

ISASE 2019

OS: Engineering Design Education and Project Based Learning

Design of International Engineering Design Challenge (IEDC)

Hidetsugu SUTO

* *Muroran Institute of Technology, 27-1 Mizumoto, Muroran, Hokkaido, Japan*
suto@sdlabo.net

Abstract: A series of workshops, called International Engineering Design Challenge (IEDC), are introduced. This series of workshops are held by three Japanese universities and two Thai universities. The main goal of the workshops is fostering participants skills for group works with various background members. In the workshops, each group tried to create a solution for an open question through group works. In this paper, the history of the workshops is shown, and the design concepts are discussed.

Keywords: *Group works, collaboration mechanism, Biotope of Learning (BoL)*

1. INTRODUCTION

International Design Workshop (IDW) was started in 2014 as a collaborative educational program between System Design Laboratory [1] in Muroran Institute of Technology and Kansei Engineering Laboratory in Future University Hakodate. In the series of workshops, students studying information engineering and product design worked together and proposed unique solutions for given problems. In the program, the author found many efficacies of collaborations of students who have diverse backgrounds.

In 2016, the program redesigned as International Engineering Design Challenge (IEDC) in order to focus on the efficacies more clearly.

The new series of workshops are held by staffs come from Muroran Institute of Technology, Akita University of Art, and Gifu City Women's College. The participants are students of information engineering, industrial engineering, arts, and visual design faculties.

In this paper, the history of IDW/IEDC are shown. Then the design concepts of IEDC are discussed.

2. HISTORY

IDW2014 Chiang Mai, Thailand: March 20 - 23, 2014

36 participants came from Chiang Mai University (Thailand), Muroran Institute of Technology (Japan), and Future University (Japan).

The main subject was decided as **Smile!**, because it is a symbol of Thailand. In this workshop, each student was

assigned to a group of six, and they tried to create an idea, which make the users smile. The rough schedule is shown below:

The 1 st day	Registration, guidance and ice breaking (creating nicknames of the members, team names and logo marks), lecture for TTS method [2], instructions of the assignment
The 2 nd day	Resource research, brainstorming, fieldwork (old city of Chiang Mai), group work, the first presentation
The 3 rd day	Group work, the second presentation
The 4 th day	Final presentation, farewell party

In this workshop, a supporting tool for fieldworks and brainstorming sessions, called TTS-method tool, was introduced. This tool consists of a mobile camera application and working sheets. By using this tool, users can organize data obtained in the fieldwork session. The user also can learn ways to make ideas form findings by using this tool.

Usually, many Japanese students do not have their nicknames despite pronouncing and remembering them are hard for foreigners. Meanwhile, most of Thai students have a simple nickname. Thus, in the series of workshops, activity of “creating nicknames for Japanese” are employed as ice breaking traditionally. To decide a nickname, the participants have to understand the personality and characters of the person. In addition, they can call easily each other by using the nicknames. They effect well for the group works.

IDW2014 Hokkaido, Japan: October 24 - 28, 2014

19 participants came from Muroran Institute of Technology (Japan), Chiang Mai University (Thailand), and Future University (Japan). 10 of them came from Japan (6 engineering course students, 4 product design course students and 2 lecturers), and 6 of them come from Thailand (6 information media course students and a lecturer).

The main subject was **Enhance Hokkaido Tourism**. Because we wanted the participant to create idea through fieldworks in several sightseeing area, the subject was decided.

The 1 st day	Welcome party (with ice breaking: creating nicknames, team names)
The 2 nd day	Fieldwork (Lake Toya area and Muroran city), brainstorming
The 3 rd day	Fieldwork (Apple picking), brainstorming, group works, mid-presentation
The 4 th day	Activity (Lake Toya cruising), group works, final presentation, farewell party (Sun palace hotel, Lake Toya)
The 5 th day	Closing ceremony

Unfortunately, the total number of participants reduced from the previous workshop. The number of Japanese participants was same as previous one despite it was conducted in Japan. Usually, Japanese students are not keen to take part in this type of events in comparison with Thai students. How to motivate Japanese students is one of the challenges of the project.

IEDC2016 Chiang Mai and Phitsanulok, Thailand: March 13rd - 20th, 2016

47 participants came from Chiang Mai University (Thailand), Naresuan University (Thailand), Muroran Institute of Technology (Japan), Akita University of Art (Japan), Gifu City Women's College (Japan). 18 of them came from Japan (4 engineering course students, 6 arts course students, 4 design course students and 4 lecturers), and 29 of them came from Thailand (19 engineering course students, 5 logistic course students and 5 lecturers).

The main subject was **Discover Arts in Chiang Mai**. The participants tried to create a novel idea which cause awareness for "arts things" hidden in the old city of Chiang Mai. In the workshop, they requested to create system/mechanism which can cause residents/traveler, who are not familiar with arts, awareness for arts things.

