Introduction for Cross-cultural Engineering Project (CEP) based on Global PBL

Shibaura Institute of Technology (SIT)
FCT, UNIVERSIDADE NOVA DE LISBOA (FCT/UNL)

July 16, 2021

Aim of CEP

CEP enables:

- To acquire the synthetic problem solving capability to be internationally attractive
- To acquire concepts and technologies on “Systems thinking”, “Systems Method (Engineering Method)”, and “Systems Management (Project Management)”
- To acquire a capability of work as a member of an international and/or interdisciplinary team

Based on Global PBL through the problem solving experience

Cross-cultural Engineering Project (CEP)

- Global PBL (Project Based Learning) for synthetic problem solving based on multi-cultures and multi-discipline.
- Design as an engineering educational program based on system thinking.

CEP is held in three area.

1. Glocal problem at KMUTT in Thailand,
2. Industrial & community cooperative at SIT in Japan,
3. Innovative creation at FCT/UNL in Portugal

Time, Venue & Members

Time: July 27, 2021 – Aug. 5, 2021

Venue: Web based project

Team members*: 48 students

14 participants from SIT students
8 participants from KMUTT & SUT students
10 participants from EU FCT/UNL & TECNUN students
6 participants from ITS students
10 participants from UCSI students

English Communication (More is better):

Students have to communicate in English, even if they use freely various devices and services, such as electronic dictionaries, smartphones and the Internet.

*Both sides should be composed of graduate school student, 4th year undergraduate students.

Role of TA & Professor

Role of Teaching Assistants (TA):

4 students from SIT,
3 students from FCT/UNL.
TAs advise the teams to coordinate with the local staff, to support the management of teams.

Role of Professors:

Professors act as an assumed investor to project.
They make various kinds of comments and suggestions in the Design Review (DR).

Comments from various points of view among lecturers are allowed.
Basic stance is to pay respect to students' ideas and opinions;
The lecturers should not force the students to follow their comments.

Oh My God Experience

In CEP, unexpected troubles, which people meet with very frequently in the real world, will be induced by intention.

This "Oh my God" experience should trigger the improvement of competency.

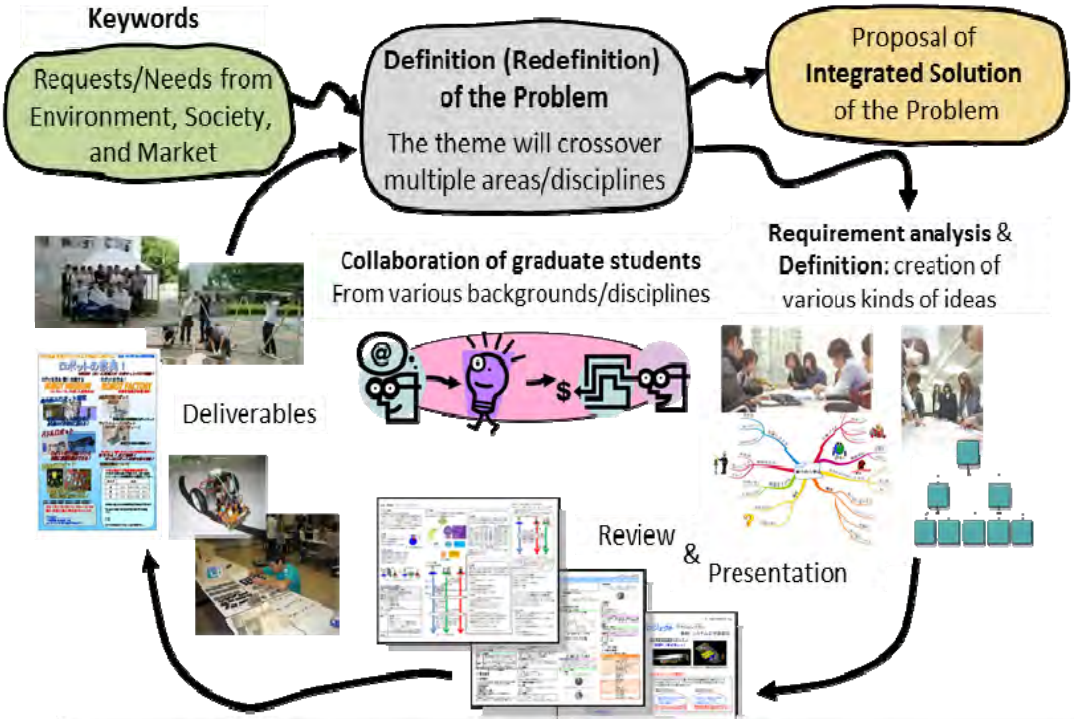
Each team will be requested to reconstruct the process of solving the problems by rescheduling.

Improvisation Education*

Creatively adaptation skill to unexpected changes in a project

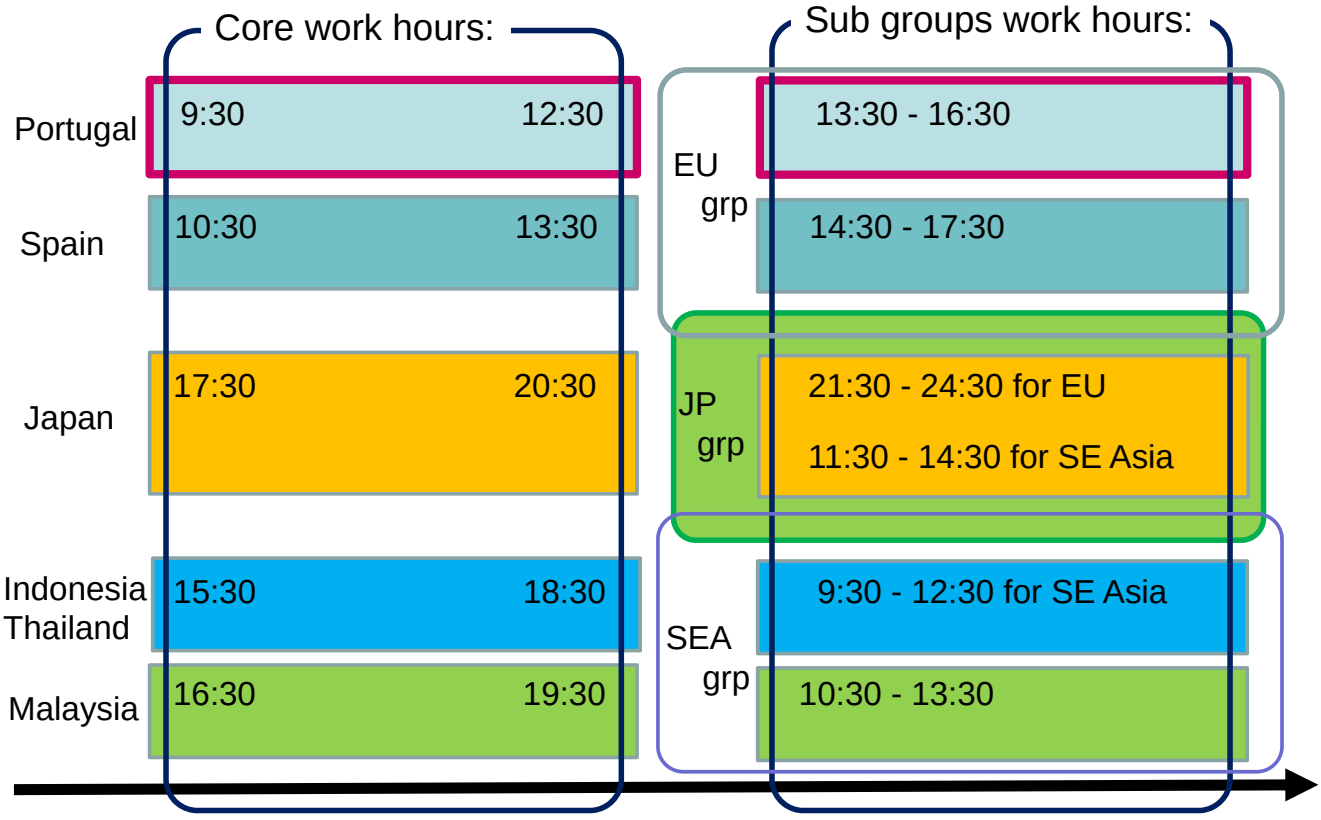
* Improvisation education has been performed to obtain creatively adaptation skill to unexpected changes in a project. As an examples, MIT and Stanford.

