Multicultural Online Collaborative Learning: Students' Engagement in Design Thinking Framework

S. Asai [1]
Ritsumeikan University
Shiga, Japan
ORCID: 0009-0006-5674-4481

Y. Rahmawati
Universitas Negeri Jakarta
Jakarta, Indonesia
ORCID0000-0002-1603-3320

C.H. Fauzan Khairi
Universiti Teknologi Malaysia
Johor Bahru, Malaysia
ORCID: 0000-0003-0343-5205

T. Jutarosaga
King Mongkut's University of Technology Thonburi
Bangkok, Thailand
ORCID: 0000-0002-6938-3957

[1] *Corresponding Author*
  sasai@fc.ritsumei.ac.jp

ABSTRACT

This paper presents a collaborative learning course in which students from four universities in different Asian countries work in mixed teams to learn how to develop user-centered products and solve problems in a hands-on way using the Design Thinking framework. For the past three years, the courses were conducted entirely online. Cooperation and collaboration among diverse people from different backgrounds are essential to solving the social problems facing the world today. Like many universities, we have been actively sending our students abroad to provide opportunities to experience diverse cultures and values, but the pandemic has made it very difficult to travel abroad for the past three years, forcing universities to shift from face-to-face classes to online classes. The pandemic has made it extremely difficult to travel abroad for the past three years, and universities have been forced to shift from face-to-face to online classes. During this time, four Asian universities, to which the authors belong, have jointly launched an online problem-solving collaborative learning course aimed at supporting students to "No one will be left behind," as stated in the SDGs. The structure of the course, profiles of participating students, improvements to the course, student evaluations, and challenges found are described.

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1   INTRODUCTION

1.1 Context and Motivation

The year 2020 forced education into chaos caused by the Pandemic. University students in Asia were no exception. Learning and teaching platforms shifted to online, and faculty and students who viewed the face-to-face teaching/learning format as self-evident were in dire straits. Leaving universities as a temporary evacuation made many international students challenging to come back due to travel constraints. Faculty staff worked hard to find sustainable ways to include all the students worldwide to keep them connected to the learning process.

Collaboration skills, English language skills, and cross-cultural understanding are necessary for engineering students to work together in the future to solve social problems that transcend national borders. Japan's Ministry of Economy, Trade and Industry expressed the expectation to foster students with good social skills and expertise. It introduced the requirement for competitive workers in 'Fundamental competencies for working persons in the era of 100 years of life and recurrent education.' in 2018. (METI 2018) ASEAN countries are no exception in developing human resources with 21st-century skills. (UNICEF 2019) Thus, the authors were on the same page in building a program to meet our shared goals to help students improve problem-solving skills, and communication skills, especially in English language collaboration skills, and cross-cultural understanding.

A pilot project started online in 2020, "Global Collaborative Learning: Design Thinking PBL(GCL-DT-PBL)" for engineering students between a Japanese and a Malaysian university, was a countermeasure for sustainable education against the Pandemic devastated teaching and learning environment. Then in 2021, two other ASEAN universities joined the loop, and *GCL-DT-PBL* became a full-fledged 4-year project, inviting many more students from diverse cultures. The following sections will describe the structure and implementation of the program, the analysis of student engagement relevant to the program goals, and the findings.

1.2 Program Structure and Implementation

Many researchers have found the effectiveness of PBL as a means of learning as it is student-centered and enhances real-world problem-solving skills, higher-order thinking, and self-directed learning compared to the classic learning approaches. (Du et al. 2009)

Design Thinking is widely applied in many fields, including architecture and urban planning (Rowe 1986), product design, businesses, and education. (Brown 2008) (Kelley and Kelley 2013) Multicultural PBL was integrated into the Design Thinking framework as the program's instructional design based on our common goals. (*Table 1.*)

Table 1. Global Online Collaborative Learning:
Design Thinking PBL (GCL-DT-PBL)