The 1 st day	City tour in Chiang Mai (pre-survey)
The 2 nd day	Opening, ice breaking (creating nicknames, team names and the logo marks), lecture
The 3 rd day	Lecture, group discussion, fieldwork, mini-presentation
The 4 th day	Lecture, group work, mini-presentation
The 5 th day	Lecture, group work, mini-presentation
The 6 th day	Move to Phitsanulok, city tour, mini party
The 7 th day	Lecture, group work, pre-final presentation
The 8 th day	Final presentation, farewell party

IEDC2017 Hokkaido, Japan: March 13rd - 19th, 2017

25 participants come from Muroran Institute of Technology (Japan), Akita University of Art (Japan), Gifu City Women's College (Japan), Chiang Mai University (Thailand), Naresuan University (Thailand). 11 of them come from Japan (3 engineering course students, 3 arts course students, design course students and 4 lecturers), and 11 of them come from Thailand (8 engineering course students and 3 logistic & supply chain course students).

The main subject was **Communication media which activate local communities**. The students tried to create now idea based on the concept of **Media biotope** [3,4].

The 1 st day	Workshop committees conference
The 2 nd day	Welcome meeting, guidance, ice breaking (creating nicknames, team names and the logo marks)
The 3 rd day	Lecture, group work, mini-presentation
The 4 th day	Lecture, group work, mini-presentation, activities in Lake Toya area (trekking, "udon" noodle making)
The 5 th day	Lecture, group work, mini-presentation
The 6 th day	Group work, final presentation, closing, farewell Party (Rusutsu Resorts)

IEDC2018 Chiang Mai, Thailand: March 14rd - 18th, 2018

38 participants came from Chiang Mai University (Thailand), Naresuan University (Thailand), Muroran Institute of Technology (Japan), Akita University of Art (Japan), Gifu City Women's College (Japan). 16 of them came from Japan (4 engineering course students, 6 arts course students, 2 design course students and 4 lecturers), and 22 of them came from Thailand (11 engineering course students, 5 logistic course students and 6 lecturers).

The main subject was **Daily life with IoT**. The participants tried to create an innovative idea and the mock-up model by using Raspberry Pi and GoGo board

[5]. GoGo Board is an additional board for Raspberry Pi. It is designed for studying basic idea of IoT. The kit includes several types of sensors and actuators, and the users can control them easily by using the visual programming environment. Even students, who do not have experiences of any programming, can create mock-ups of IoT system by using the product.

Until the previous workshop, the main subjects and all of the program was proposed by the author, and the host university just provided the rooms, materials, and parties. This workshop is the first case that all of the program was proposed by the host university. "How to establish rotating the host" is a key point of sustainable collaborative workshop. In our case, we invited the staffs of Thai university for beginning workshops and shared the know-hows. Eventually, they have learned the know-how. Such process makes success the workshop in 2017.

The 1 st day	Welcome party (with ice breaking: creating nicknames and team names)
The 2 nd day	Fieldwork (Lake Toya area and Muroran city), brainstorming
The 3 rd day	Fieldwork (Apple picking), brainstorming, group works, mid-presentation
The 4 th day	Activity (Lake Toya cruising), group works, final presentation, farewell party (Sun palace hotel, Lake Toya)
The 5 th day	Closing ceremony

3. DESIGN CONCEPT

3.1 Biotope of learning (BoL)

"Media biotope" is a concept of media communication structures [3]. In this concept, small media, e.g., cable television, free paper, and community FM radio, are focused on because these types of media can create sustainable communities.

Traditionally, communication mechanism is illustrated with Shannon & Weaver's communication model [6], which is illustrated in Fig.1 (A). In this model, encoded information is transmitted from a sender to a receiver. It is difficult to illustrate communications within a community with this model because sometime members are influenced by information which is not be aware by the source persons.

Thus, the author has proposed a communication scheme based on the Media biotope [4]. Fig.1 (B) illustrates the proposed scheme. In this scheme, sender of information is not required for communication. Receivers get signals

surround them and interpret them as information. By using this scheme, processes of creating communities can be illustrated.

Fig. 2 illustrates patterns of structure of communities for learning. In this figure, a white person stands for a student, a gray person stands for a teacher, a solid line stands for close communications, and a dashed line stands for moderate communications.

(A) Stand-alone

This scheme stands for self-educations. Sometimes, students communicate with teachers, and talk with the others, but basically, they study by themselves.

(B) Central-push

This scheme stands for traditional style classes in Japan. One-to-many communications are conducted, and a teacher controls the class.

(C) Group work

A teacher instructs groups, and the group conduct some tasks in accordance with the instructions. The teacher is actively involved with the groups and gives them advices.

(D) Biotope of learning (BoL)

A teacher gives minimum instructions, and each group works autonomously with having communications with the other groups. In this scheme, students can have experiences of teaching mutually. They also can learn diverse situations and ideas.

In IEDC, structure of BoL is aimed.

Arrangements of the members are also important. The basic policy is; the team do not have two or more members from same department, and the team have many nationality members as much as possible. They have the following merits:

- 1) Each member can realize his/her own role.
- 2) The member can have opportunities to discuss with the members who has different cultures.