Practical Process



The solution would be formed by correlating various science and technology each other, which has been obtained through environment and social activities

Time line



Euro (Portugal & Spain)

WEST UTC+1		Project activities
Pre Process	Web form	1st outcomes assessment (Rubric) and Team-Forming questionnaire
Day 1 (T, July 27)	Core work Sub groups work	Guidance and Icebreaking Problem finding and gathering needs and technologies
Day 2 (W, July 28)	Core work Sub group work	Confirmation of the theme by KJ method or Mind Map Deploy needs and technologies on QFD through requirement analysis
Day 3 (T, July 29)	Core work Sub groups work	Gather **Kando Quality (Emotional requirement) & deploy KQ on QFD** Deploy function (solution) on QFD for needs, technologies and KQ
Day 4 (F, July 30)	Core work Sub groups work	Deploy inventive solution using **Contradiction Problem** on QFD matrix
Day 5 (S, July 31)	Sub groups work	Goal setting of business model Preparation of Design Review (DR)
Day 6 (M, Aug. 2)	Core work	Design Review (DR)
Day 7 (T, Aug 3)	Sub groups work	Reset goal and reschedule for the activities via DR's comments Remake business model in accordance with the planned schedule
Day 8 (W, Aug. 4)	Sub groups work	Decide business model in accordance with the planned schedule Preparation of the final presentation
Day 9 (T, Aug. 5)	Core work Core work+2h	**Final Presentation** Closing ceremony
Post Process	Web form	Report of Expenditures and 2nd Outcomes assessment PROG competency test

Japan & South East Asia

		Project activities
Pre Process	Web form	1st outcomes assessment (Rubric) and Team-Forming questionnaire
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Day 2 (W, July 28)	Sub groups work Core work	Problem finding and gathering needs and technologies Confirmation of the theme by KJ method or Mind Map
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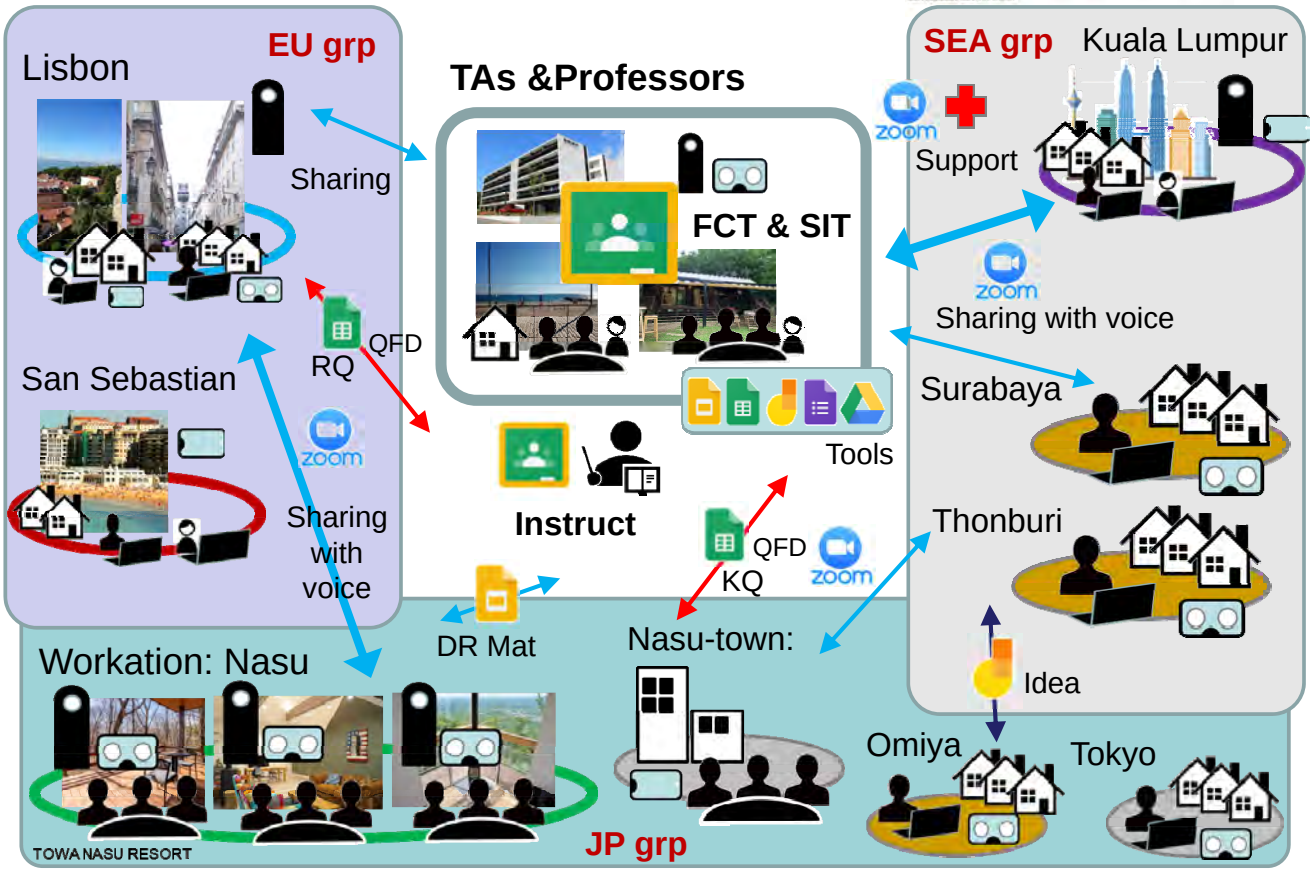
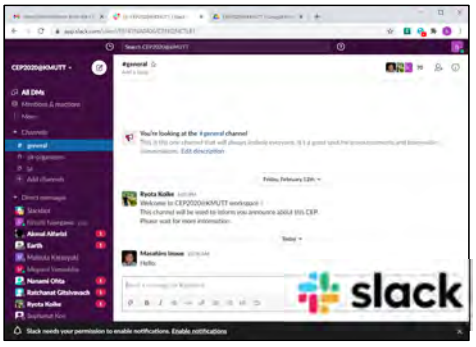
Cyber & physical space



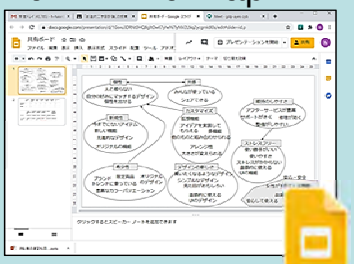
RQ: Requirements Quality, KQ: Kando Quality, DR Mat: Design Review Material

slack and Google drive & tools

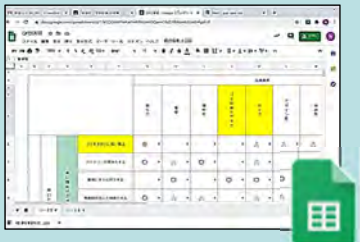
1. **Announce and Instruct for the whole by slack**



KJ & Mind map



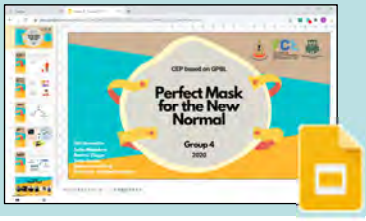
Matrix



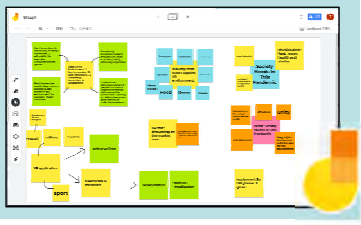
2. **Work in each team on Zoom.**

   Using the google applications on Google Drive

Presentation



Idea creation



Day 1:

Icebreaking & Team-Forming

Icebreaking:

Self introductions and team-forming through simple game for communication and questionnaire

Team Formulation:

Total of 8 teams of 6 students.

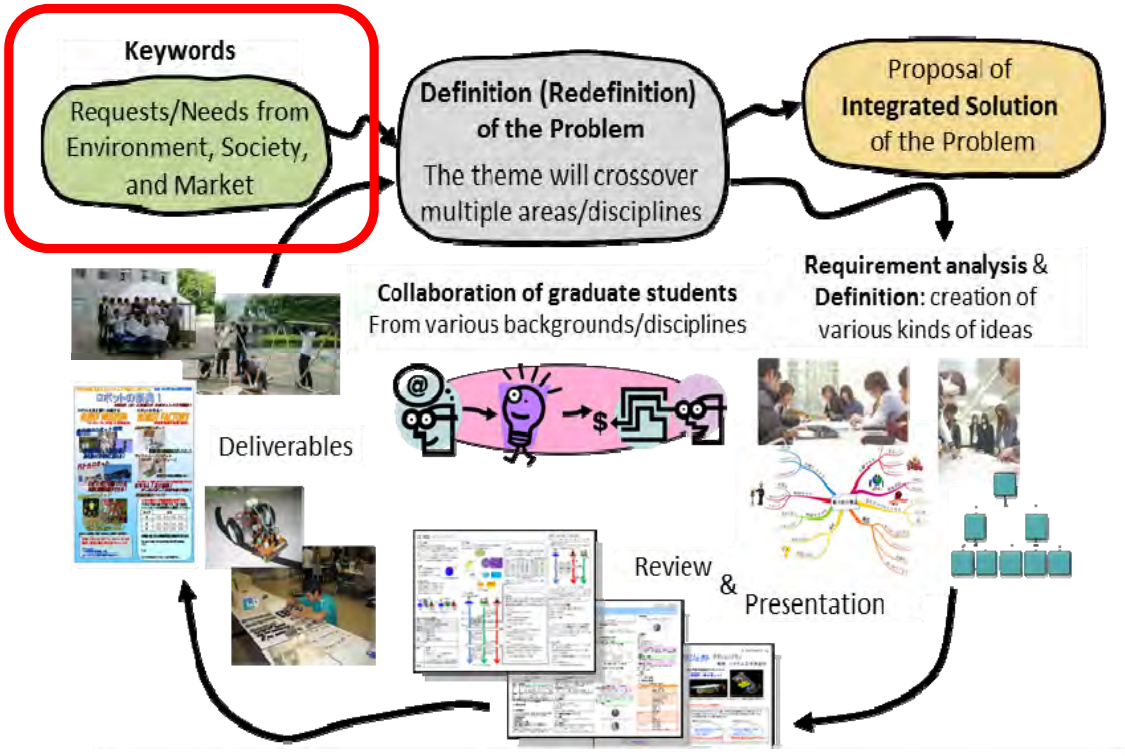
自己紹介ゲームの様子

日本人とタイ人でバディ(ペア)を組みました

ニックネームの発表

Day 1:

Project's theme



The solution would be formed by correlating various science and technology each other, which has been obtained through environment and social activities

Day 1, 2:

Project's theme

Some keywords should be referred for setting the theme.