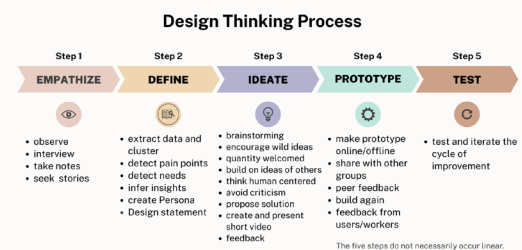| Year	Participants	Universities	Duration	Platform	Theme
2020	20	2	7 days (14hrs)	Online	Innovation in COVID-19 Crisis
2021	36	4	6 days (30hrs)	Online	Innovate UTM Campus Cafeteria
2022	31	4	6 days (30hrs)	Online	Innovate UTM Campus Cafeteria

Fig. 1. Design Thinking Process
(The first author created using Canva)

Fig. 1 Shows five steps design thinking model applied and is based on a guideline Stanford Design Thinking of GCL-DT-PBL. Test in Stage 5 was not conducted in 2020 and 2021 due to the constraint caused by the Pandemic but held face-to-face in 2022 in Malaysia with participants from three ASEAN universities. Japanese university was unable to make it because of travel constraints.

2   METHODOLOGY

Data Collection and analytical method

The Google Forms questionnaire was sent to the participants after each program. Responses were collected, and the content was analyzed using text mining software KHcoder. (Higuchi 2016)(Higuchi 2017) Content analysis is an analysis of the content of the communication. Analyzing the written content, especially in the responses to the questions collected after the program is over, helps understand the engagement of the participating students. Text mining is an analytical method to capture potentially useful information from document data. *Table 2.* shows the elemental attribute composition of the data used in the analysis.

Table 2. Elemental attribute composition of the data used

Year	Response	Participants	Number of universities
2020	16	16	2
2021	36	36	4
2022	9	31	4

The focus of the analysis was to explore the students' engagement. The response items text analyzed include expectations for the program, how the programs met the initial expectations, the best part, and the challenges the participants met.

One helpful method for examining text mining results is to read co-occurrence networks applied in our study. A co-occurrence network is a graphical representation of the distance between extracted words. Larger circles connect words with high frequency, and darker lines connect words close to each other. The co-occurrence network allows us to see how frequently occurring words are combined. The context in which the term was used can be deciphered by returning to the description's original text.
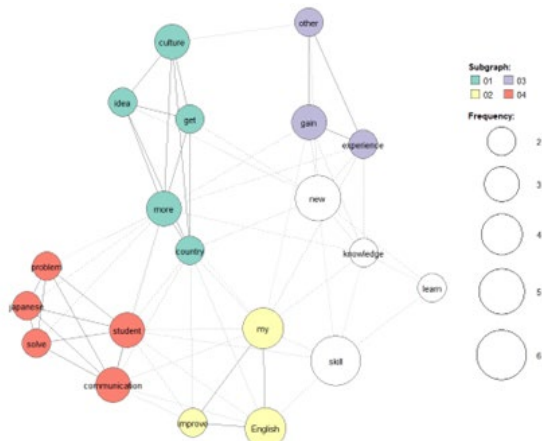
3 RESULTS AND FINDINGS
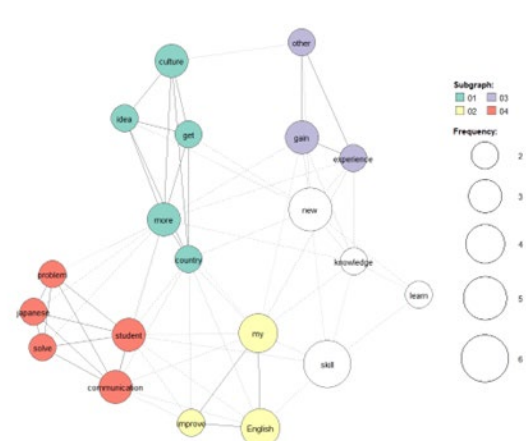

