Systems Thinking and Engineering-based Global Project Based Learning
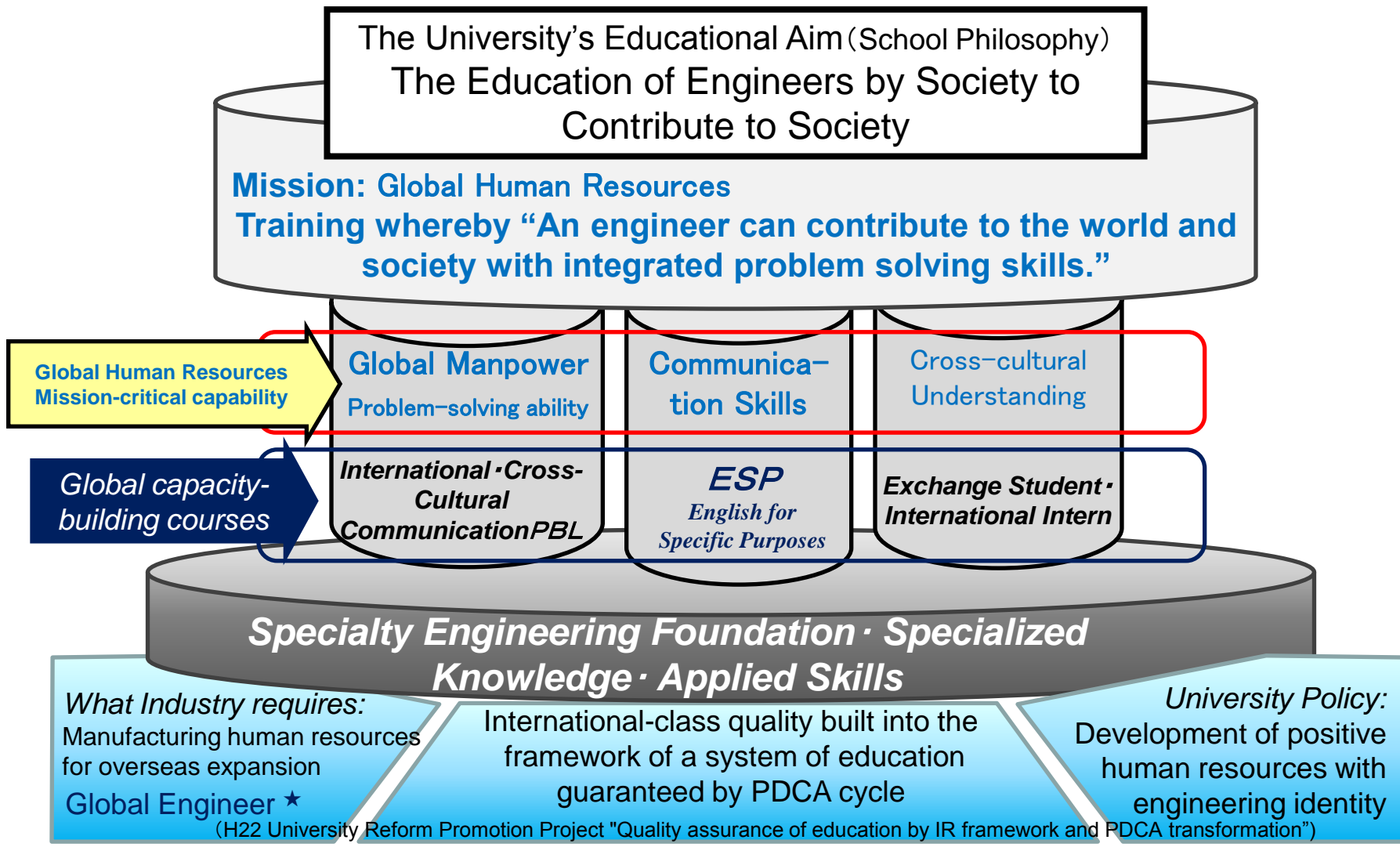
Shibaura Institute of Technology
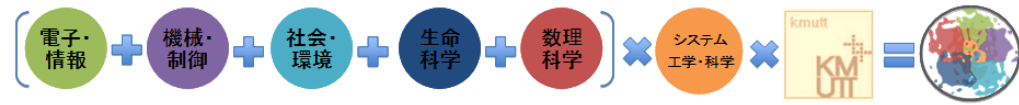
Hiroshi Hasegawa

cdio™ ASIAN REGIONAL MEETING 2014 2014/03/25

The University's Educational Aims, Performance and Special Features Realize Useful Global Human Resources

The University's Educational Aim（School Philosophy）
The Education of Engineers by Society to Contribute to Society

Mission: Global Human Resources
Training whereby "An engineer can contribute to the world and society with integrated problem solving skills."

Global Human Resources Mission-critical capability

Global Manpower Problem-solving ability	Communica-tion Skills	Cross-cultural Understanding

Global capacity-building courses

International・Cross-Cultural CommunicationPBL	*ESP* *English for Specific Purposes*	*Exchange Student・International Intern*

Specialty Engineering Foundation・Specialized Knowledge・Applied Skills

What Industry requires:
Manufacturing human resources for overseas expansion
Global Engineer ★

International-class quality built into the framework of a system of education guaranteed by PDCA cycle

（H22 University Reform Promotion Project "Quality assurance of education by IR framework and PDCA transformation"）

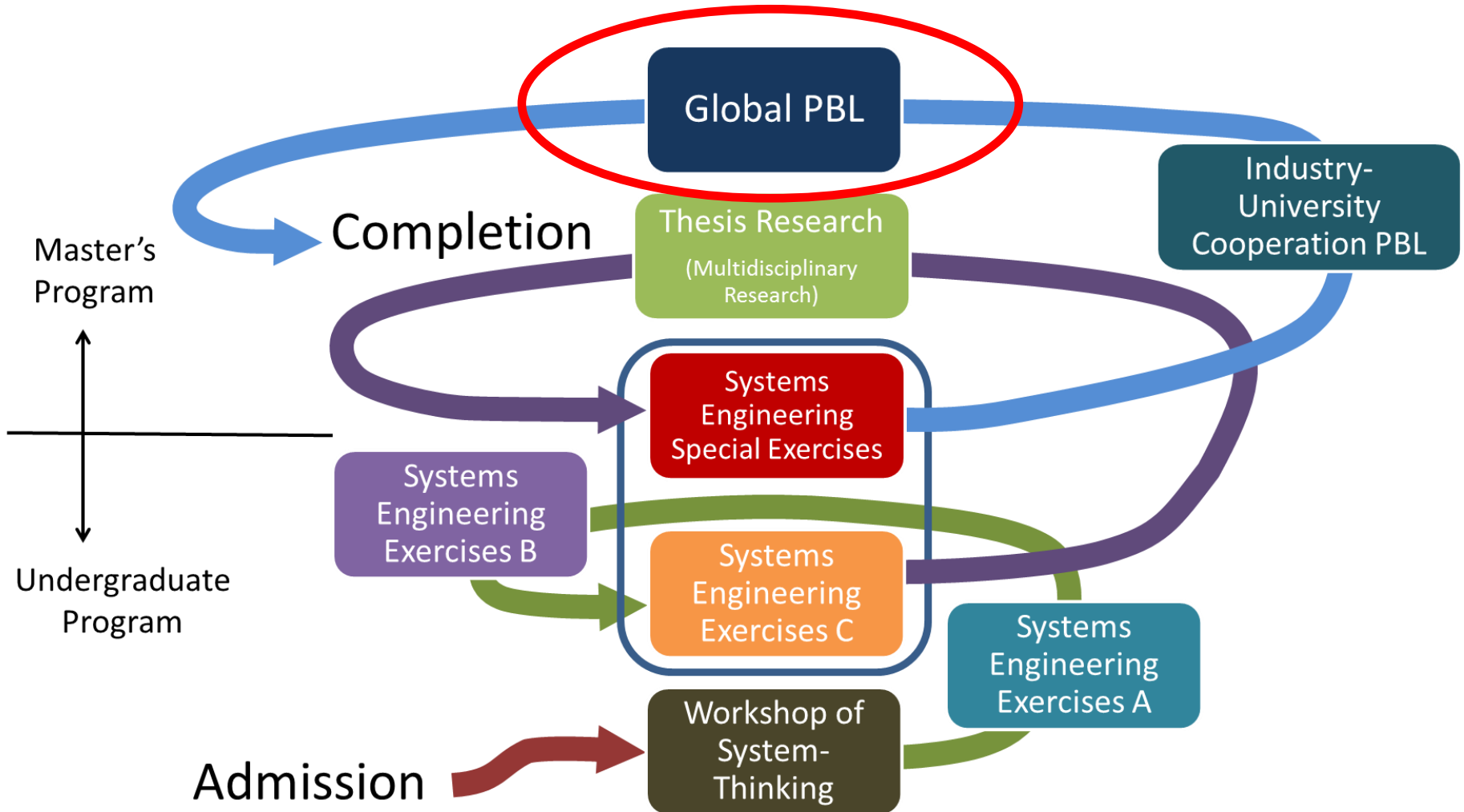*University Policy:*
Development of positive human resources with engineering identity

