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Innovative Engineering Education with Community-Based Projects at Kanazawa Institute of Technology

CDIO Asian Regional Meeting
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Kanazawa Institute of Technology

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1. Introduction

Circumstances

Surrounding

Universities &

Higher Educational Institutions

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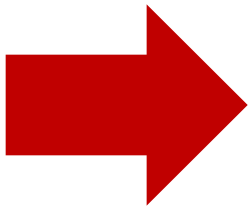
Change of circumstances surrounding Japanese universities (KIT)

- Practice trends in science & technology/
  Diversity, refinement and integration trends in academic fields/
  Progress in computer-aided technology/
  Interest in environmental and energy problems
- Change of student disposition due to affluent lives/
  Problems in learning => Decline in academic interest and motivation for learning
- From rote memorization to applicable, practical, and creative activities/Importance of innovation in engineering
- Development of pedagogy



Need to change existing education systems and teaching methods

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2. Engineering Education at Kanazawa Institute of Technology (KIT)

1) Transition of KIT-Education

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Recent Progress in engineering education at KIT

From the latter part of 20th century : Reformation & renovation on a global scale

Yume-koubou (1993), Engineering design education, Project Based Learning,, Team activity, …

KIT educational reform (1995-)

Curriculum with project-based design course as the main pillar

Feedback and reforms:
To foster "active-minded engineers" who can succeed in real world"

KIT joins CDIO-initiative in June 2011

Center of Community:
University which can communicate with local community

The 5th educational reform

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2) Educational Goal:

What kind of engineers does KIT aim to nurture?

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What attributes should graduates of KIT acquire?

KIT Educational Goal：

Engineers who can act with initiative based on creative thinking

Nurture of human resources who can succeed in a real (industrial) world

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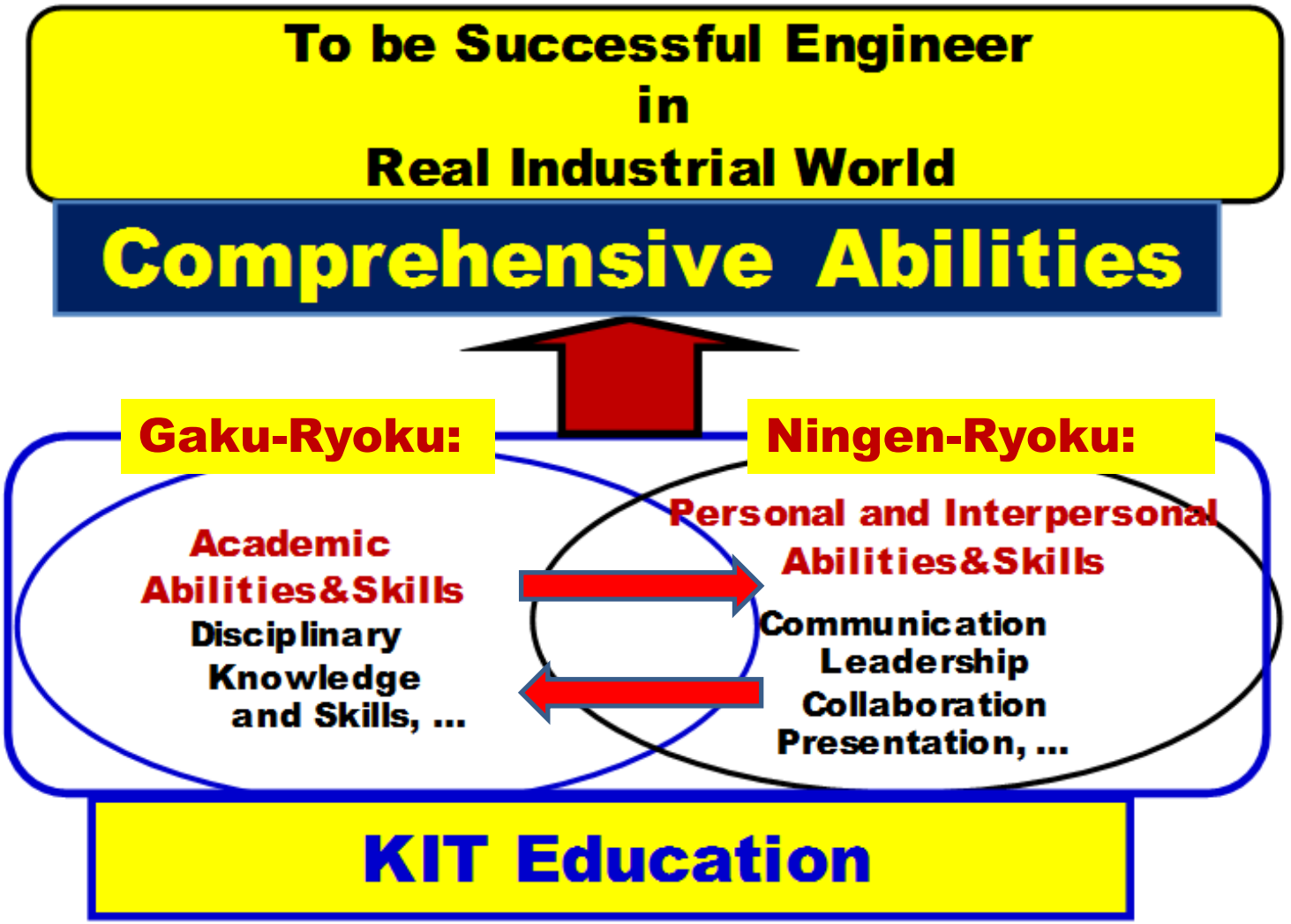