Fig.2 2020   Initial Expectation

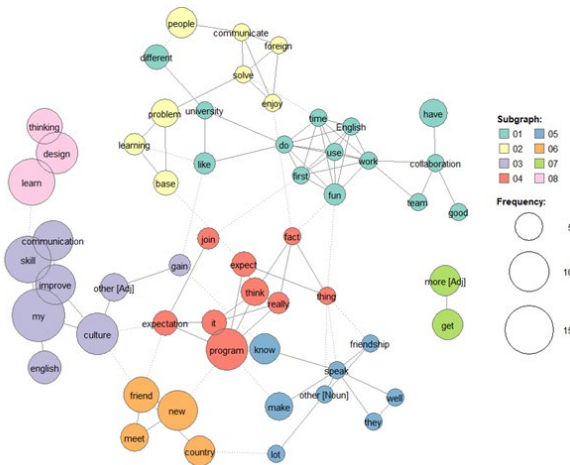*Fig.3   2020 Consistency with Expectation*

Fig.4 2021   Initial Expectation
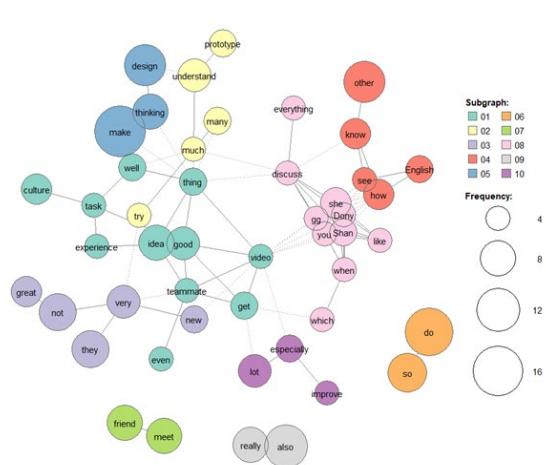

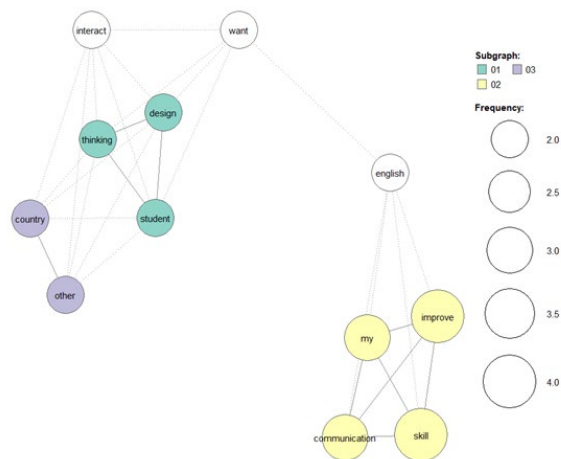*Fig.5   2021 Consistency with Expectation*

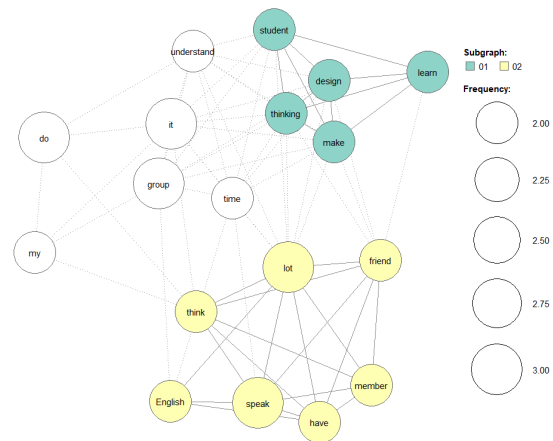Fig.6 2022   Initial Expectation   Fig.7   2022 Consistency with Expectation

The notably common initial expectations for the three programs in 2020-2022 were: 1) To learn about other cultures and work with new friends and 2) To improve communication skills in English. Few expressed the expectation for learning Design Thinking driven problem-solving. However, the responses to the question about whether the program met expectations were different. Among the familiar words that strongly link the three programs is design-thinking-new-experience-make. This suggests that problem-solving and prototyping in a design thinking framework was a fresh and meaningful experience for the participants. Below are the textual statements extracted from the KWIC concordance showing how the aforementioned linked word groups appear.