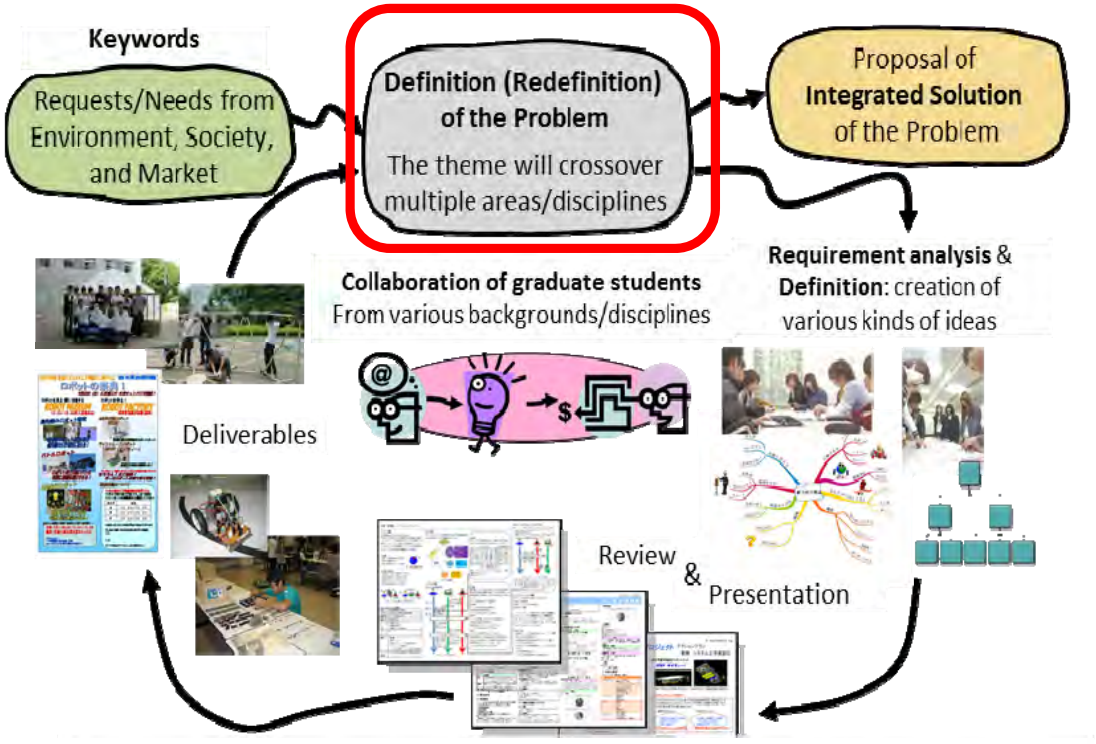
All through the project, students are expected not only to make a plan but also make a design, implementation and a fieldwork.

Keyword:

Ecology, Energy, Eco-tourism, Community development, Service, Mobility, Welfare and medical system, Disaster prevention, Multi-language communication, User experience, Innovation, Education system, Global leadership, Unexamined Patent, Others (student's idea)

Day 1, 2:

Definition of the problem



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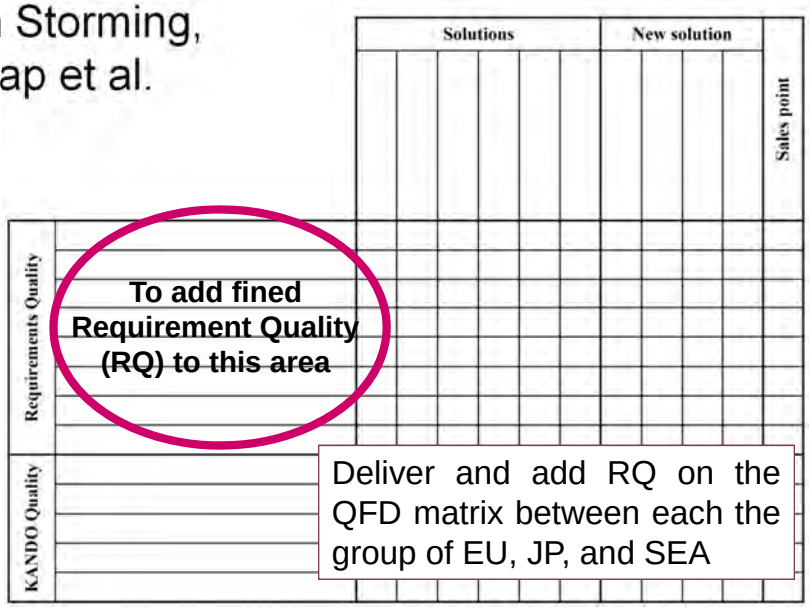
Day 1, 2:

Definition of the problem

Problem finding and gathering needs and technologies

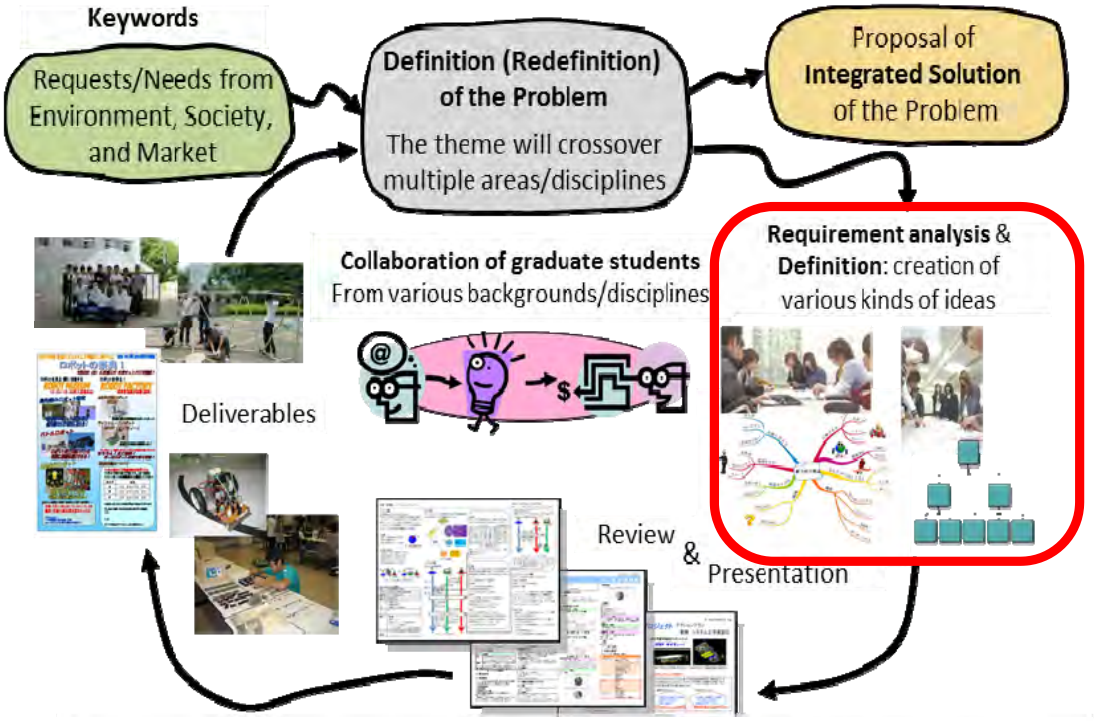
Using learned methods and thinking process in Systems Engineering courses as a systematic communication tools, such as Brain Storming, KJ method, Mind map et al.

Using sticky notes during discussions open to any challenge



Day 3:

Requirement Analysis and Definition



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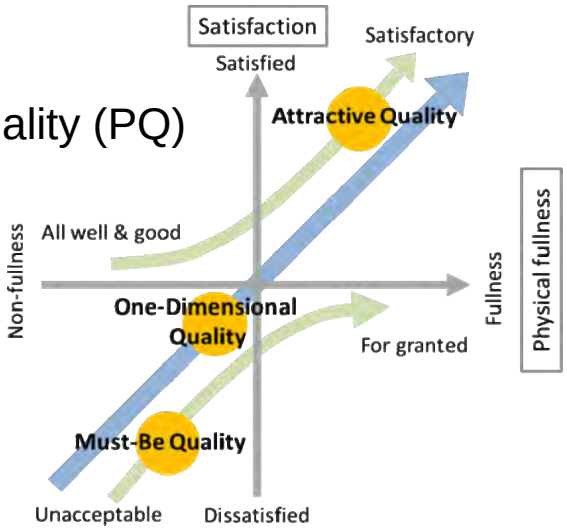
Day 3:
Attractive Quality

- Introduce viewpoint of Product Quality (PQ)
- Apply Kano model for PQ

Kano model has classified the product quality into five categories.

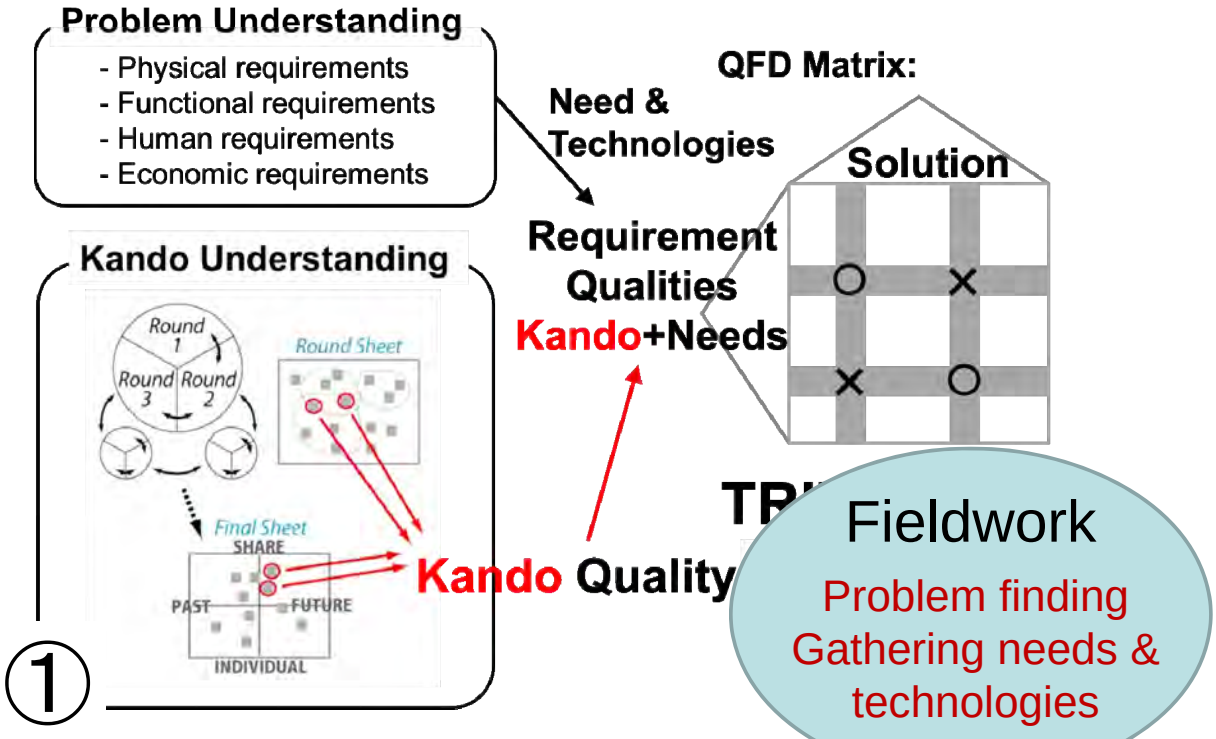


Evaluations of same quality element through progress of time change with “AQ -> ODQ -> MBQ".