★ Global Engineer: human resources with these capabilities as defined by the American Society of Mechanical Engineers（ASME）

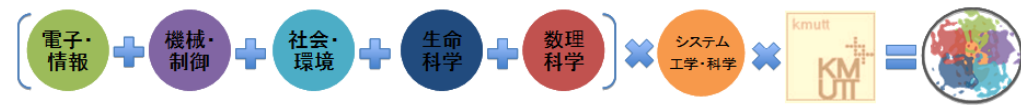電子・情報 ＋ 機械・制御 ＋ 社会・環境 ＋ 生命科学 ＋ 数理科学 ✕ システム工学・科学 ✕ kmutt KMUTT ＝

Graduate
and Faculty Cooperation

Systems Engineering Education Program:

SEATUC
South East Asian Technical University Consortium

- Shibaura Institute of Technology & 7 South-East Asian technological institutes participate in the consortium (established in May, 2006)
- The SEATUC Symposium has been held every year since 2006.
- International Cooperation & Exchange programs among the participants
- Participants
  - Shibaura Institute of Technology（SIT）
  - King Mongkut's University of Technology,Thonburi（KMUTT）, Thailand
  - Suranaree University of Technology（SUT）, Thailand
  - Institut Teknologi Bandung（ITB）, Indonesia
  - Universitas Gadjah Mada（UGM）, Indonesia
  - University of Teknologi Malaysia（UTM）, Malaysia
  - Hanoi University of Technology（HUST）, Vietnam
  - Ho Chi Minh City University of Technology（HCMUT), Vietnam
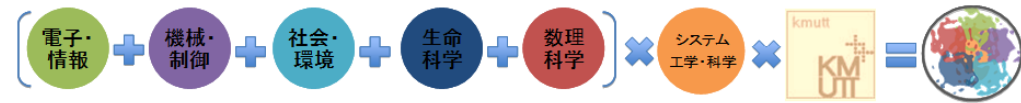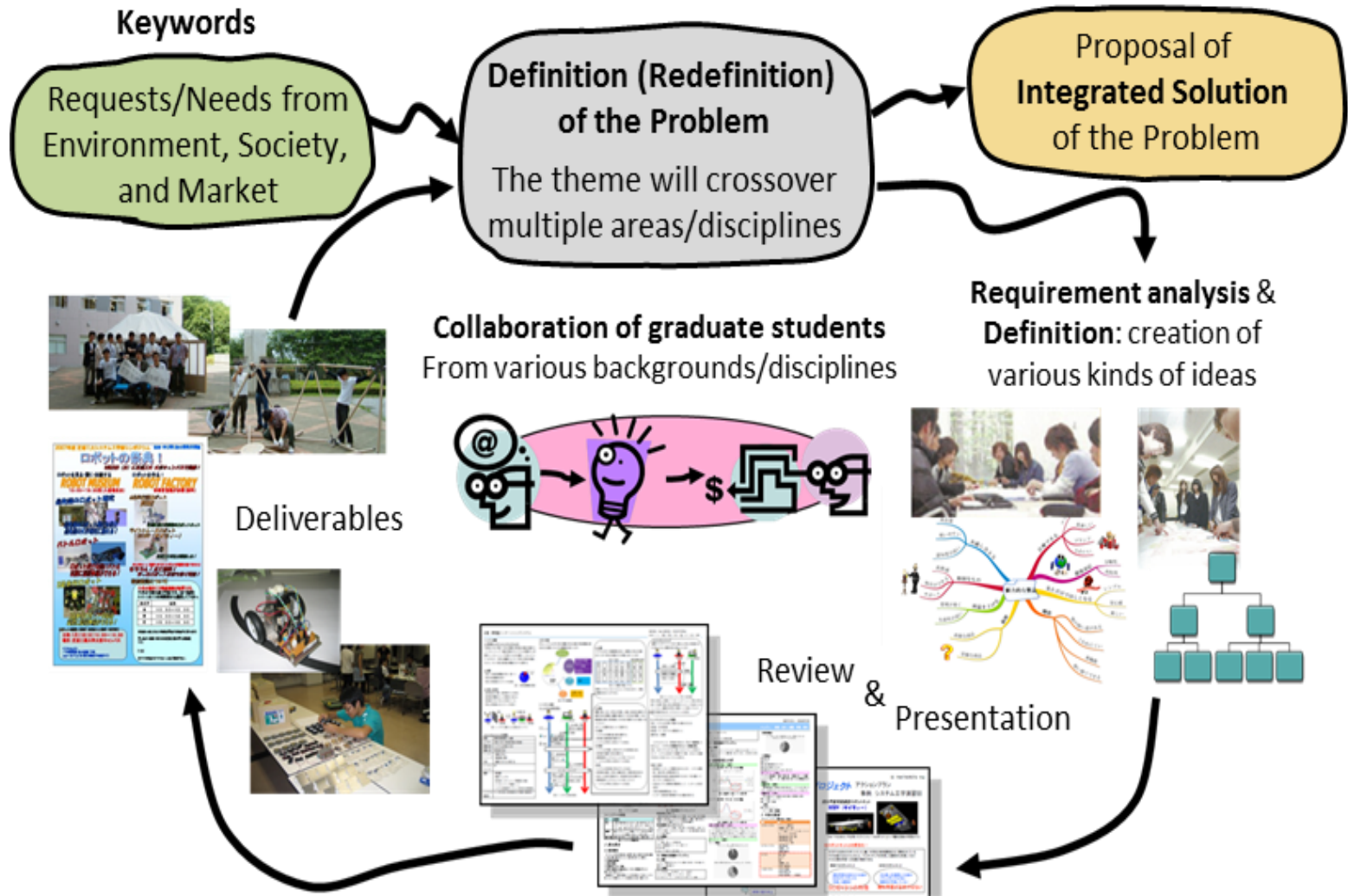
Goals
for Global PBL
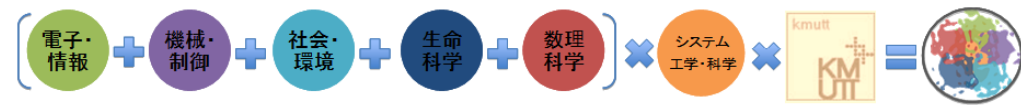
Through exercise and experience of Global Project Based Learning, the following three skills are acquired:

- Synthetic (Integrative) problem-solving skills in order to become marketable and international.