- *I 've done new and challenging things from this program .*
- *I still gain a lot of knowledge such as about design thinking , new skills on how to make a prototype mobile apps -LRB- which actually was asked by a company that is currently interviewing me for my internship -RRB- and also new experience .*
- *we must make a project and that 's it really great experience*
- *I have found a new achievement for myself during this program*

KWIC concordance is an abbreviation for keywords in context. It is possible to see which words that appear at the top of the list of extracted terms are used in the sentence. KWIC concordance lets us see how frequently words are used in a sentence.

Regarding the degree of conformity with the original expectations, all but one of the respondents in all three years indicated that the program met their initial expectations. The reason statements of the participant whose expectation was not matched show that the greatest expectation for the program was to improve their English proficiency, as one stated, "My proficiency level still remains the same."
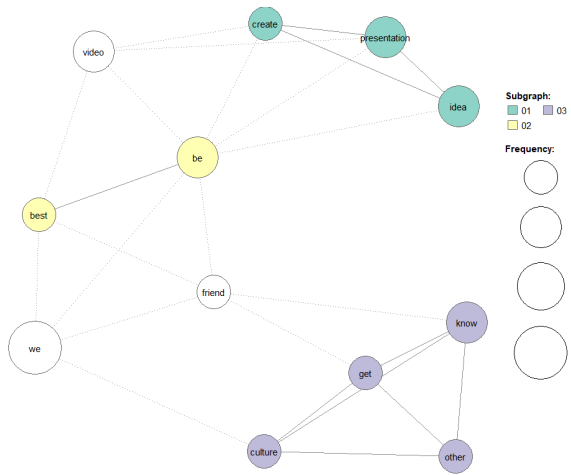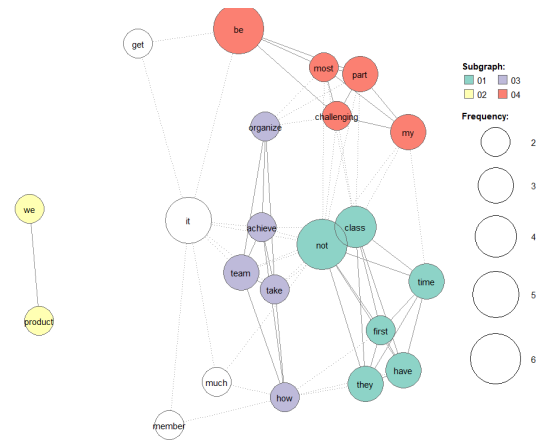
Fig.8 2020   Best experience

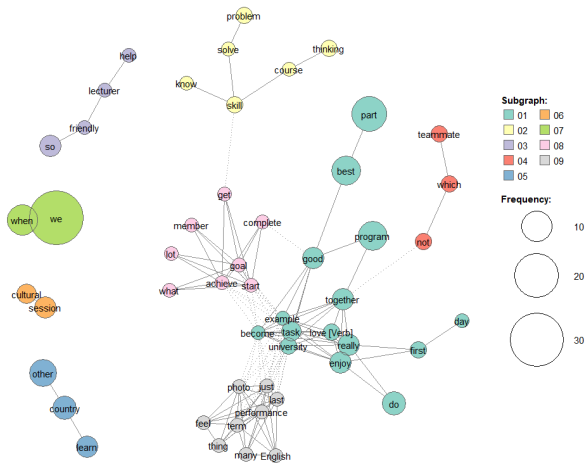*Fig.9   2020 Most challenging experience*