Quality elements	Customer response	
	Fullness of Quality	Non-fullness of Quality
Attractive Quality (AQ)	Satisfaction	All well and good
One-Dimensional Quality (ODQ)	Satisfaction	Dissatisfaction
Must-Be Quality (MBQ)	Taking for granted	Dissatisfaction
Indifferent Quality (IQ)	Not provide satisfaction and dissatisfaction	
Reverse Quality (RQ)	Dissatisfaction	Satisfaction

Day 3:

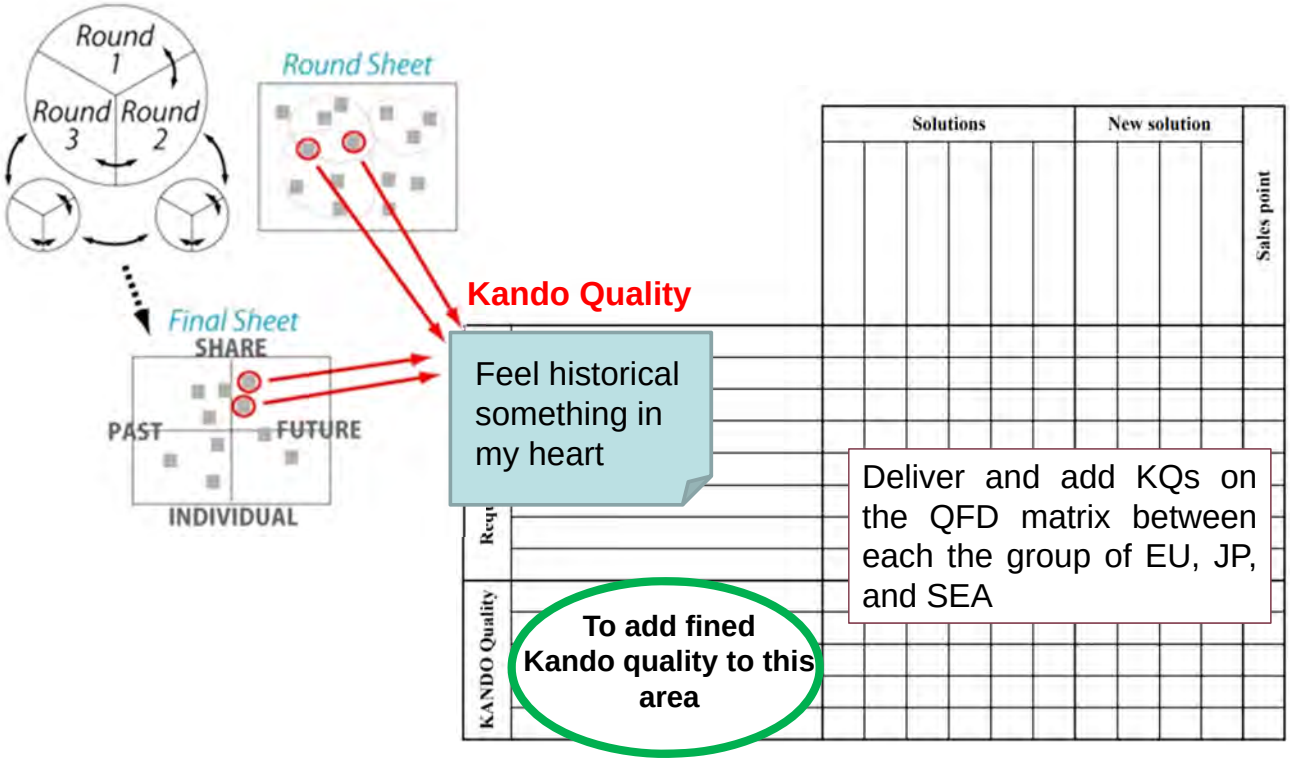
① Kando Quality (Emotional requirement) finding



QFD: Quality Function Deployment

Day 3:

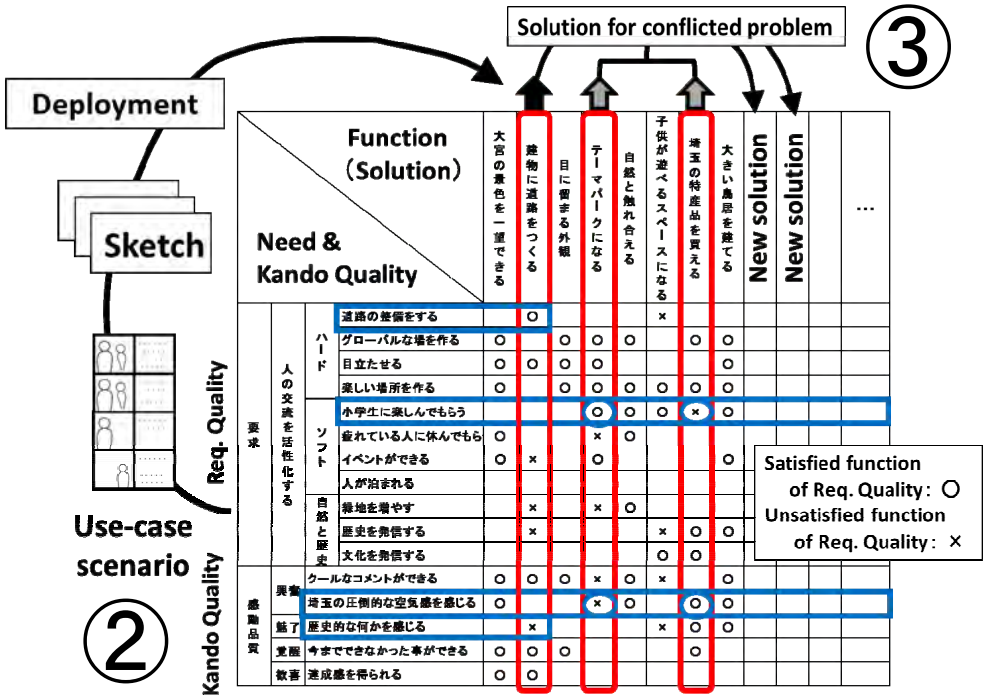
Definition of Kando Quality (KQ)



Day 4:

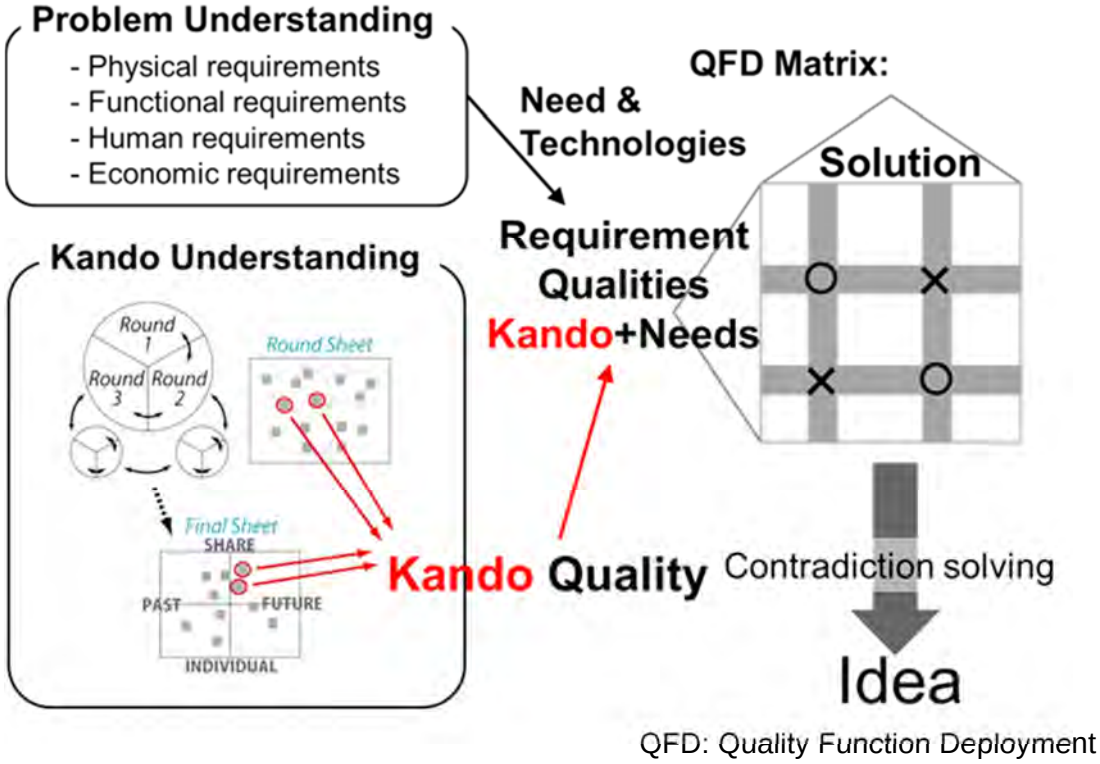
② Definition of needs & technologies on QFD