- Concepts and technologies of "systems thinking", "system approach", and "System Management (Project Management)"

- Ability to work as a member of an international, interdisciplinary team.

Global PBL:
Synthetic (Integrative) problem-solving process

Keywords

Requests/Needs from Environment, Society, and Market

Definition (Redefinition) of the Problem
The theme will crossover multiple areas/disciplines

Proposal of **Integrated Solution** of the Problem

Collaboration of graduate students
From various backgrounds/disciplines

Requirement analysis & **Definition**: creation of various kinds of ideas

Deliverables

Review & Presentation

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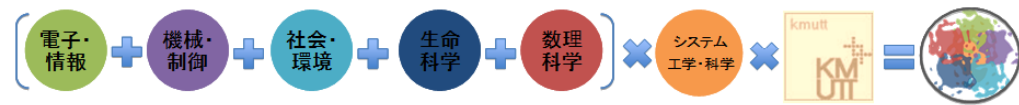
Schedule & Participants

Dates:　2013/02/24 – 2013/03/03　（8 days）

Place:

　　King Mongkut's University of Technology, Thonburi in Thailand

Team Member Totals*:　27 from SIT,　23 from KMUTT

The Ability to Communicate in English:

　Students who is weak in English can use a PC, smart phone, Internet, or a variety of devices or services. This way students are encouraged to seize opportunities to speak and bolster confidence in English.

 *Both sides should be composed of 1st year Graduate School students, and Third- and Fourth-Year Undergrads.
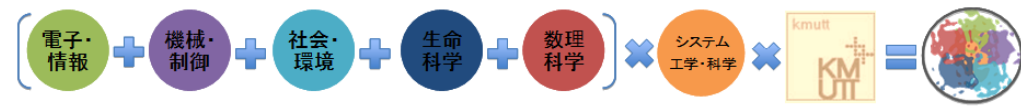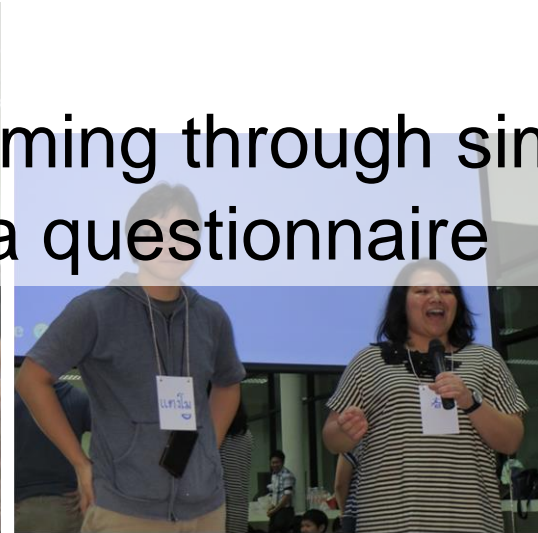
Day 1:
Icebreaking & Team-forming

Icebreaking:
Self introductions and team-forming through simple games for communication and a questionnaire
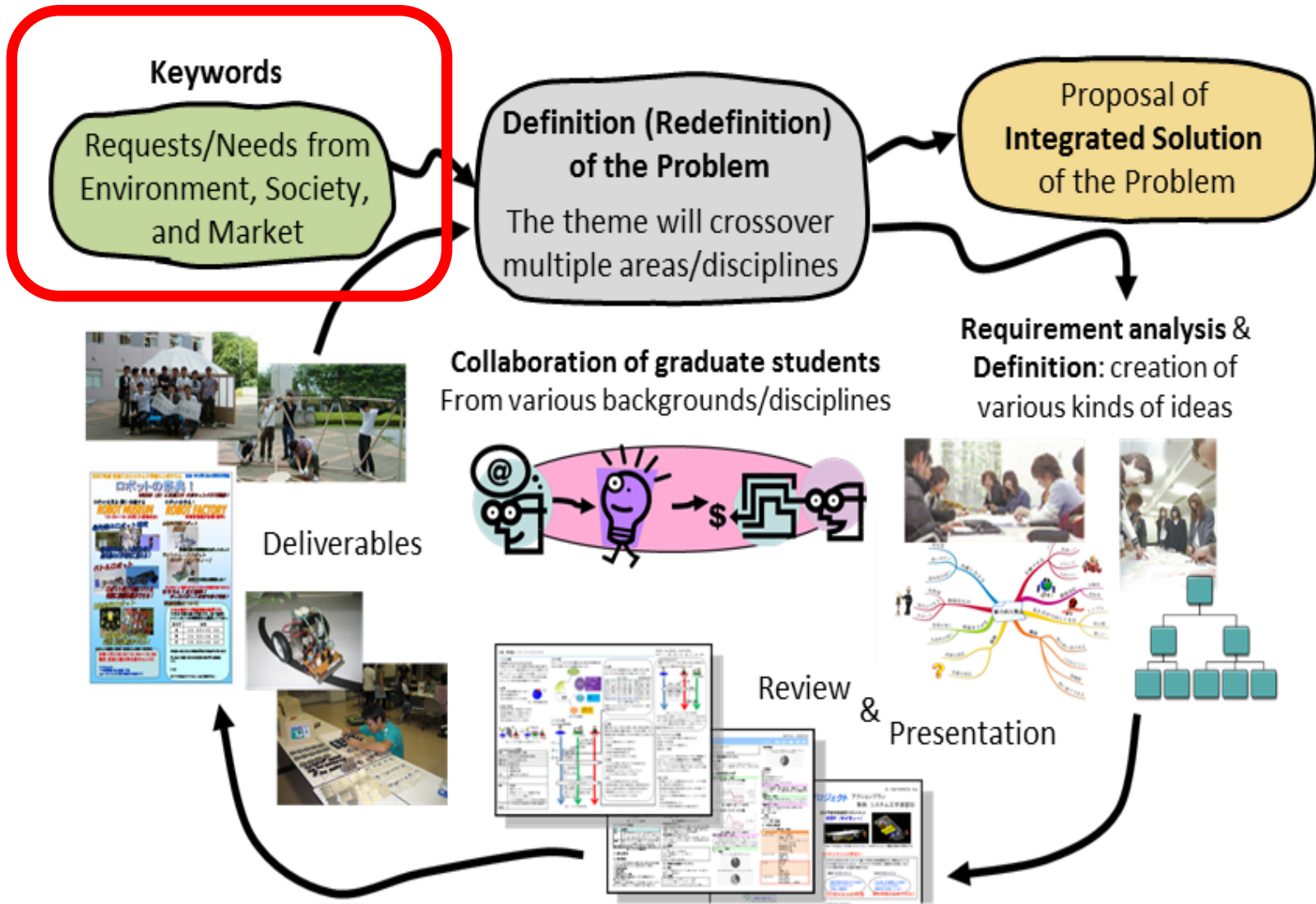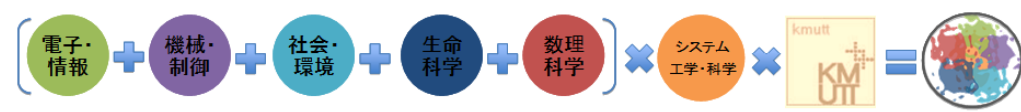