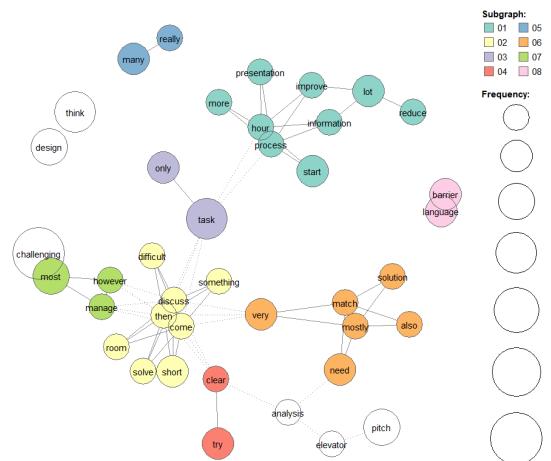*Fig.10 2021 Best experience*

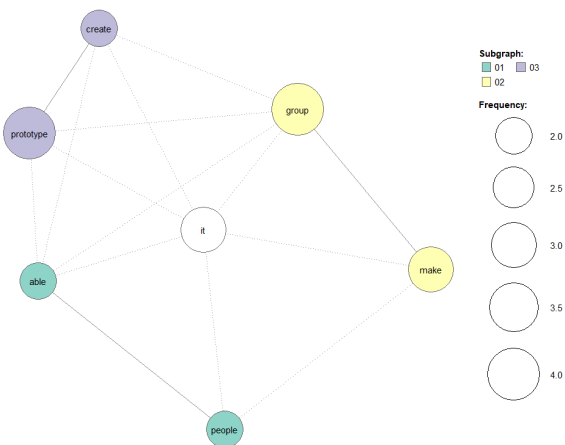*Fig.112021 Most challenging experience*
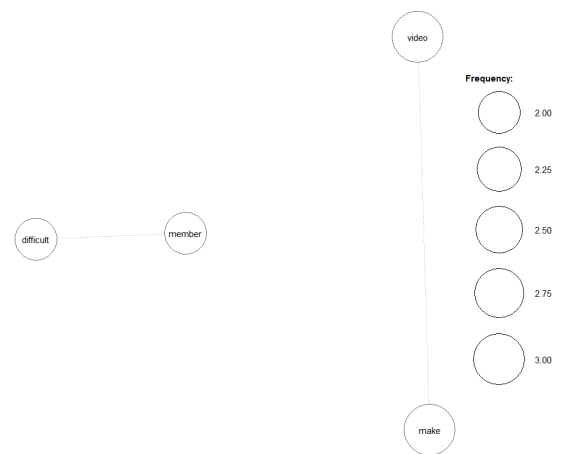
Fig.12 2022   Best experience

Fig.13   2022 Most challenging experience

Considering reflective statements about the quality of the learning experience
brought about by GCL-DT-PBL is an excellent way to learn about the engagement of

the participants. Fig.8-Fig.13 shows the co-occurrence network of participants' descriptions of their best and most challenging experiences during the 3-year program.

Commonalities were found in each year in what was interpreted through the described as the best. The participants were involved in teamwork and collaboration towards a common goal. To wrap up all the comments related to the bubbles that appeared in the analysis results above:

- 2020：The teamwork in idea creation led to the final presentation.
- 2021：Participants communicated and accomplished tasks together. They got to know each other better and better in working on the job.
- 2022：The group work allowed the participants to make prototypes and final presentations, make friends, and create something as a group.

The most challenging aspects and familiar to all years were: communication in English, teamwork, and time constraints. There were no descriptions of the degree of difficulty of the program itself. Here are some excerpts of KWIC concordance:

- I experienced how difficult communicating with other language people in English . Maybe , i did not speak correct English , but I was so enjoyed !!!
- This is the most challenging part because I am not better English speaker
- Video making as it was hard to communicate with group members thru online to get ideas
- To find the suitable time for all my groupmates for an external discussion and meeting to complete the work .

These results indicate that multicultural collaboration using English as the common language of communication is fun. Still, it also needs help communicating within the group for students uncomfortable with English. Some students also described time constraints, such as insufficient time to complete the task.