③ Deployment of function (solution) on QFD



Day 4:

④ Inventive solution using Contradiction Matrix

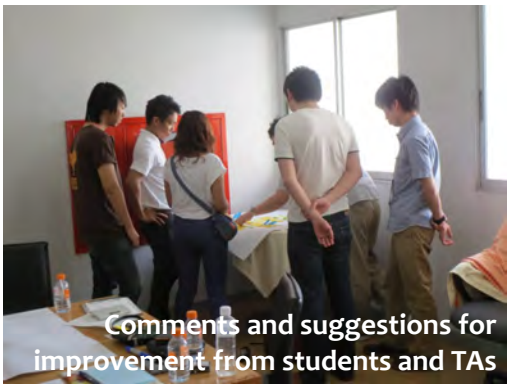


QFD: Quality Function Deployment

Day 5:

Goal setting and others planning

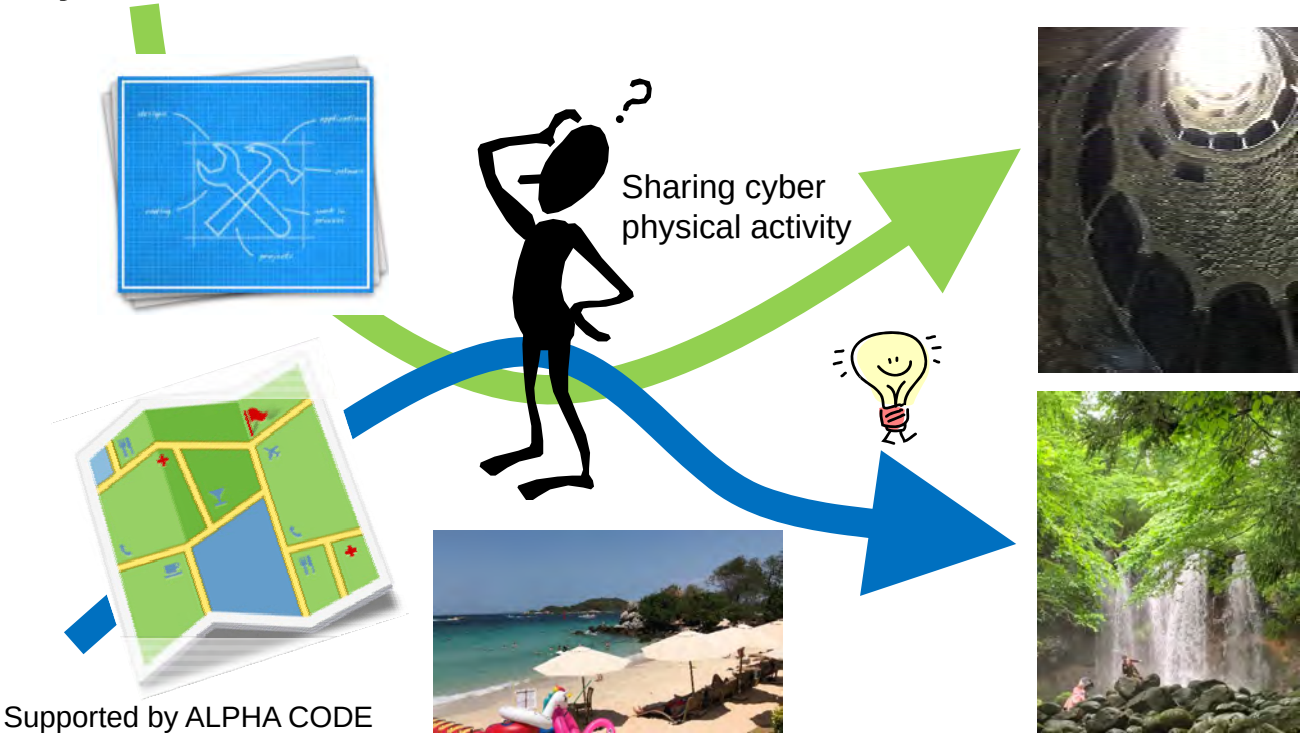
- ✓ Goal setting
- ✓ Assessment planning
- ✓ Budget planning
- ✓ Schedule planning for activities



- ✓ Preparation of design review (DR) materials

OMG's Day:

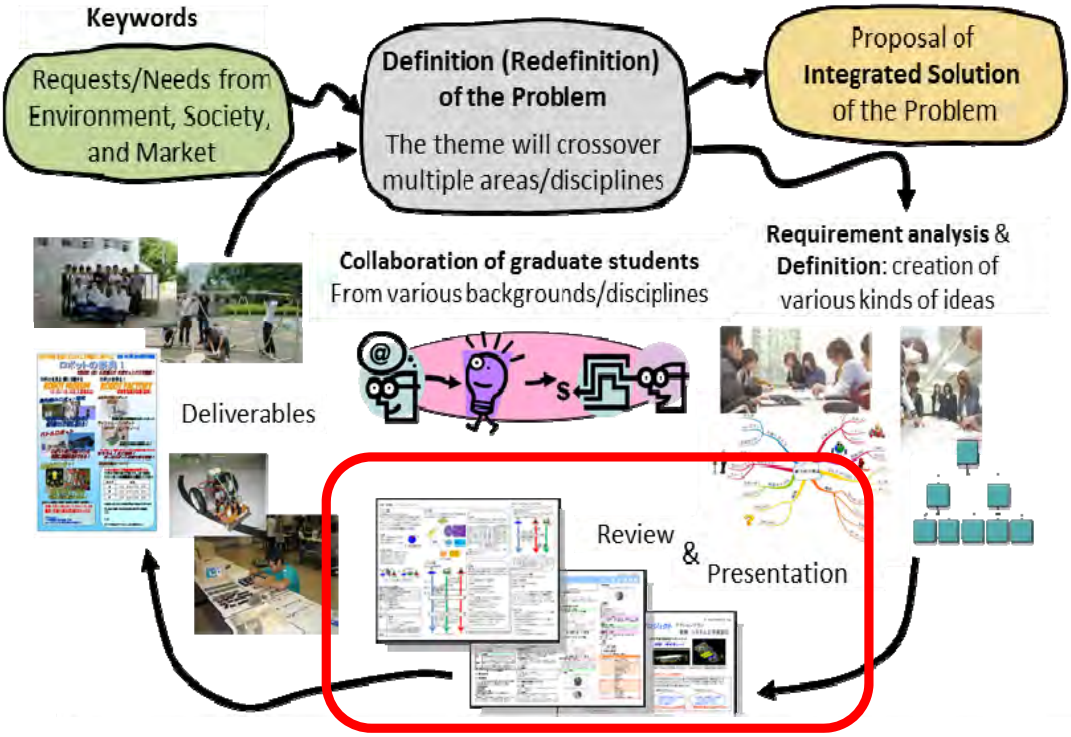
Team activity: Improvisation education produced by OMG Professor with TA



Supported by ALPHA CODE

Day 6:

Design Review



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Day 6:

Standard of Evaluation for DR

In DR, evaluation is made with scale from 1 to 5, by using the standards (1) through (6) shown below.
The actual evaluation will be conducted in 2 levels consecutively; (a) Evaluation by students among groups, (b) Evaluation by the professors and TAs.

(1) What are the requirements for the theme?
- Are Background and Objective stated clearly?
- Are Present Status and Needs analyzed well?

(2) What is the goal to meet the requirements?
- Are any ideas and proposals clearly described to reach the goal?

(3) Was the relationship between Requirements and Goal an appropriate one?

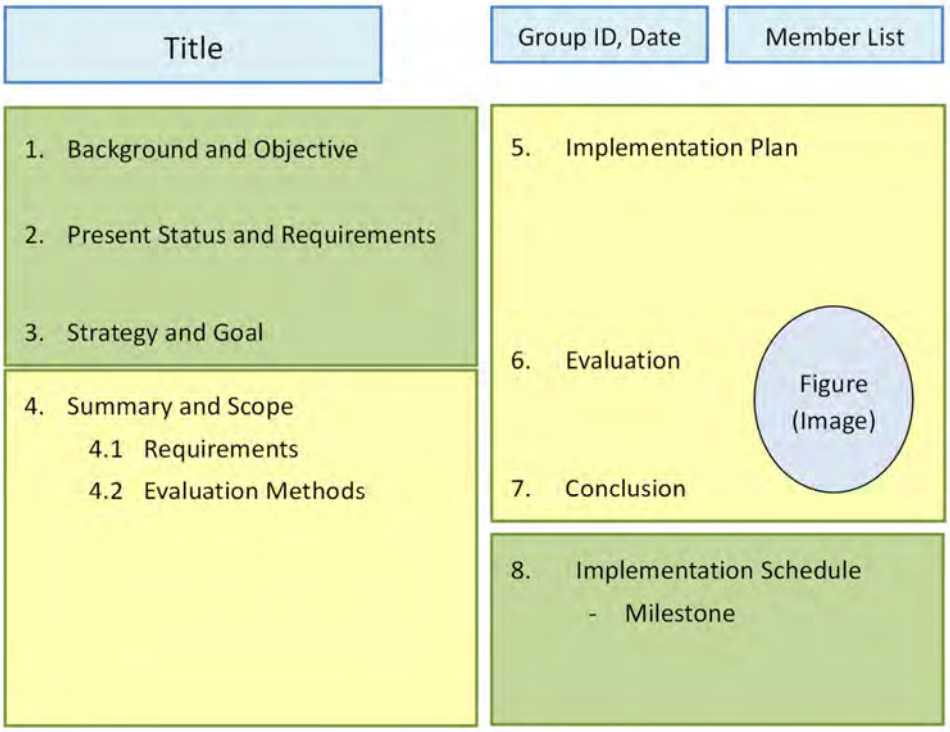
(4) Was the Evaluation Method planned properly?