Everyone at the Self-introduction Game

Nickname announcement

Japanese and Thai students form pairs (become buddies)

Project Theme-setting

電子・情報 ＋ 機械・制御 ＋ 社会・環境 ＋ 生命科学 ＋ 数理科学 ✕ システム工学・科学 ✕ KMUTT ＝

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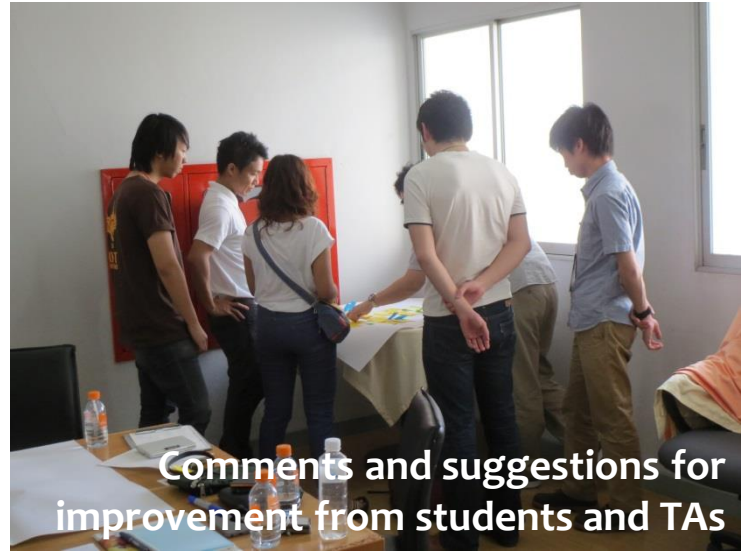
Deliverables

Review & Presentation

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

Day 2: Team-setting

社会・環境 + 生命科学 + 数理科学 × システム工学・科学 × kmutt KMUTT = 🌐
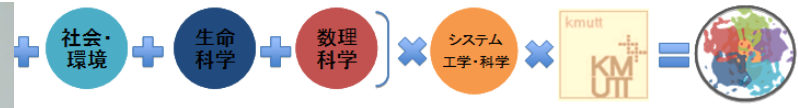
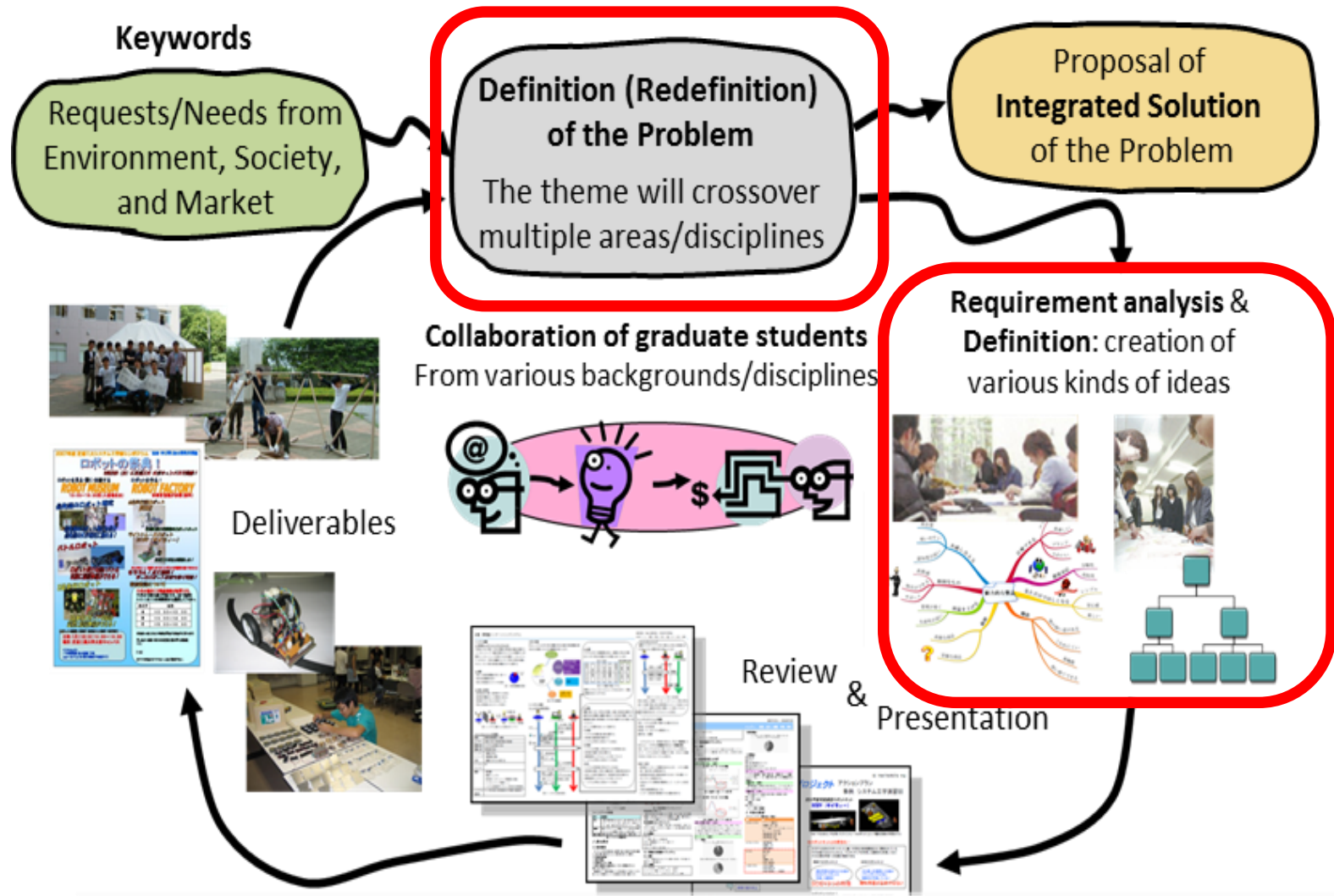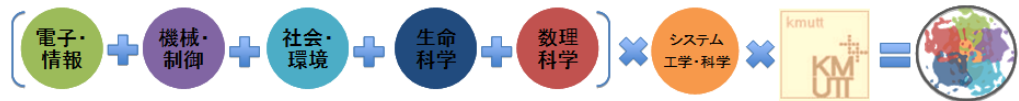Using sticky notes during discussions open to any challenge

Comments and suggestions for improvement from students and TAs

Agreed upon theme announced

Keywords:

Ecology, Energy, Eco-tourism, Community development, Service, Mobility, Welfare and medical systems, Disaster prevention, Multi-language communication, User experience, Innovation, Education systems, Global leadership, Others (student-generated)

Problem Analysis & Definition

Keywords

Requests/Needs from Environment, Society, and Market

Definition (Redefinition) of the Problem

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Collaboration of graduate students
From various backgrounds/disciplines

Requirement analysis & Definition: creation of various kinds of ideas

Deliverables

Review & Presentation

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

Day 3 & 4:

Requirements analysis and goal setting, budget planning and activity scheduling

On the second day, the venue was moved to Hua Hin, two days and one night, and when the schedule Review (submission of execution plan that include the cost of the survey, announcement, and evaluation) " was implemented.