4 LIMITATION

As seen in the figure from the 2022 analysis, the sample size is affected by the response rate to the questionnaire. We need to improve the survey collection rate to grasp the overall response from the participants and prepare for the next program. Another limitation was the iterance of the cycle of the five stages of the Design Thinking process. The key to designing and manufacturing products and improving the products or systems requires constant *Kaizen*. Though the PBL deals with real-world problem-solving as a learning framework, we could not give the students enough time and opportunities to repeat the processes.

5 SUMMARY AND ACKNOWLEDGMENTS

5.1 Summary and Future Direction

This paper described the background of a multicultural collaborative PBL in the framework of Design Thinking conducted with the collaboration of four Asian universities. It showed the analysis result as part of an interim report of our 4-year project. The analysis mainly focused on student engagement, and content analysis methods using KH coder as a text mining tool were applied.

Findings are: The characteristics observed in GCL-DT-PBL participants over the past three years were consistent with the goals of this program. On the other hand, we also found that English may be a factor that can impede achievement.

The results of this survey support that this program was in line with the authors' common objectives. In addition, this analysis method allowed us to explore what words participants chose to describe in their responses and what could be read from the context. This helps to explore participants' thoughts that might not be picked up in a survey using the 5-point scale method.

On the other hand, the data size is relatively small because the program's size is not that large. In addition, the nature of the post-program questionnaire collection, which depends on the students' free will, has led to only a tiny amount of data being collected, as in the 2022 result. For example, formative evaluations could be added at several activity stages during the program to avoid this problem.

Step 1 and Step 2 of the Design Thinking Process showed a difference in perception of the problem. When cultural backgrounds differed within a team, points that seemed problematic to someone else sometimes did not mean as much to others. While the idea generation stage of Step 3 saw the most active participation, differences in viewpoints were observed again. Furthermore, during the team discussion to bridge the gap in views, there was a problem communicating this well using English, the common language. Step 4 prototyping and Step 5 testing had to be minimal effort due to the online nature of the project.

This paper can contribute to sharing two suggestions for future multicultural PBL design.

(1) Incorporate an approach from the perspective of cross-cultural understanding into program design to address real-world problem-solving.

(2) The need to make participants aware of the importance of additional linguistic efforts to bridge gaps in understanding due to differences in cultural backgrounds since English, the common language, is not the native language of all participants.

Future studies seek more in-depth research on how the participants improved their communication skills in English and, by that, improved their engagement.

5.2 Acknowledgment

REFERENCES

Brown, T. 2008. ″Design Thinking″, *Harvard Business Review*

Du, X., De Graaff, E., & Kolmos, A. 2009. *Research on PBL practice in engineering education.* Brill.

Higuchi, K. 2016. ″A Two-Step Approach to Quantitative Content Analysis: KH Coder Tutorial Using Anne of Green Gables (Part I) ″, *Ritsumeikan Social Science Review,* 52(3): 77-91

Higuchi, K. 2017. ″A Two-Step Approach to Quantitative Content Analysis: KH Coder Tutorial Using Anne of Green Gables (Part II) ″, *Ritsumeikan Social Science Review*, 53(1): 137-147

Kelley, T., and Kelley, D. 2013. *Creative Confidence: Unleashing the Creative Potential Within Us All*, Crown Business, New York.

Ministry of Economy, Trade, and Industry. 2018. *Fundamental competencies for working persons in the era of 100 years of life and recurrent education.* Retrieved from
https://www.meti.go.jp/report/whitepaper/data/20180319001.html

Rowe, P.G. 1986. ″Design Thinking″, *The MIT Press*, Cambridge, MA.

UNICEF East Asia and Pacific. July 1, 2019. *"ASEAN-UNICEF Conference on 21st Century Skills and Youth Participation."* ,https://www.unicef.org/eap/reports/asean-unicef-conference-21st-century-skills-and-youth-participation.