Two important competencies in KIT education

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Comprehensive Abilities

Gaku-Ryoku=
Academic Abilities & Skills

Knowledge and skills in discipline

X

Ningen-Ryoku=
Personal and Interpersonal Abilities & Skills in KIT

(1) Independence and Autonomy
(2) Leadership
(3) Collaboration skill
(4) Presentation skill
(5) Communication skill

*** Red colored words = in Japanese**

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3. Fundamental Elements in KIT Educational Program

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Four Elements in KIT-Educational Program

A) **Curriculum**

B) **Workspaces**

C) **Learning Methods; Class-Work & Extracurricular activities**

D) **Reflection and Feedback**

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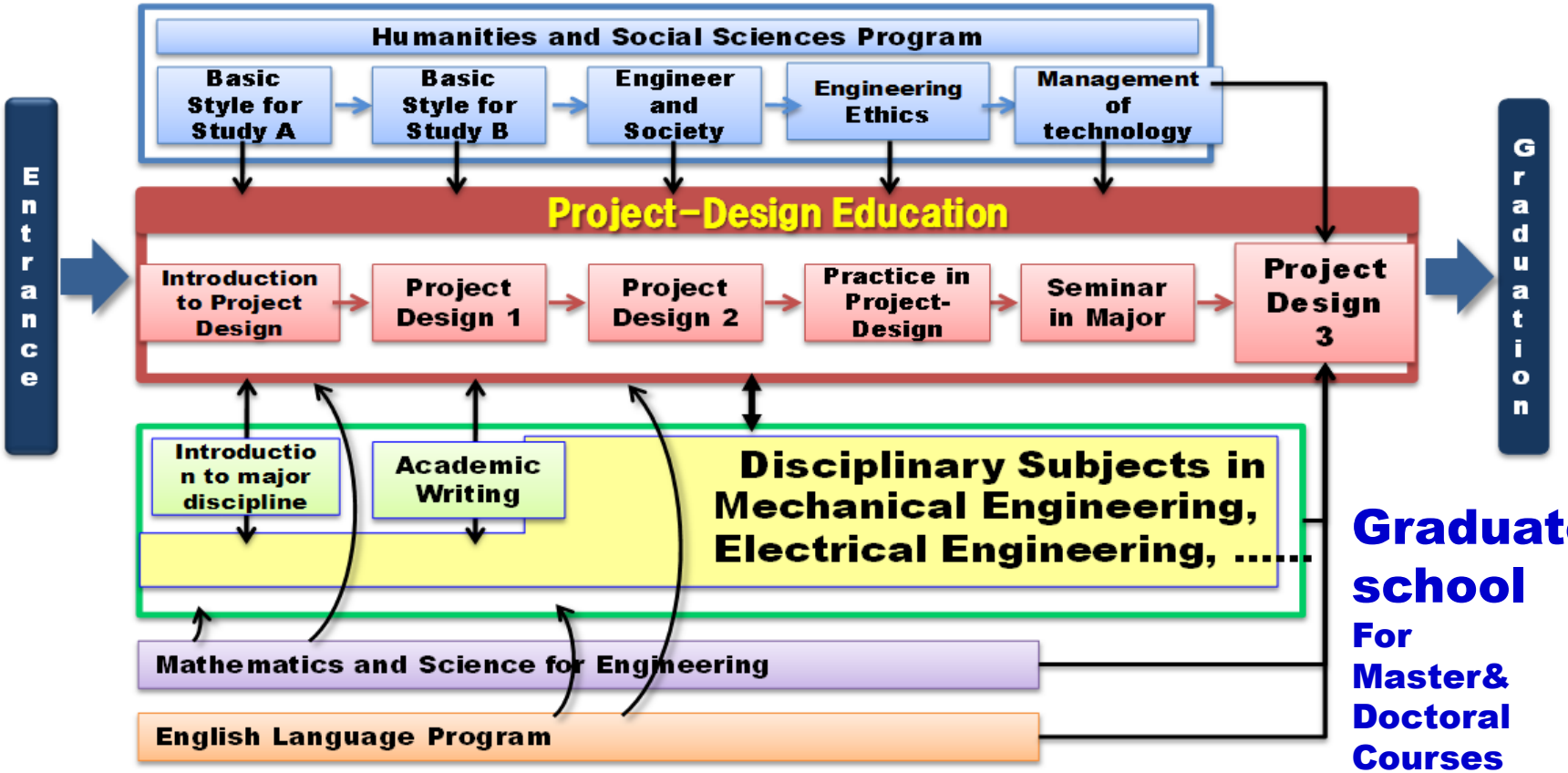
A) Curriculum