Surprise!
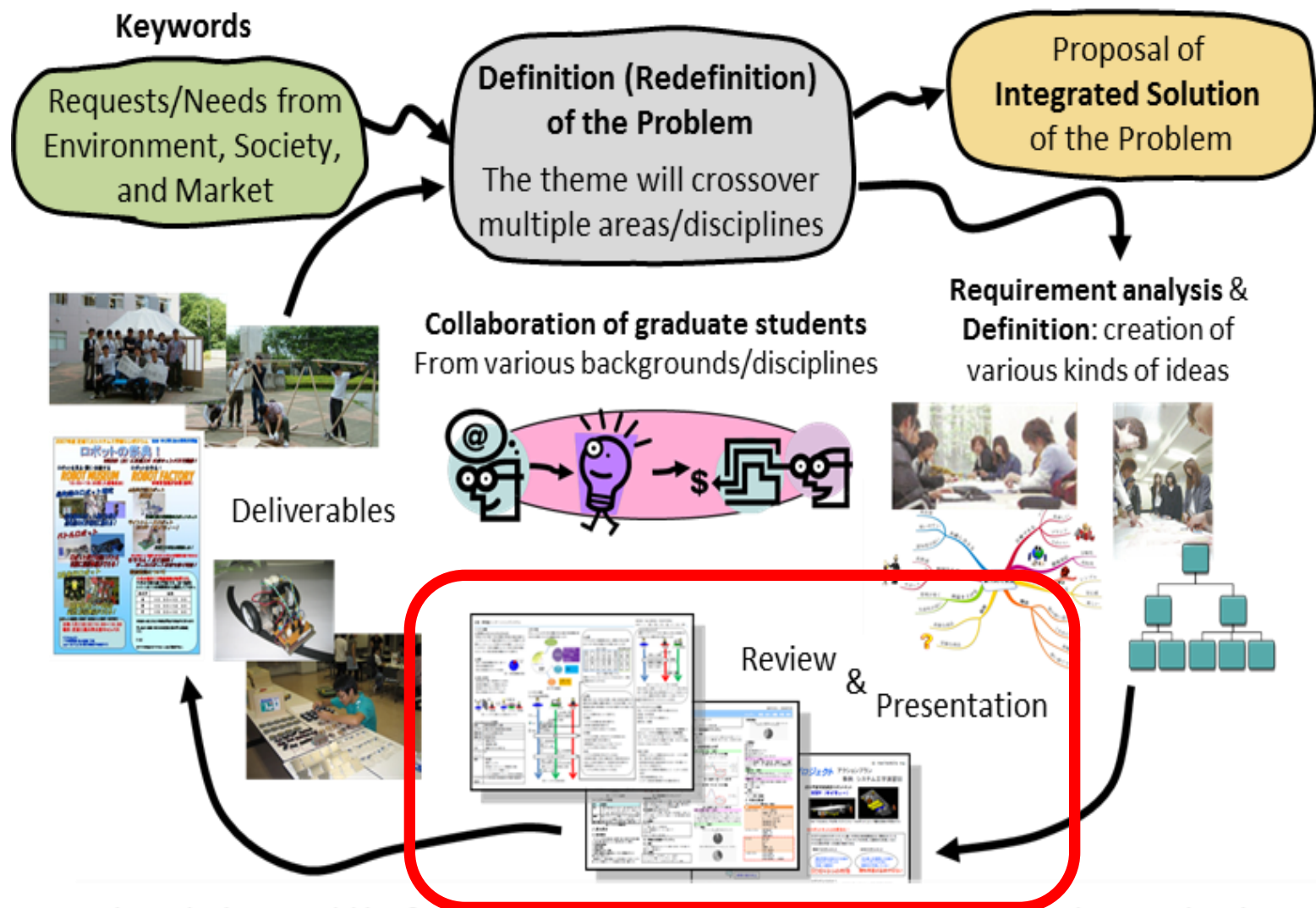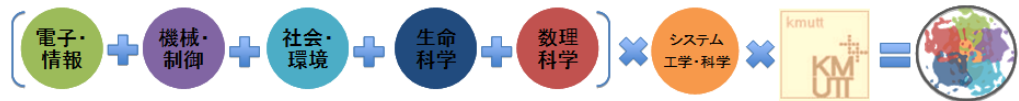
Lunch facing the beach

Group work here, too

Design Review

Keywords

Requests/Needs from Environment, Society, and Market

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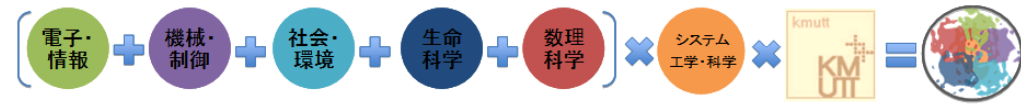
Day 4: Design Review (DR)

The A3 material and budget planning document are used for DR. The A3 material should include the following points.

1. Background and objective
2. Requirement analysis
2.1. Present status and needs, Objective analysis
2.2. Requirements, Strategy, and Goal
2.3. Criteria plan for evaluation
3. Scheduled Actions

Back on campus, at last the DR!

A3 Material

Green Room(緑の部屋)

Group 6 : 2013/3/2

Member List
Junichi Kawasaki   Makoto Sugawara
Kanitta Maneerat   Monenarpas Limleartponboon
Mai Ishibashi   Nattakrit Limjanthong

Background and objective

Decrease of tree by deforestation

Environmental problem

Flood
Landslide
Global warming
Loss the animal

We want to implant the children to conserve the forests.

Strategy and goal

We propose the room that make children to understand the importance of protecting the forest and we create the Tree Bank. **These 2 strategies can increase the forest.**

Green room
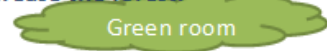
Tree Bank
Tree bank is the area for exchange the young plant (from children) to money.

Summary and scope
Project

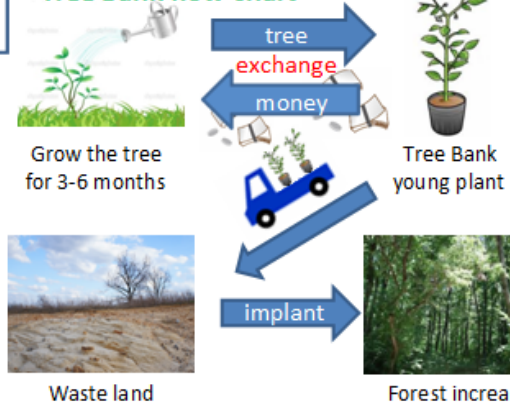The project created for educate the children to get knowledge about the important of the forest.

