said that their abilities improved.
**Keywords:** PBL, project-based learning, engineering, design, workshop

## 1. BACKGROUND AND PURPOSE

College students are required the ability to solve their problems in their own initiative. For that reason it is important to enhance the ability to communicate with others and cooperate in teams. Project-based learning is known to learn practical problem-solving abilities and teamwork. So it has been introduced a lot in university lessons [1]. However, designing of project-based learning burdensome for teachers and difficult. Therefore the author studies the elements of effective project-based learning exercise.

We have held a cross-domain international design workshop for university student [2]. The workshop was named "International Engineering Design Challenge" (This is called IEDC below). IEDC has been held since 2016. In 2016, it was held in Chiang Mai and Phitsanulok in Thailand. In 2017, it was held in Hokkaido Japan. In 2018, it was held in Chiang Mai in Thailand. College students such as Japan, Thailand, China and Laos participated in these. In this paper, the result of IEDC 2107 is analyzed and reported.

## 2. CONTENTS OF IEDC2017

### 2.1 Schedule and location

IEDC 2017 was held from 13th until 17th March in Date City in Hokkaido Japan. The number of participants and their nationality are shown below.
・3 students of Muroran Institute of Technology (in Japan).
・3 students of Akita University of Art (in Japan).
・8 students of Chiang Mai University (in Thailand).
・3 students of Naresuan University (in Thailand).

11 students majored in engineering. 7 students majored in art, design, and logistic. Participants were divided into 4 teams. The nationality and major of students in each team were divided to be about the same.
The theme of the workshop was designing of "Propose a communication medium, which activates local communities". It means media that enriches the exchange of nearby people of the small community. In short, those are created to stimulate communication among friends, family members and local residents. The students received several lectures and did group work for the proposal. Table 1 shows schedule of the workshop.

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At beginning of the first day, students introduced themselves to each other. Then they answered the first questionnaire about the workshop. Next, they discussed and decided their team name.

On the second day, they enjoyed playing games together to get to each other. Then they got a lecture on "What is Media Biotope?" and "Brainstorming". After the lecture, they brainstormed about the concept of communication media, and they presented the result of the discussion.

On the third day, they got a lecture on "How to design your leaflet and presentation".

They learned how to tell their ideas to others. And they repeated discussions about their ideas in the group work.

On the fourth day they got a lecture on "What is Computer vision". Then they took a second presentation and received comments on the presentation from the lectures. Then they represented their ideas in leaflets, slides and posters in the group work.

In the morning of the last day, students announced the communication media they propose for each team. After the final presentation, they answered second questionnaire about the workshop. Items of the questionnaire are as follows.

Q.1 I can get along well with my team members.
Q.2 I can explain my opinions to my team members.
Q.3 My team members can understand my opinions.
Q.4 I don't have problem to show my opinions.

**Table 1:** The time table of IEDC2017

| Date | Schedule |
| --- | --- |
| 2017/3/13 | Guidance |
| 2017/3/14 | Ice breaking |
| | Lecture1 "What is Media Biotope?", "Brainstorming" |
| | Group work 1 |
| | Group work 2 |
| | The 1st presentation |
| 2017/3/15 | Lecture 2 "How to design your leaflet and presentation" |
| | Group work 3 |
| | Activity 1 |
| | Group work 4 |
| 2017/3/16 | Lecture 3 "What is Computer vision" |
| | The 2nd presentation |
| | Group work 5 |
| | Group work 6 |
| 2017/3/17 | Final presentation |
| | Activity 2 |
| | Evening Closing party |

Q.5 I can understand what my team member said.
Q.6 I accept and understand every opinion from my team members.
Q.7 My ideas can help my team to achieve goal.
Q.8 I'd rather work as teamwork more than work alone.
Q.9 My skill of language is not problem to communicate.
The five-step SD method was used for the evaluation method.