International Standard-Directed Curriculum with its pillar of Project-Design Education

Outline of KIT curriculum 2012

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B) Workspaces

Yume-Koubo:
The Factory for Dreams and Ideas

Workshop

Project Space

Exhibition space

Yume-kobo Project

Library Center, Innovation & Design Studio, Entrepreneurs-Lab, 24hours-study room,

Project Design Center

Team activity by Cutter in Anamizu Bay

■ Robot ■ Human powered aircraft ■ Human powered boat ■ RoboCup ■ GPS boat ■ Wind powered generator ■ Electric vehicle ■ Model making ■ Solar car ■ Eco run ■ Conveyance vehicle ■ Solar boat ■ Emergency robot ■ Formula car

Anamizu-Bay Seminar House

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Research Campus in Yatsukaho

Project Design Ⅲ :Senior(Graduation) Project
Research in graduate students (M.C. & PhD)

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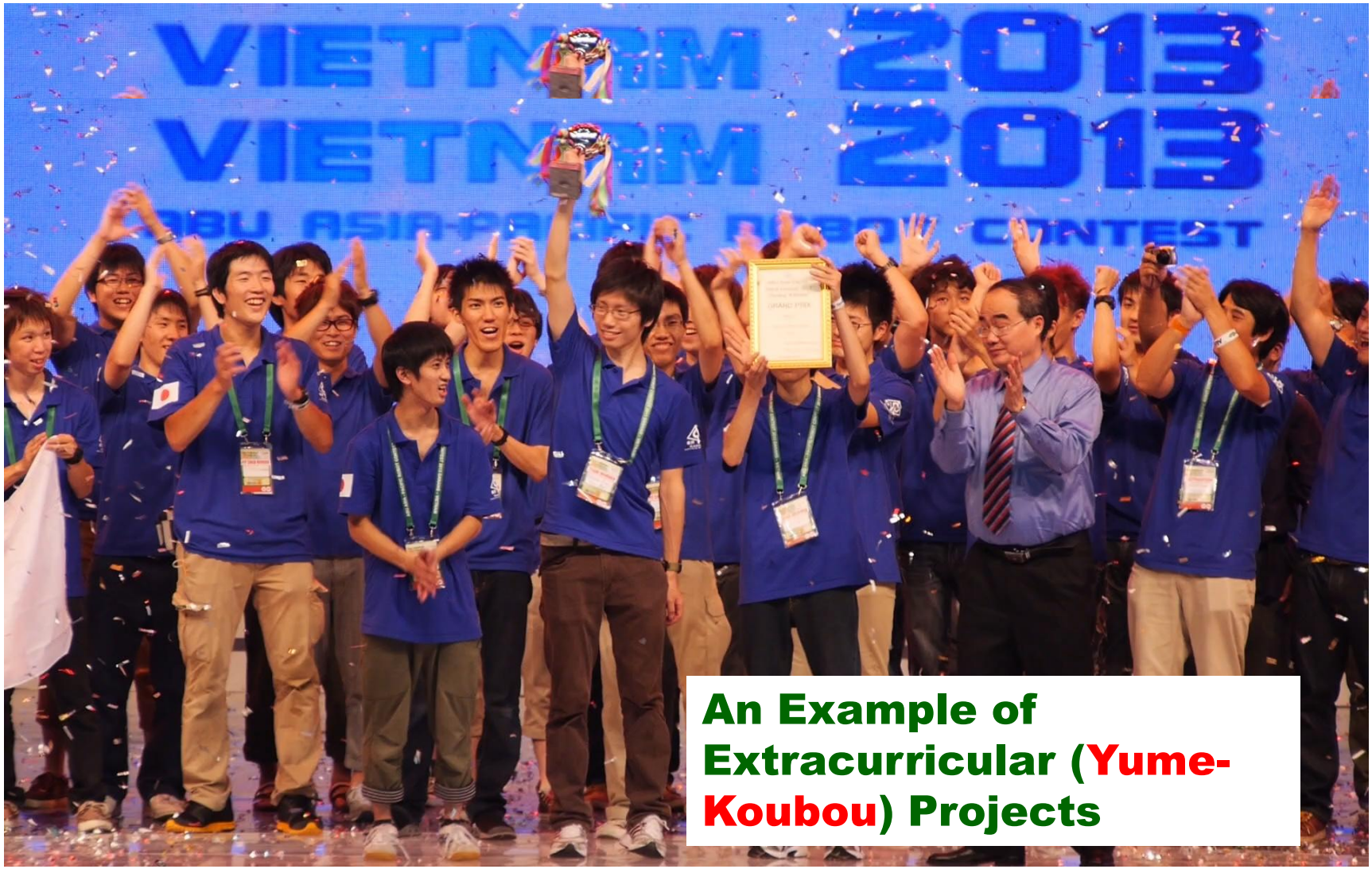
Victory at ABU Asia-Pacific Robot Contest 2013