Scope
· The interesting group who will join this project is the children and the elders.
· Make good habit in children for good starting point to grow up to nice people.

Space design (room) for this project.

HoT room
Cool room
Green Game
Sea room
Helping Forest
Growing Forest
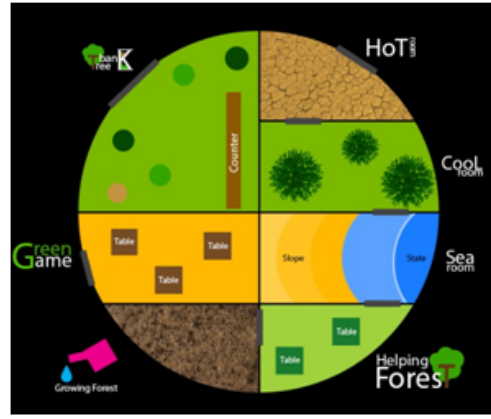
· Hot Room (simulation the calamity)
· Cool Room (simulation the beautiful environment)
· Sea Room (explain the environment importance)
· Helping Forest (teach about how to grow the tree)
· Growing Forest (the space for do grow tree activity)
· Green Game (the space for game activity that give the knowledge about environment)
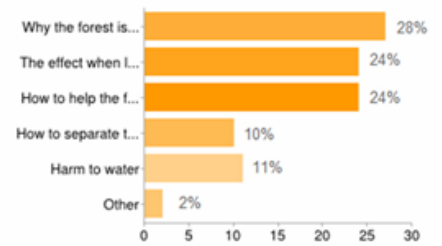· The Tree Bank

Tree Bank flow chart

tree
exchange
money

Grow the tree for 3-6 months
Tree Bank young plant

implant
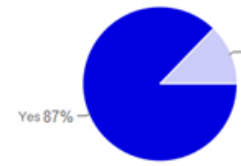
Waste land
Forest increase

Take the questionnaire
· Understanding of environmental issues (Such as in which there is no problem that the tree would happen)
· Evaluation of the Green room
· Awareness to the Green room
· The advantage of working on environmental issues (Which becomes the money by selling the trees)

Survey result

In your opinion, which topic is important for children about the environment?

Topic	Percent
Why the forest is...	28%
The effect when I...	24%
How to help the f...	24%
How to separate t...	10%
Harm to water	11%
Other	2%

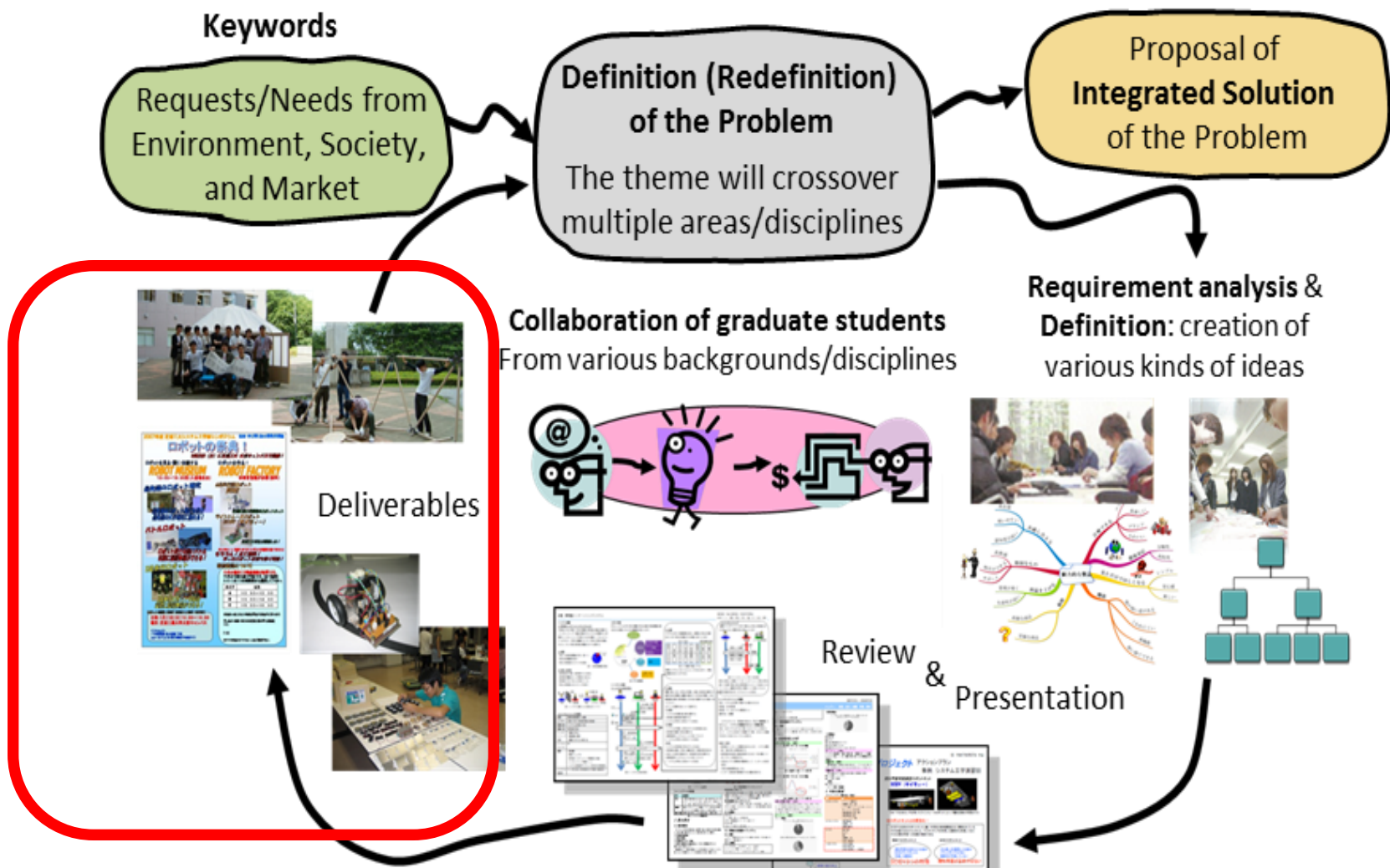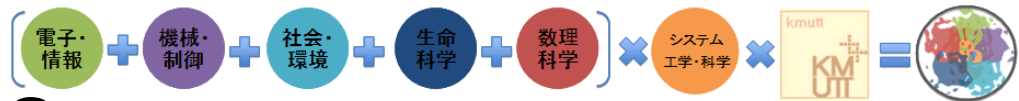Do you interest to join the green room?
Yes 87%   No 13%

In your opinion, we should have the green room in your country?
Yes 94%   No 6%

Conclusion and future work
· We created the Green room that incorporates the ideas of many people.
· We must consider to build a place of the green room.
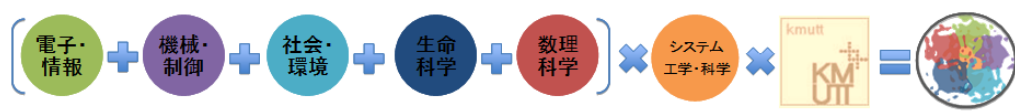
Scheduled Actions