(5) Was the Budget Plan planned properly?

(6) Did the resource and the oral presentation help your understanding?

Day 6:

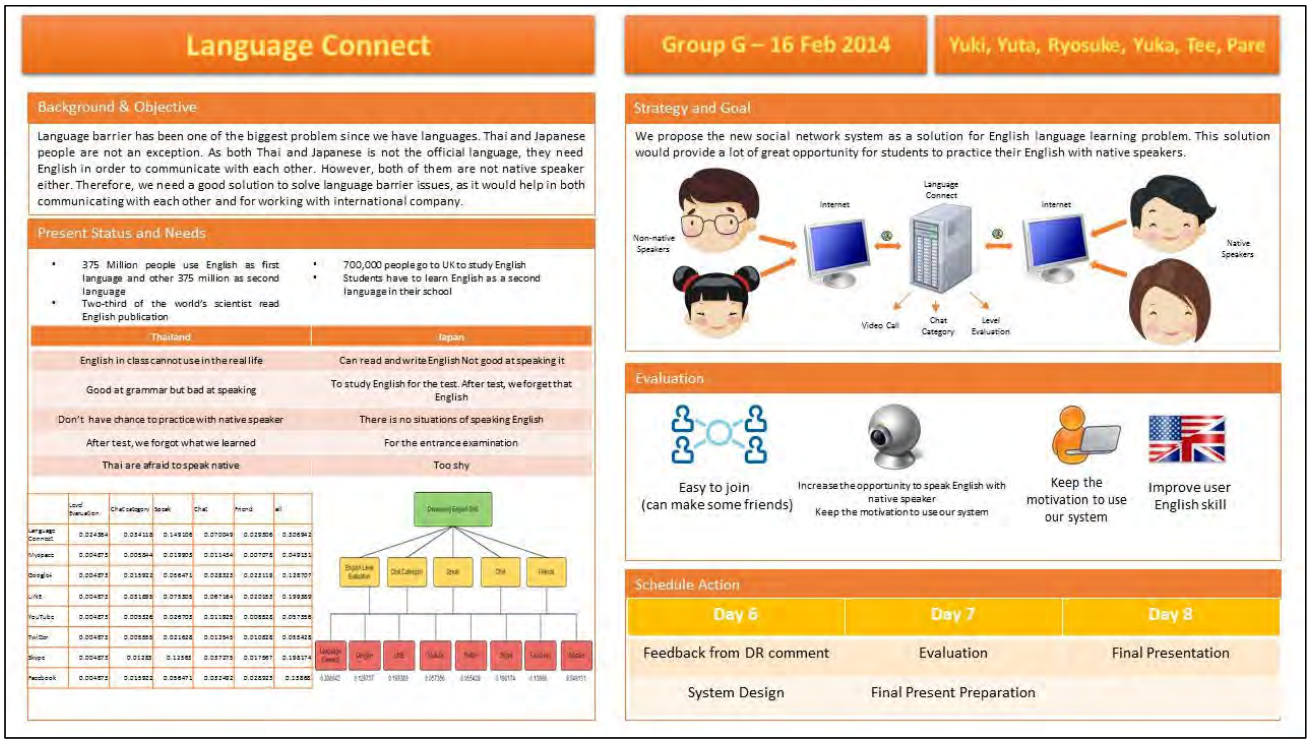
A3 Material for DR



A3 Material is used for DR at many Japanese companies, such as automotive or electric-appliance companies, Mitsubishi, Toyota…

Day 6:

A3 Material for DR



Language Connect

Group G – 16 Feb 2014

Yuki, Yuta, Ryosuke, Yuka, Tee, Pare

Background & Objective

Language barrier has been one of the biggest problem since we have languages. Thai and Japanese people are not an exception. As both Thai and Japanese is not the official language, they need English in order to communicate with each other. However, both of them are not native speaker either. Therefore, we need a good solution to solve language barrier issues, as it would help in both communicating with each other and for working with international company.

Present Status and Needs

- 375 Million people use English as first language and other 375 million as second language
- Two-third of the world's scientist read English publication
- 700,000 people go to UK to study English
- Students have to learn English as a second language in their school

Thailand	Japan
English in class cannot use in the real life	Can read and write English Not good at speaking it
Good at grammar but bad at speaking	To study English for the test. After test, we forget that English
Don't have chance to practice with native speaker	There is no situations of speaking English
After test, we forgot what we learned	For the entrance examination
Thai are afraid to speak native	Too shy

Strategy and Goal

We propose the new social network system as a solution for English language learning problem. This solution would provide a lot of great opportunity for students to practice their English with native speakers.

Evaluation

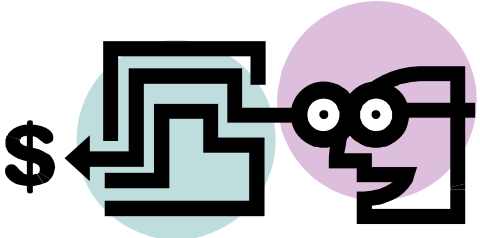
Schedule Action

Day 6	Day 7	Day 8
Feedback from DR comment	Evaluation	Final Presentation
System Design	Final Present Preparation	

Day 7:

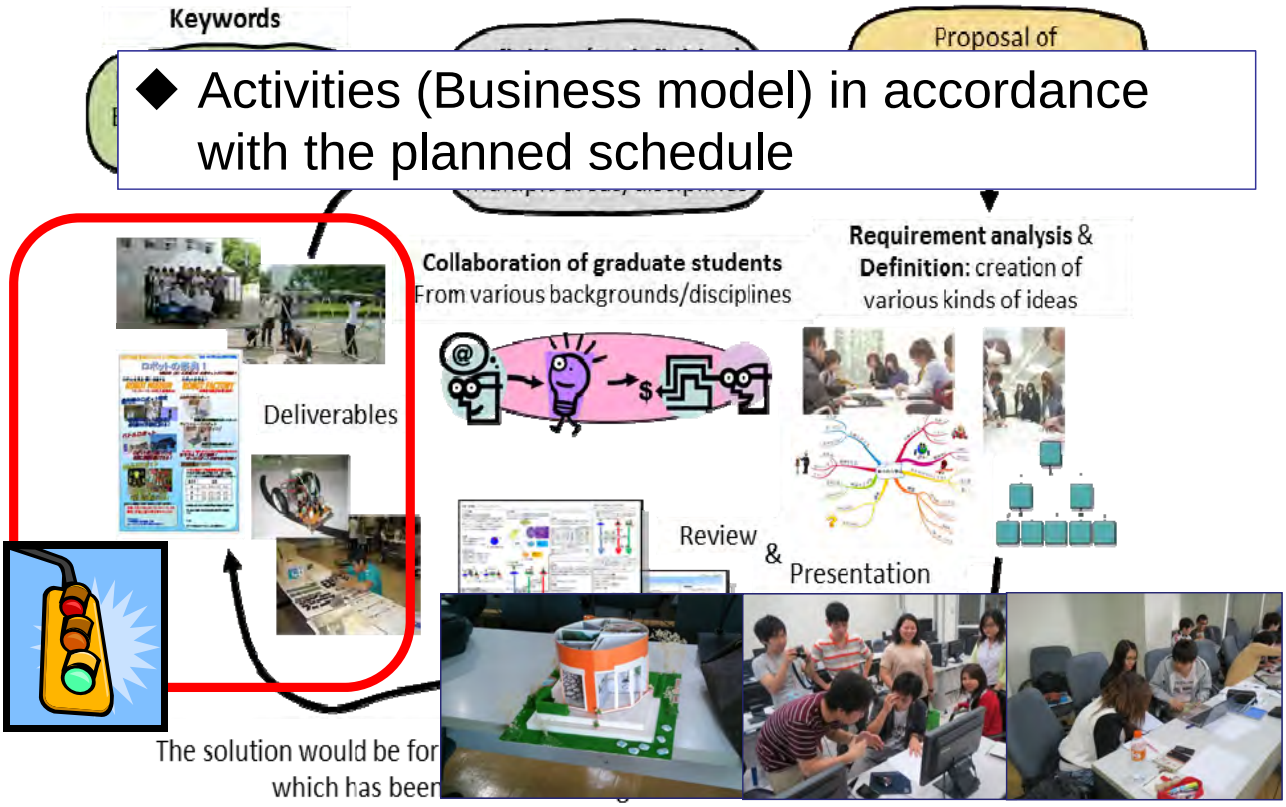
Resetting goal and reschedule for the activities via DR's comments.