An Example of Extracurricular (Yume-Koubou) Projects

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Courtesy Call

on Prime Minister Shinzo Abe

as the representative of Japanese universities

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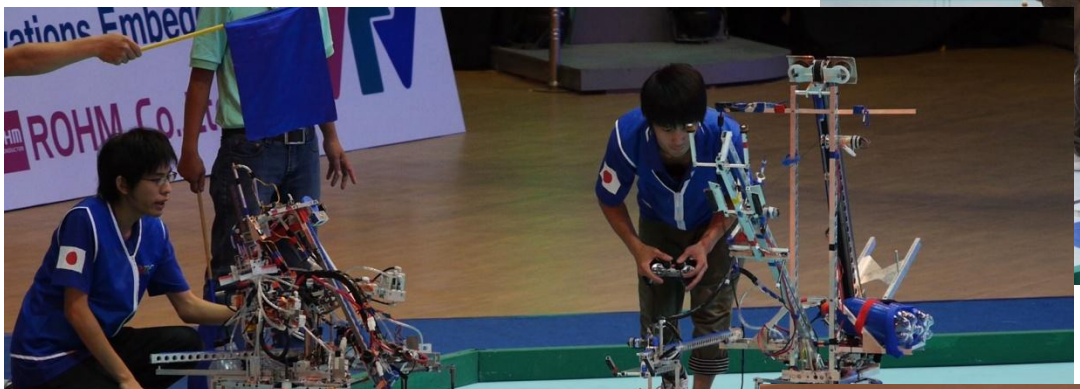

ABU Asia-Pacific Robot Contest 2013 Vietnam

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C) Learning Methods; Class-Work & Extracurricular Activities

From Teacher-Centered Education
To Learner-Centered Education

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Learning & Teaching Comprehensive Abilities in KIT

Engineering Practice Skills:CDIO

◆Functional
•Design & build
•Operate & repair
◆Professional
•Ethics & Integrity
•Behavior
◆Personal
•Thinking, planning
•Time mgt., initiative
◆Interpersonal
•Communication
•Teamwork, leadership
◆Business
•Customer
•Marketing

Personal and Interpersonal Abilities & Skills
(1) Independence and Autonomy
(2) Leadership
(3) Collaboration skill
(4) Presentation skill
(5) Communication skill