Keywords

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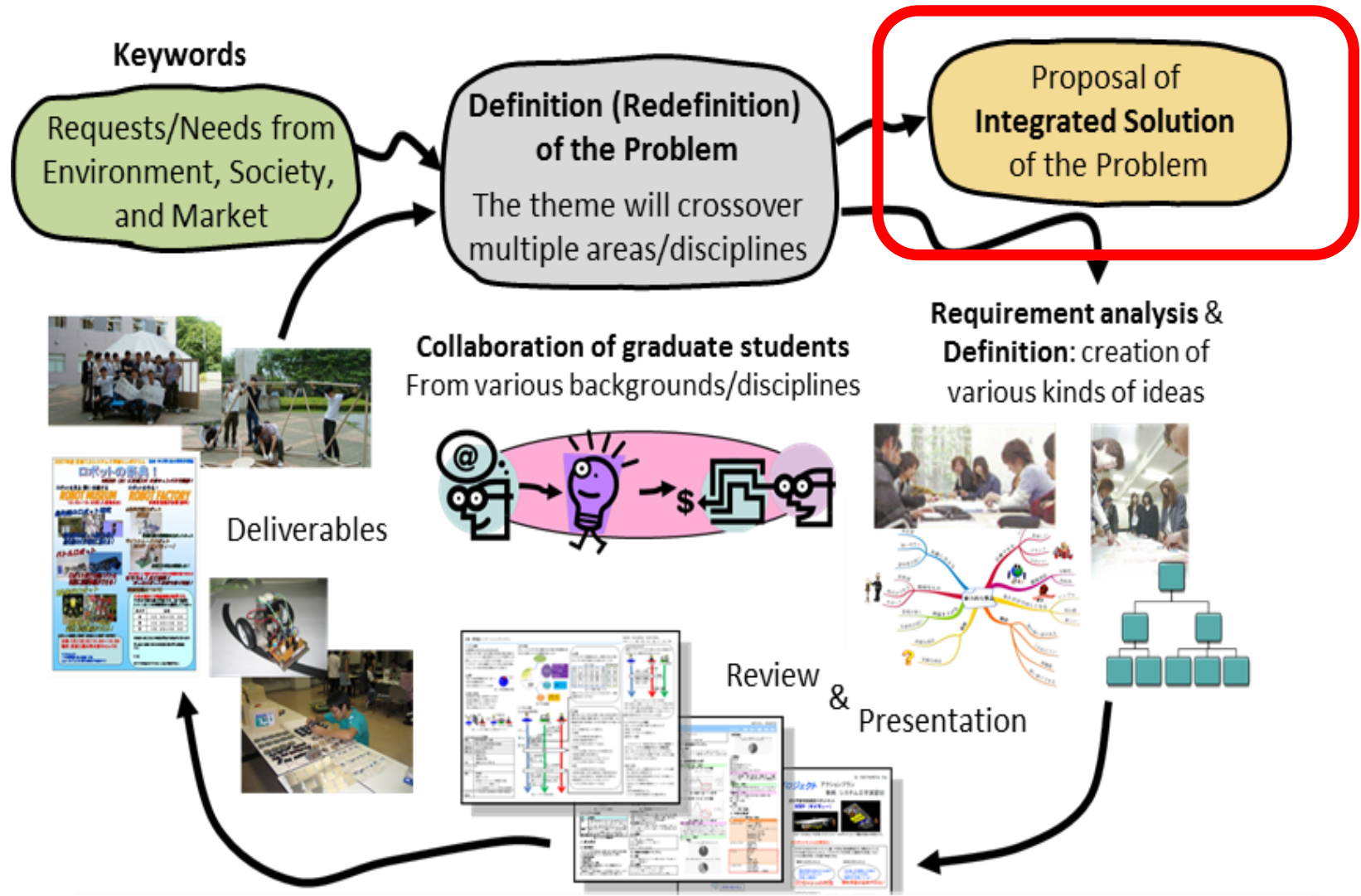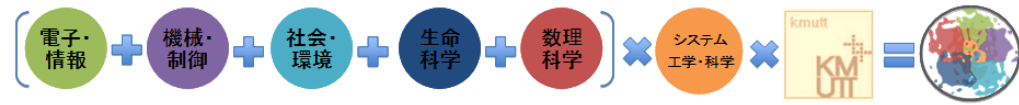
Day 5 & 6
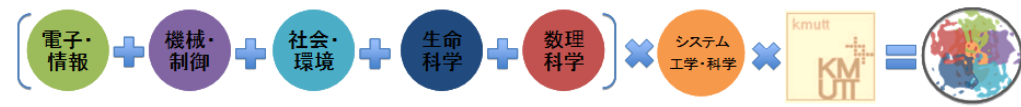
Day 5	Thu 28, Feb	Activities (Research/Survey/Production etc.) in accordance with the planned schedule
	9:00-12:00	Bangkok City Tour (Royal Palace)
	13:00-16:00	Workshop
	18:00-20:00	Cultural Exchange
Day 6	Fri 01, Mar	Activities in accordance with the planned schedule

Sightseeing &
Cultural exchange activities

Final Presentation

Final Presentation

Evaluation criteria for Project Deliverables:

・Creativity　　　・Usefulness
・Completion　　　・Goal-appropriate
・Goal Achievement

What is described in A3 material:

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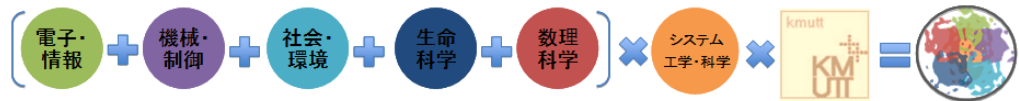　　Summary and Scope
　　Implementation Plan
Evaluation
　　Evaluation Method
　　Evaluation Result
Conclusion

Evaluation of Outcomes Achievement & PROG Test

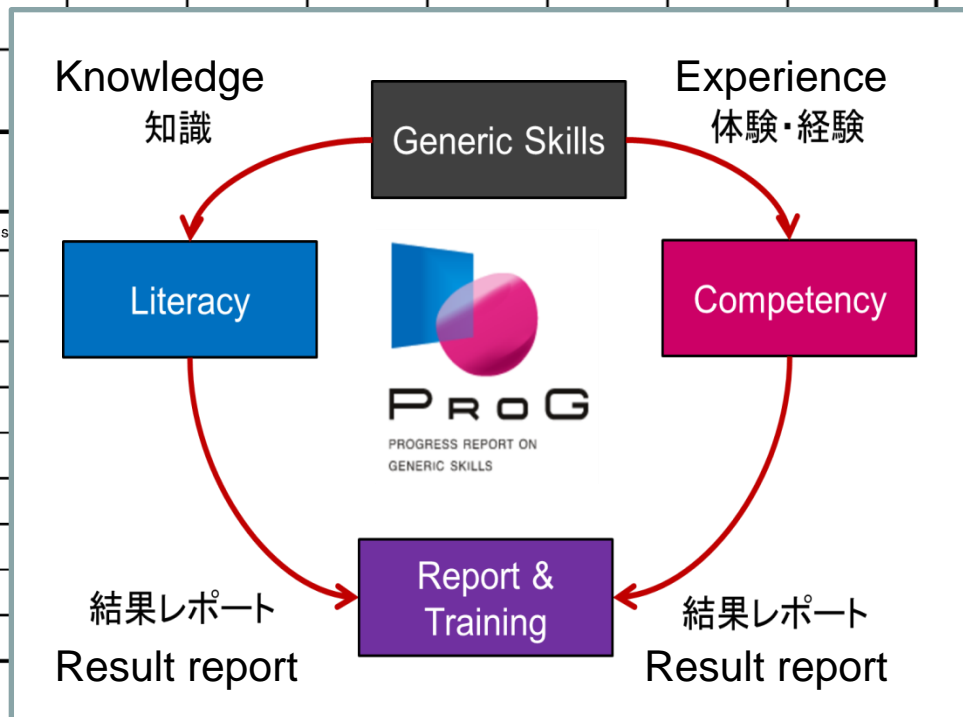**gPBL Outcomes Assessment Sheet**
(for student)