- ✓ Re-requirement analysis
- ✓ Goal setting
- ✓ Assessment planning
- ✓ Schedule planning for activities

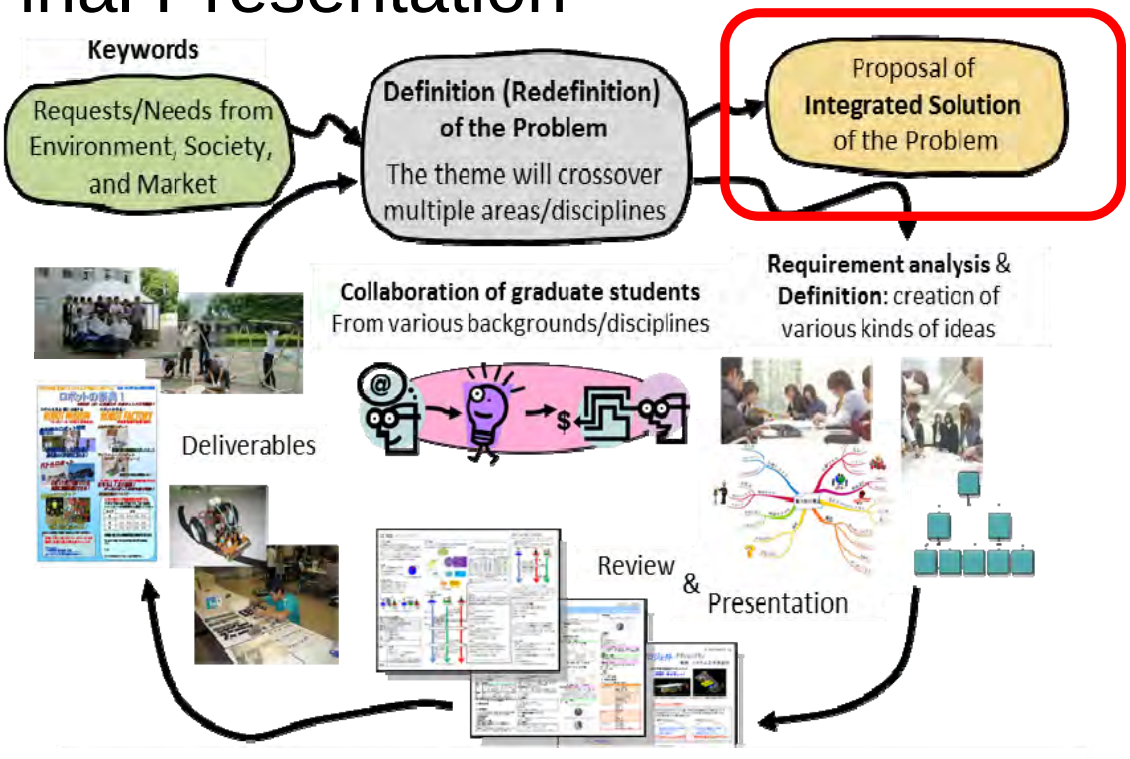


Day 7, 8:
Scheduled Actions

- Activities (Business model) in accordance with the planned schedule



Day 9:
Final Presentation



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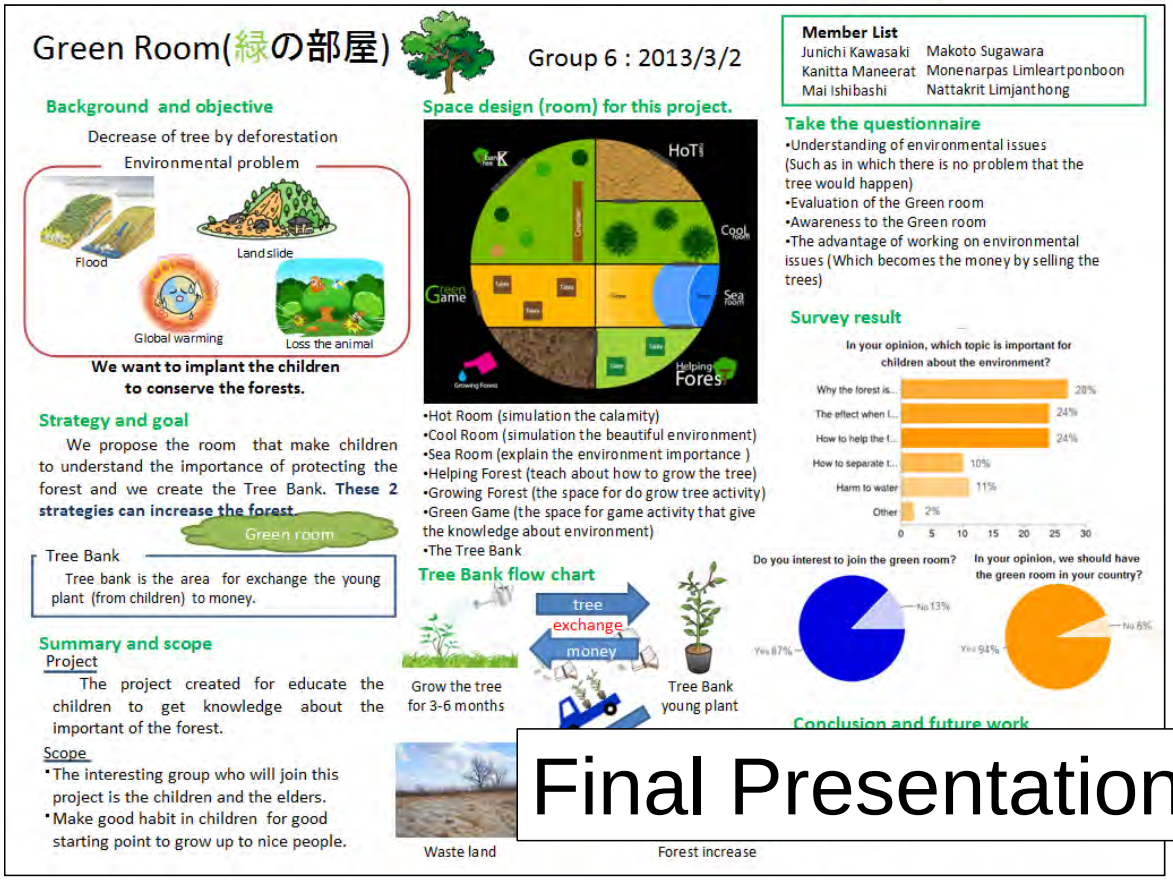
Day 9:

Final Presentation material

The A3 Material should include following points for the final presentation.

- Background and Objective
- Requirement Analysis
  - Present Status and Needs, Objective Analysis
  - Requirements, Strategy, and Goal
  - Criteria plan for evaluation
- Implementation
  - Summary and Scope
  - Implementation Plan
- Evaluation
  - Evaluation Method
  - Evaluation Result
- Conclusion