## 3. RESULT AND ANALYSIS
### 3.1 Communication media designed by each team
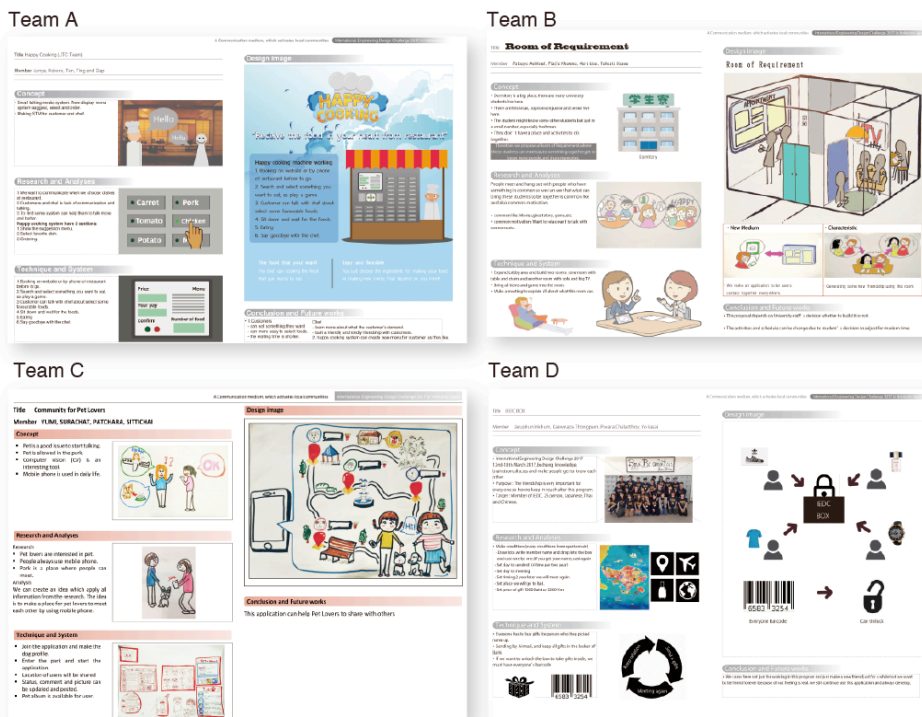
New communication media was proposed from each



**Figure 1**: Proposals by 4 teams

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team. Their proposal was ex-pressed on a worksheet of A3 size.

The figure of upper left in figure 1 shows a proposal by team A. They proposed "Happy Cooking". This system induces communication between customers and cooks. Customers don't order dishes by looking at menus. They consult with the cooks what they want to eat decide the menu.

The figure of upper right in figure 1 shows a proposal by team B. They proposed "Room of Requirement". It's a room for activate communication between students in dormitory. This room is at the entrance of the dormitory, so everyone will definitely pass. The room has bulletin boards and rental rooms. Students can study together, play games and watch TV. The students organize activities and recruit participants on bulletin boards and SNS.

The figure of bottom left in figure 1 shows a proposal by team C. They proposed "Community for Pet lovers". It's
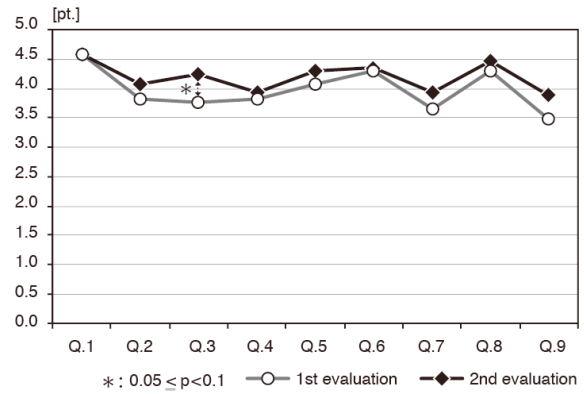


**Figure 2 :** Average of the result of questionnaire

a system that induces communication between pet enthusiasts. When a user arrives at an area in the park, users meeting each other can know the profile of each other's pets. The users enjoy talking based on the obtained information.

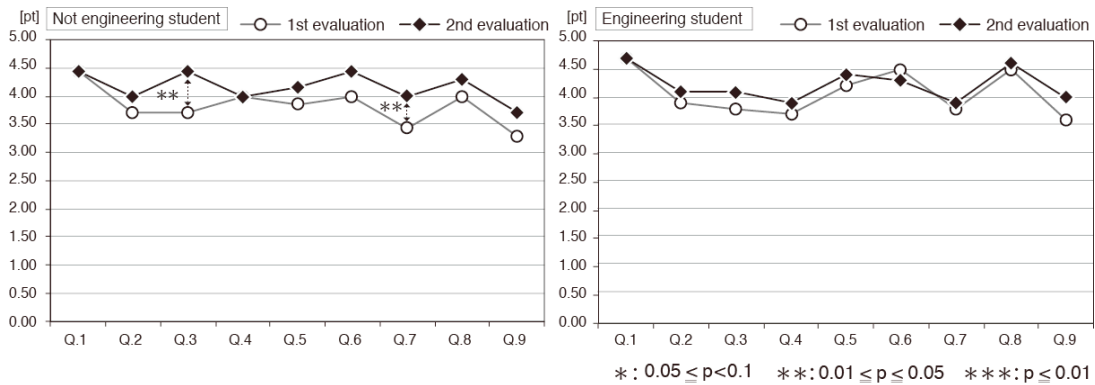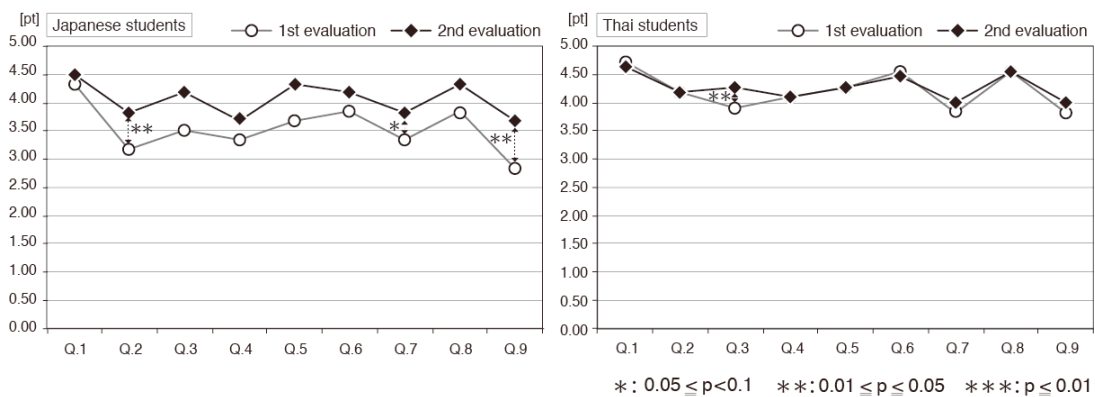The figure of bottom right in figure 1 shows a proposal