YYYYMMDD:

Bachelor/Master	Grade:	Number:	Name:

Personal Outcomes Self and Peer Assessment (High::5,4,3,2,1:Low)

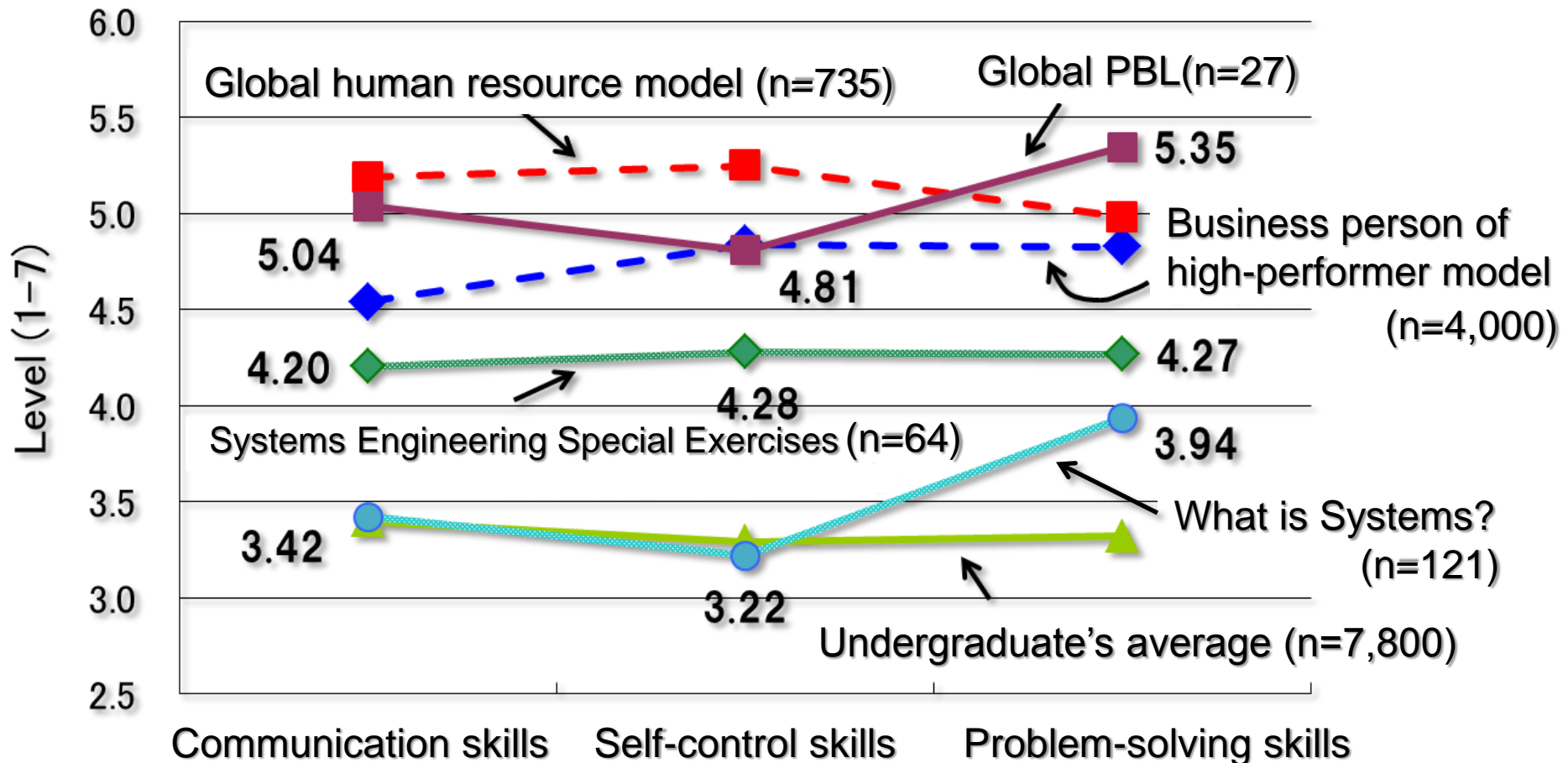|	Learning Outcomes	Competency	.Self Assessment	Peer #1 Name	Peer #2 Name	Peer #3 Name	Peer #4 Name	Peer #5 Name	Peer #6 Name	Average of Peer
			–							–
Personal Outcomes	Work in multi-culture and interdisciplinary team	Communicate and teamwork in multi-culture and interdisciplinary team								
	Engineering Design	Design system, service and process which satisfies 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.								

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

	Project Outcomes		Self Asses
Team Outcomes	Originality	Propose original system and service	
	Usefulness	Propose useful system and service	
	Accuracy	Based on scientific analysis and engineering design	
	Feasibility	Technically, socially and economically feasible	
	Goal	Set appropriate goal	
	Achievement	Achieve goal	
	Written and Oral Presentation	Written presentation	
		Oral presentation	

Knowledge 知識   Experience 体験・経験

Generic Skills

Literacy   Competency

PROG
PROGRESS REPORT ON GENERIC SKILLS

Report & Training
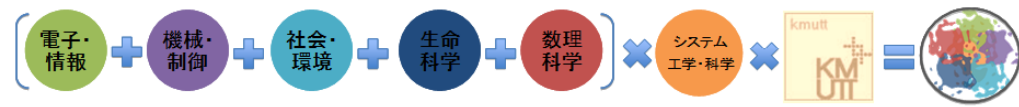
結果レポート Result report   結果レポート Result report

Competency of Generic Skill:
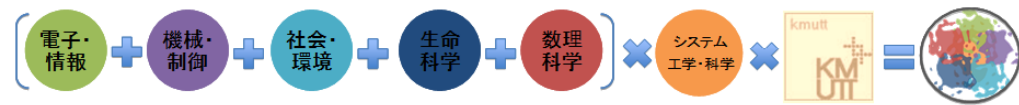
Progress Report On Generic skills (PROG)

Summary

A team of Japanese and Thai students was formed to collaborate and communicate in English to carry out the implementation of an international system of PBL engineering.

Final presentation and design review were completed in only one week. Moreover, the PBL practice, "Surprise!", was undertaken with schedule changes without prior announcement.

International PBL was also validated by PROG test.

Satisfaction was very high in the interviews with graduate students and students of the two countries after the end of the program, confirming the effectiveness of the international PBL.