A3 Material

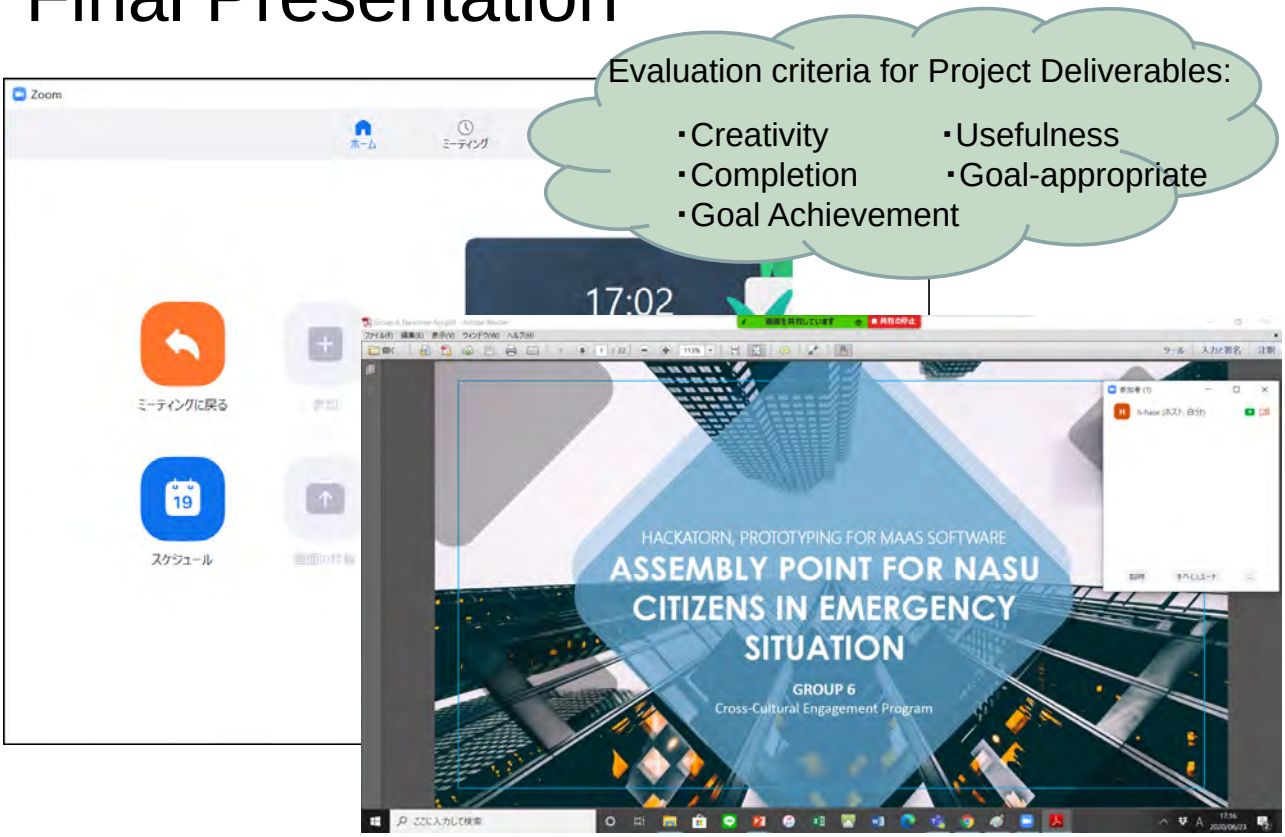


Day 9:
Standard of Evaluation for Final Presentation

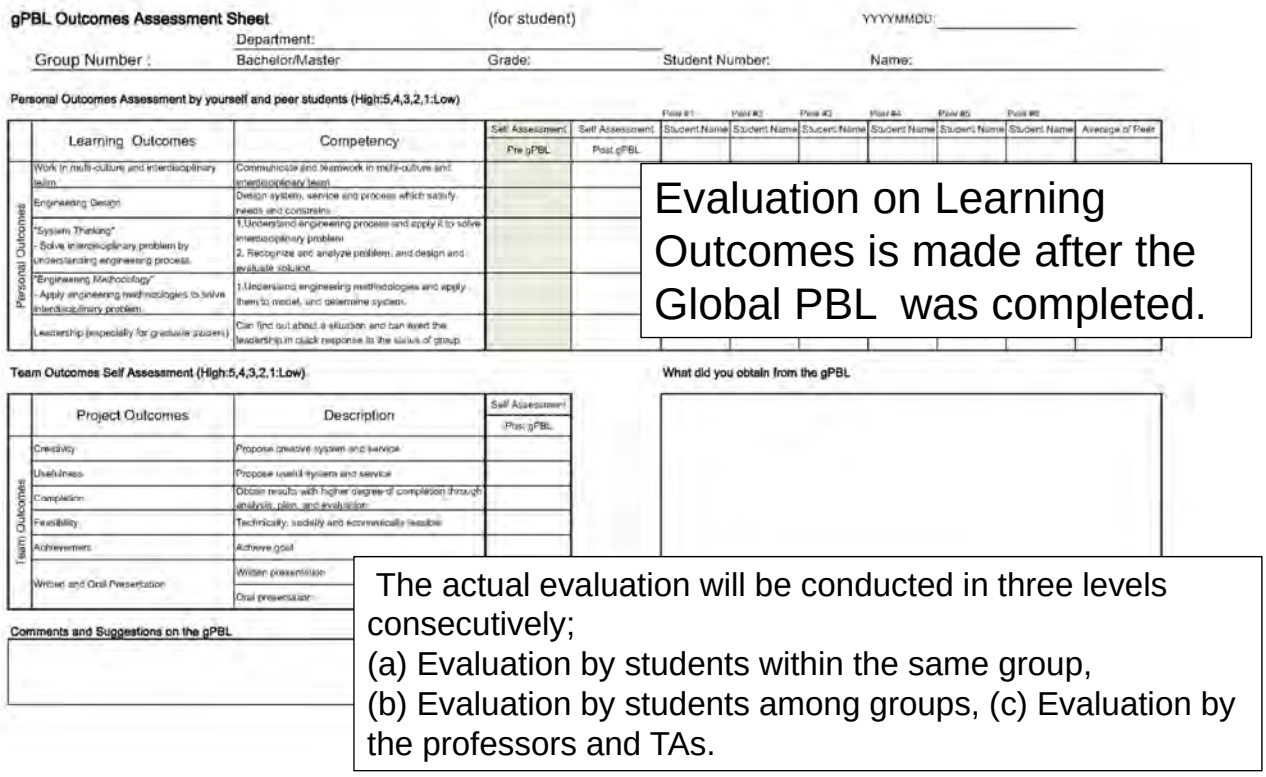
The final presentation are evaluated with scale from 1 to 5, based on the following evaluation standards.
The actual evaluation will be conducted in 2 levels consecutively; (a) Evaluation by students among groups, (b) Evaluation by the professors and TAs.

(1) Creativity: Did the group obtain creative results?
(2) Usefulness: Did the group obtain results that hit the point of the theme, which is useful in general or global problem solving?
(3) Completion: Did the group obtain results with higher degree of completion through analysis, plan, and evaluation?
(4) Feasibility: Did the group set a goal with an adequate level of feasibility?
(5) Achievement to the Goal: Did the group achieve the goal that was set at the beginning?

Day 9:
Final Presentation



Day 9:
Outcomes Assessment



gPBL Outcomes Assessment Sheet (for student) YYYYMMDD:

Department:

Group Number : Bachelor/Master Grade: Student Number: Name:

Personal Outcomes Assessment by yourself and peer students (High:5,4,3,2,1:Low)

	Learning Outcomes	Competency	Self Assessment Pre gPBL	Self Assessment Post gPBL	Peer #1 Student Name	Peer #2 Student Name	Peer #3 Student Name	Peer #4 Student Name	Peer #5 Student Name	Peer #6 Student Name	Average of Peer
Personal Outcomes	Work in multi-culture and interdisciplinary team	Communicate and Teamwork in multi-culture and interdisciplinary team									
	Engineering Design	Design system, service and process which satisfy needs and constrains									
	"System Thinking" - Solve interdisciplinary problem by understanding engineering process.	1.Understand engineering process and apply it to solve interdisciplinary problem 2. Recognize and analyze problem, and design and evaluate solution									
	"Engineering Methodology" - Apply engineering methodologies to solve interdisciplinary problem	1.Understand engineering methodologies and apply them to model, and determine system.									
	Leadership (especially for graduate student)	Can find out about a situation and can lead the leadership in quick response to the status of group									

Evaluation on Learning Outcomes is made after the Global PBL was completed.

Team Outcomes Self Assessment (High:5,4,3,2,1:Low)

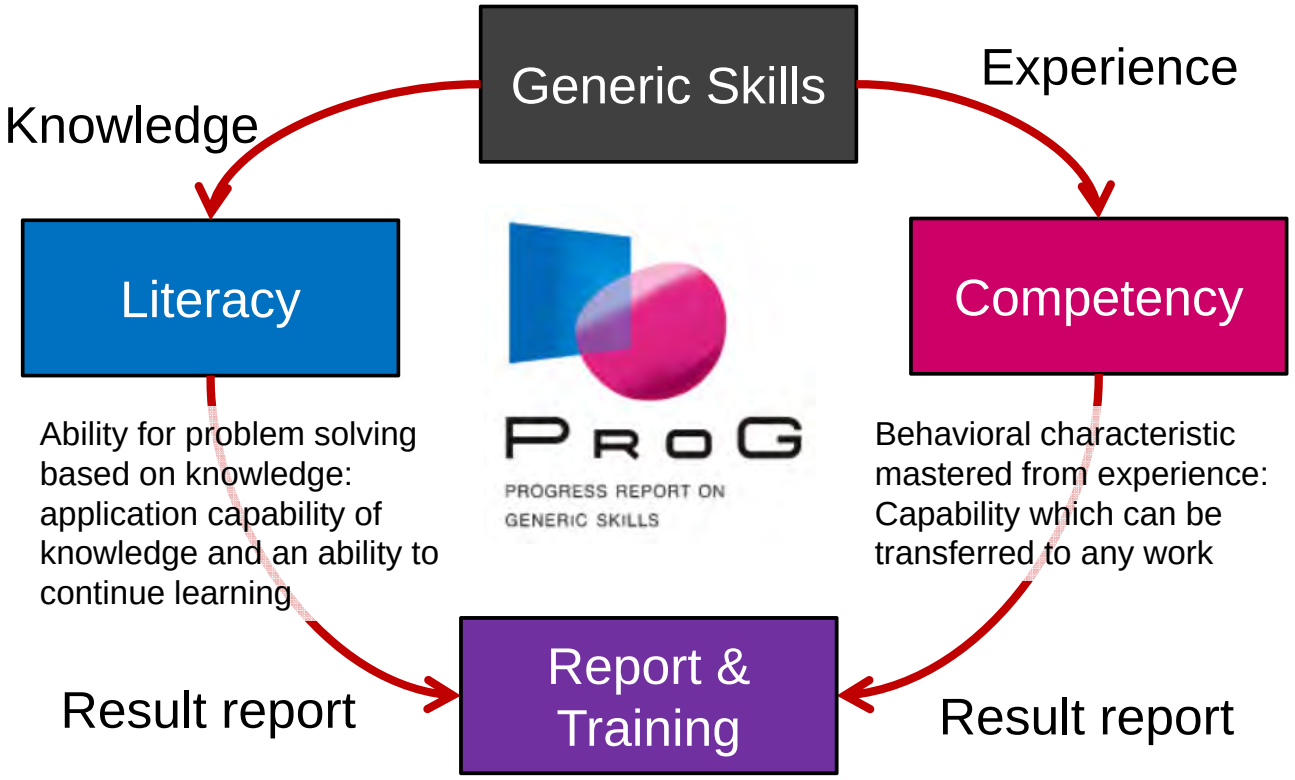
	Project Outcomes	Description	Self Assessment Post gPBL
Team Outcomes	Creativity	Propose creative system and service	
	Usefulness	Propose useful system and service	
	Completion	Obtain results with higher degree of completion through analysis, plan, and evaluation	
	Feasibility	Technically, socially and economically feasible	
	Achievement	Achieve goal	
	Written and Oral Presentation	Written presentation	
		Oral presentation	

What did you obtain from the gPBL

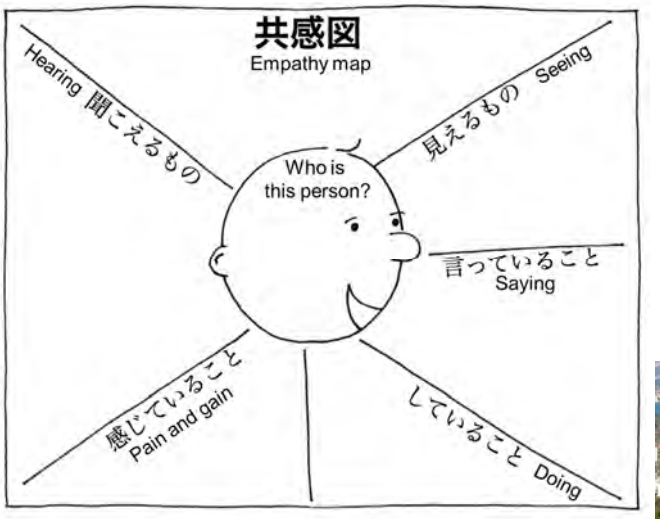
Comments and Suggestions on the gPBL

The actual evaluation will be conducted in three levels consecutively;
(a) Evaluation by students within the same group,
(b) Evaluation by students among groups, (c) Evaluation by the professors and TAs.

Day 9:
Progress Report On Generic skills (PROG)



Let’s exercise



Let’s exercise on CEP at Web based PBL

Activities in CEP

Last year GPBL

https://www.youtube.com/watch?v=KMVEkB6M7GM

gPBL@FCT/UNL 2017

https://www.youtube.com/watch?v=Ssh1R9A5r3M