**Figure 3:** Comparison of the average of evaluations by students majored in Engineering VS the average of evaluations by students majored in fields other than engineering



Q.1 I can get along well with my team members.
Q.2 I can explain my opinions to my team members.
Q.3 My team members can understand my opinions.
Q.4 I don't have problem to show my opinions.
Q.5 I can understand what my team member said.
Q.6 I accept and understand every opinion from my team members.
Q.7 My ideas can help my team to achieve goal.
Q.8 I'd rather work as teamwork more than work alone.
Q.9 My skill of language is not problem to communicate.

**Figure 4:** Comparison of the average of the evaluation by university students in Thailand VS the average of the evaluation by Japanese students

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by team D. They proposed "IEDC BOX". This is a time capsule for IEDC 2017 participants. Each IEDC 2017 participant needs prepare a gift for entering this box. A barcode is distributed to each participant. After two years all of IEDC 2017 participant come to Bari, they can open the box with their barcodes.

Team B's proposal and team C's proposal were better appreciated than the other two proposals, because those proposals had novelty and were in line with the theme. Especially the proposal of team C was high feasibility and novelty.

On the other hand, team A's proposal seems to be a cooking system rather than a communication medium and the proposal of team D is not feasible. Team A and D students themselves understood that the ideas were not excellent, but they could not think of better ideas.

### 3.2 Result of the questionnaire

Figure 2 shows result of the questionnaire before the workshop and the results of the questionnaire after the workshop. There is a significance difference between the answers before the workshop in Question 3 and the responses after workshop. Despite a short workshop of about four days, many students felt that team members understood their own ideas.

Two graphs in figure 3 show comparison of the average of evaluations by students majored in engineering and the average of evaluations by students majored in fields other than engineering. Before and after the workshop there was a significant difference between the evaluation for questions 3 and 7 for students other than engineering. On the other hand, there were no significant differences in the results of the questionnaire of students in the field of engineering before and after the workshop. Therefore, it was speculated that the workshop lacked the tasks that required engineering techniques such as programming for engineering students.

Two graphs in figure 4 show comparison of the average of the evaluation by university students in Thailand and the average of the evaluation by Japanese students. Before and after the workshop there was a significant difference between the evaluation for questions 2, 7, 9 for Japanese students. On the other hand, before and after the workshop there was a significant difference between the evaluation for questions 3 for Thai students. Japanese students felt their explanatory abilities and language skills improved after the workshop. Thai students tended to have a higher English language ability than Japanese students in this work shop. Therefore, in these items they think that they did not evaluate that their abilities improved. However, the cause of this result is not clear, so we will ask opinions from teachers of Thai students.

### 4. CONCLUSION

The workshop as an experiment to improve the engineering design ability and inter-national sense of college students was conducted. Six Japanese students and 11 Thai students participated in it. The 17 students were divided into 4 teams and they pro-posed a new communication medium for each team. The students received several lectures and group work for the proposal. The students answered a questionnaire be-fore and after participating in the workshop. As a result of analyzing the questionnaire, Japanese students realized that their ability was improved more than Thai students. In addition, students in other fields than engineering students said that their abilities improved. Their proposal was compiled in a worksheet. In other words they expressed ideas with pictures and diagrams. These tasks belong to the field of graphic design. Therefore students studying engineering may have been unlikely to make good use of their engineering abilities. Our workshop was effective in extending the international communication skills of Japanese students. However, the contents should be improved to those that require engineering ability. Based on these considerations IEDC 2018 and IEDC 2019 will be held.

### REFFERENCES

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