In usual exercises in universities/schools, the member studied similar subjects. So, each member does not have inevitable tasks. As a result, some of the member tend to be "free rider." Meanwhile, in the workshop, there are no member who has the similar knowledges and skill. Eventually, each member can take part in the projects positively.

3.2 Wall-newspapers

From IEDC2017 Hokkaido, we have introduced a new activity, publishing wall-newspapers. In the workshops, the participants have to make a wall-newspaper which

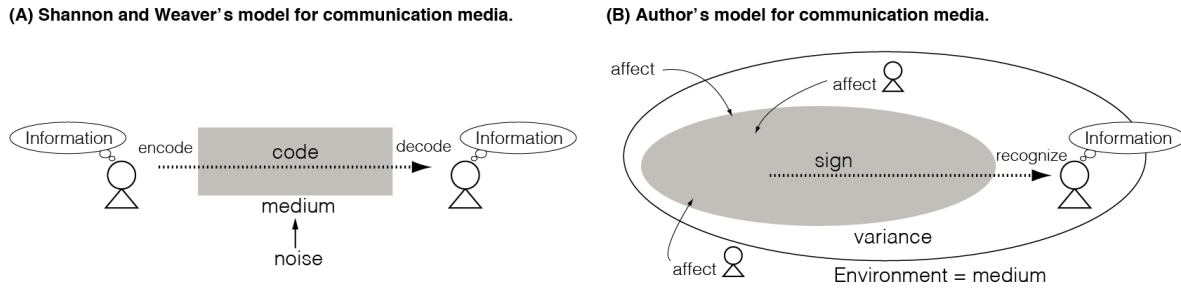


Figure 1: Models of communication scheme

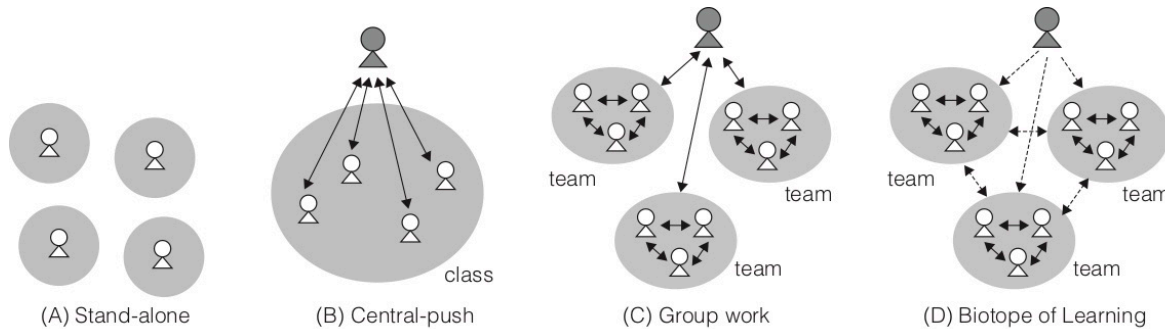


Figure 2: Structures of community for learning

reports the day's activities every day. Most of the participants create some fun while doing the tasks. By creating the wall papers, they can review the day's activities and doing group works in relaxed environments.

The wall-newspapers were displayed in the room and Facebook page of the workshop [7].

4. CONCLUSION

Since 2014, we have conducted 5 workshops and many students took part in them. Many of the students still have communications, and some of them be a best friend through the workshop beyond the difference of nationalities and academic backgrounds. It can be highlighted as a specific character of the series of workshops. A participant posted the below message on the Facebook page of IEDC:

If it was just an ordinary travel trip in Japan, I might not miss the time there so bad like I do right now. Meeting new friends and doing activities together with these people is the best time I had in this trip. I wish we would keep in touch so that one day soon we will meet again.
(sic)

It is the message we just want to hear from the participants!

As the next step, we are planning to expand the

workshop to Taiwan. Taiwan is a country which keen in education of engineering design, and we have similar sense of values for educational systems. Now we are talking with National Taichung University of Science and Technology, and we expect that they will be a member in the next workshop. The next workshop is planned in the March of 2019 in Akita, Japan.

ACKNOWLEDGMENTS

This work was supported by JSPS KAKENHI Grant Number 26350013, 15K00486 and 16K02807..

REFERENCES

- [1] <https://www.sdlabo.net/?TopPage-E> (2019.2.12)
- [2] Namgyu Kang, Hidetsugu Suto and Patchanee Patitad; Role of Design Process Based on Expanded ADT Model and TTS Model, Journal of Integrated Design Research, 13 (1), pp.107-116, 2014.
- [3] Shin Mizukoshi; Media Biotope, Kinokuniya Publication Services, 2005. (Japanese)
- [4] Hidetsugu Suto; Communication Scheme based on the Concept of Media Biotope. International Journal of Communications, issue 3, vol. 5, pp. 87-94, 2011.
- [5] <https://gogoboard.org/> (2019.1.31)
- [6] Shannon C.E., Weaver, W.: The Mathematical Theory of Communication, University of Illinois Pr., 1949.
- [7] <https://www.facebook.com/groups/983666205042980/> (2019.1.31)