Ningen-ryoku

Recent Education=CDIO

Integration

Comprehensive Learning: KIT

Separation

Existing Education

Disciplinary Knowledge

◆Science & math
◆Physics
◆Thermodynamics
◆Statics & dynamics
◆Discipline specific
•Aero
•ME
•EE
•Civil
•Chemical
•etc.
◆Humanity electives

Gaku-ryoku

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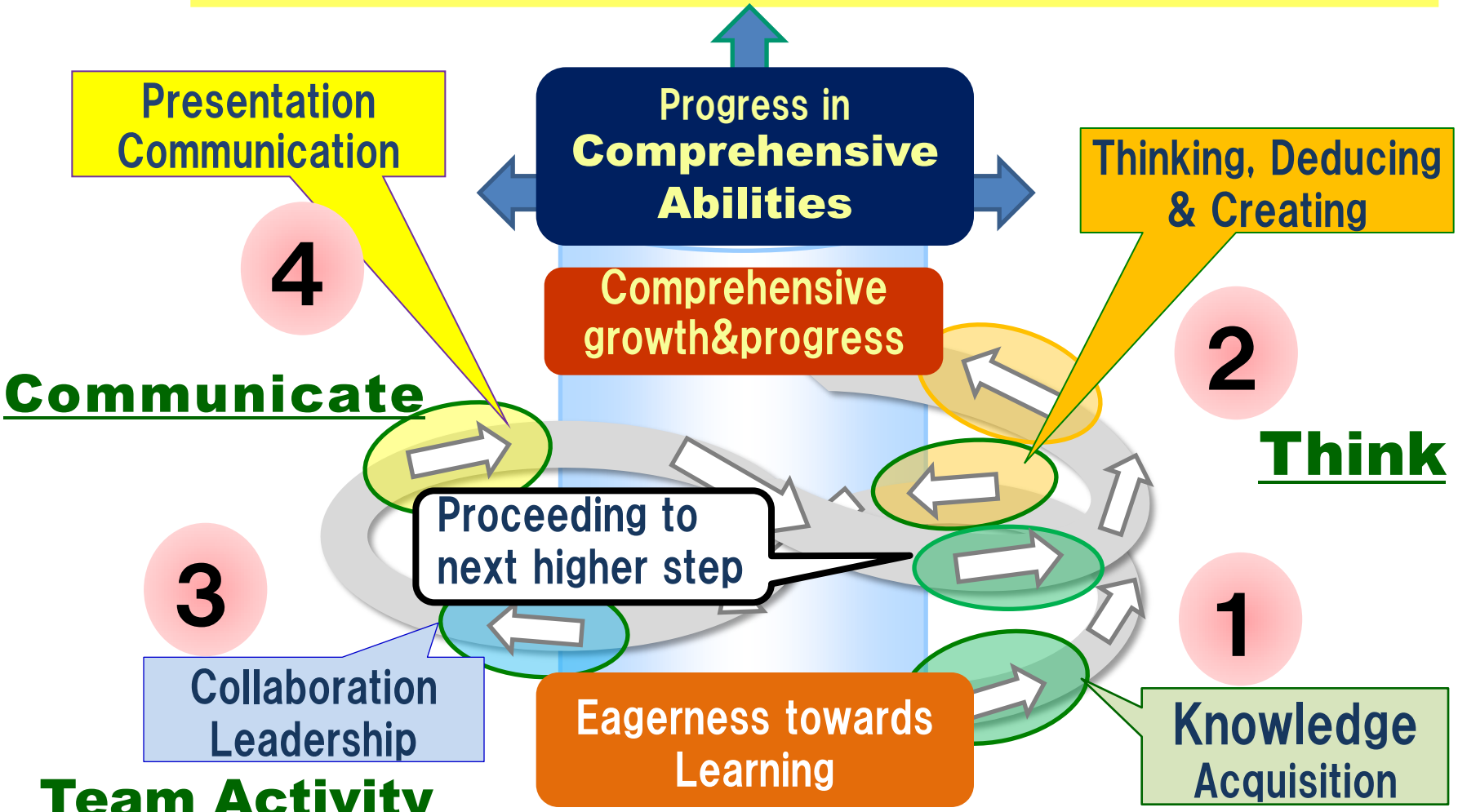
CLIP: Comprehensive Learning Initiative Process

Upward Spiral Circuit in CLIP-Learning Process



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How should we implement the CLIP learning process for the comprehensive abilities ?

Strive for
Comprehensive Abilities

⇔

Implement
CLIP Learning Process

↓

Active Learning

Comprehensive Learning-type Class

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Engineering Education at KIT

Active Learning

>>>Introduce to all classes!

"Active Learning"
of Each class, Each subject,
and Each teacher

For Example: for KIT program

Practice on innovative development of human resources through community-based educational reforms

文部科学省
地(知)の拠点

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4. Practice on Innovative Development of Human Resources through Community-Based Educational Reforms

2013 MEXT: Center of Community Project

MEXT (Ministry of Education, Culture, Sports, Science and Technology in JAPAN)

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Collaboration with Local Community toward Innovative Human Resources Development

◆From teacher-centered education to **learner-centered education**

◆ Preparation of learning environment where students learn by their own initiative (**workspace**)

－promotion of creative project activities

－support system for students to engage in learning activities in conjunction with classwork

With regional partnership, we aim to promote human resources development in cooperation with local governments, residents, and industries

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Features in Education&Research Practice

KIT

Class-work Research + Extracurricular activities

Process of problem finding & solving based on issues in real world

Local Government Residents + Enterprises

Local Community

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COC : Center of Community
Community-based Education & Research Projects at KIT

Merging of Education, Research and Social contribution as professor's primary tasks

Education/Research Project
Social Contribution Project
Cooperation of teachers, staffs, businesses and local residents

→

Enhancement of opportunity for project-based learning
Opportunity for Practical Learning

↙

Community-based education
Comprehensive learning-type class
Achievement of active learning

↖

Active Campus/Education & Research Environment

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Community Based Project（Example1）

Geospatial Information Project

By Prof. Shikada's group

The geospatial information project provides an opportunity for local community to study advanced technologies. Geospatial technology is utilized in various fields such as car navigation systems, map services, surveying, and monitoring services for children and the elderly.

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Community Based Project（Example2）

Medical Engineering Collaboration Project

by Prof. Shintani's group

KIT has made a cooperative agreement with Kanazawa Medical University to address immediate problems of disease treatment. We also partner with businesses in the field of medical engineering.

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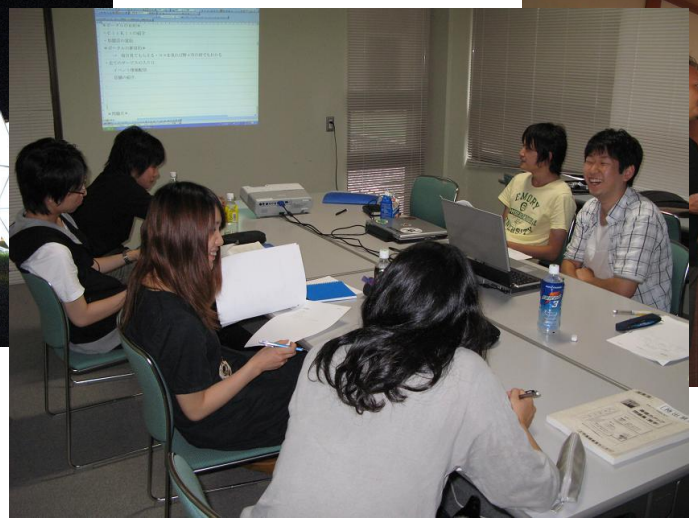
Community Based Project（Example3）

Re-Design Apartment Project

By Prof. Miyashita's group

This project contributes to community development on the basis of a cooperative agreement with important stakeholders in the local communities of Kanazawa City and Nonoichi City. This is an extremely beneficial experience for students studying architecture.



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5. Concluding Remarks

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➢The direction of KIT engineering education program fits the context of CDIO-Initiative.

- Curriculum with project based design education as its main pillar
- Many workspaces, such as the Factory for Dreams & Ideas
- Active learning based on the CLIP-learning process
- Promotion of integrated learning activities based on community-related projects, which make regional contributions and provide students and teachers with an opportunity to be motivated and reflected

➢**By participating in the CDIO-Initiative** which indicates an international standard engineering education program, **KIT strives to expose the strengths and weakness of the KIT education program and formulate specific remedial measures from a global viewpoint with the goal of enhancing engineering education.**

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Thank you for your attention!