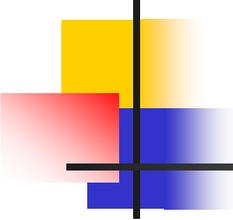


International Certification in Engineering Education

Kikuo Kishimoto

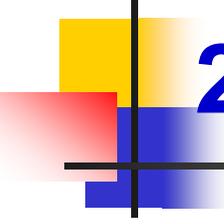
**Dean, Graduate School of Science and Engineering
Tokyo Institute of Technology, Japan**

- **Accreditation of Educational Program**
- **Accreditation in JAPAN**
- **OECD-AHELO Project**



1. Background

- **The profession of engineering is becoming increasingly global. As a result, there is a need for international agreements governing mutual recognition of engineering qualifications and professional competence.**
- **Professional societies (council of engineers, institution of professional engineers, etc.) have been promoting their professional status and looking after engineering education through accreditation**



2. Accreditation of Educational Program

Washington Accord

- **Established in 1989 by 6 accreditation bodies for engineering education in Australia, Canada, GB, Ireland, New Zealand and USA**
- **Accreditation bodies (of WA signatories) accredit educational programs with “similar” criteria**
- **Recognizes substantial equivalency of accredited programs under the Accord**

Washington Accord membership

Accreditation bodies	Provisional status	Signatory
6 Founding Members		1989
HKIE (HK)	No system at that time	1995
ECSA (South Africa)	1994	1999
JABEE (Japan)	2001	2005
IES (Singapore)	2003	2006
BEM (Malaysia)	2003	2009
ASIIN (Germany)	2003	
ABEEK (RP Korea)	2005	2007
IEET (Chinese Taipei)	2005	2007
AEER (Russia)	2007	2012
AICTE (India)	2007	
IESL (Sri Lank)	2007	
MUDEK (Turkey)	2010	2011
PEC (Pakistan)	2010	
COE (Thailand)	Submitted in 2010 but was differed	
BAETE (Bangladesh)	2011	
CAST (PR China)	Planning to submit in 2013	
PTC (The Philippines)	Planning	
Indonesia	Interest	

Signatories to the Washington Accord



2012 September

Signatory Member Provisional Member

Steps to become a WA signatory

■ **Provisional Status**

Request should be submitted with recommendation letters from 2 signatories, who well know the accreditation system of that jurisdiction

2/3 of the signatories should agree

■ **Signatory**

3 signatories appointed by the WA undertake a review and submit the report to WA.

Unanimous agreement is needed

International Engineering Alliance (IEA)

Educational Accord

Washington
Accord

Sydney
Accord

Dublin
Accord

*Professional
Engineers*

*Engineering
Technologist*

*Engineering
Technicians*

JABEE

Competence Recognition/ Mobility Agreements

Engineers
Mobility
Forum

APEC
Engineer

Engineering
Technologist
Mobility
Forum

*Professional
Engineers*

*Professional
Engineers
(regional
Agreement)*

*Engineering
Technologist*

IPEJ

<http://www.ieagreements.org/>

International Engineering Alliance (IEA) Graduate Attributes & Professional Competencies

Educational and professional accords for mutual recognition of qualifications and registration have developed statements of graduate attributes and professional competency profiles.

Educational Accord	Washington Accord	Sydney Accord	Dublin Accord
Type of Engineer	Professional Engineer	Engineering Technologist	Engineering Technician
Range of Problem Solving	Complex Problems	Broadly-defined Problems	Well-defined Problems
Range of Engineering Activities			
Knowledge Profiles			
Graduate Attributes Profiles			
Professional Competencies Profiles			

<http://www.ieagrements.org/IEA-Grad-Attr-Prof-Competencies-v2.pdf>

Graduate Attributes Profiles

1	Engineering knowledge
2	Problem Analysis
3	Design / Development of Solutions
4	Investigation
5	Modern Tool Usage
6	The Engineer and Society
7	Environment and Sustainability
8	Ethics
9	Individual and Team Work
10	Communication
11	Project Management and Finance
12	Life Long Learning

Other International Framework

- **EUR-ACE**

(European Accreditation of Engineering Programs)

<http://www.enaee.eu/the-eur-ace-system/eur-ace-framework-standards/>



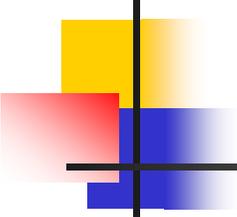
- **Seoul Accord (Computing & IT-related Programs)**

JABEE joined in 2008 as a founding signatory

- **UNESCO-UIA (Architectural Design & Planning)**

JABEE was recognized in 2008 as an accreditation body

- **Canberra Accord (Architects)**



3. Accreditation in JAPAN

Name of Organization:

JABEE

(Japan Accreditation Board for Engineering Education)

Chronicle :

1997 Preparation committee

1999 Establishment of JABEE

2001 Started accreditation

2005 Signatory of Washington Accord

Accreditations:

◆ **Undergraduate Engineering Programs**

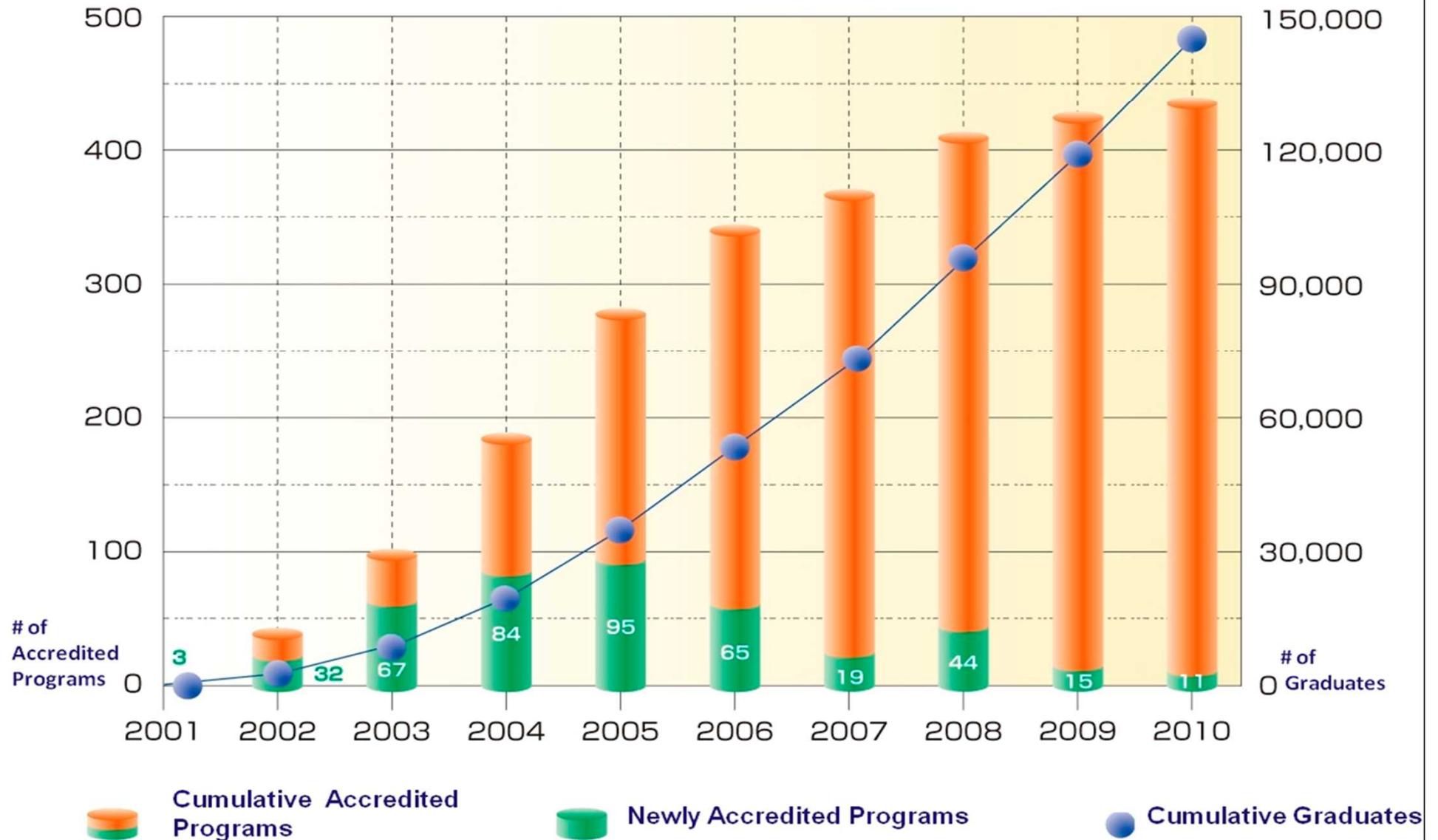
◆ **Master Engineering Programs**

◆ **Undergraduate Computing and IT-related Programs**

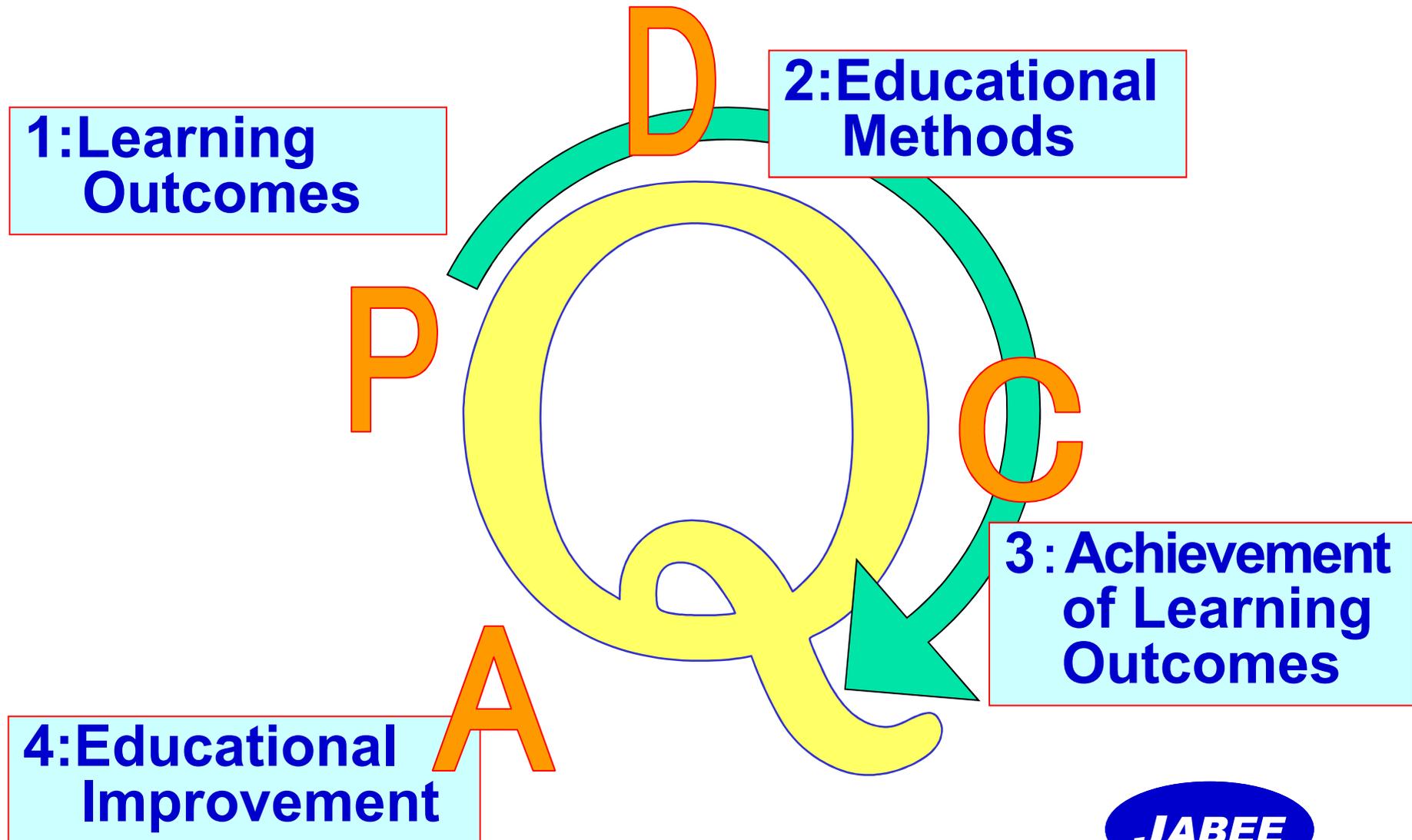
◆ **Undergraduate + Master in Architecture**

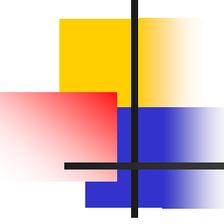
◆ **Professional Graduate Schools**

Cumulative Numbers Since the Beginning of Accreditation Until 2010 Engineering Programs Leading to Bachelor's Degree



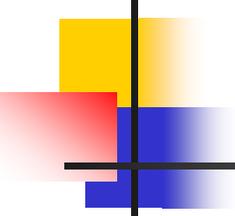
JABEE Common Criteria (Applicable in the years 2012)





Learning/Educational Objectives

- (a) An ability of multidimensional thinking with knowledge from global perspective
- (b) An ability of understanding of effects and impact of professional activities on society and nature, and of professionals' social responsibility
- (c) Knowledge of and ability to apply mathematics and natural sciences
- (d) Knowledge of the related professional fields, and ability to apply
- (e) Design ability to respond to requirements of the society by utilizing various sciences, technologies and information
- (f) Communication skills including logical writing, presentation and debating
- (g) An ability of independent and life-long learning
- (h) An ability to manage and accomplish tasks systematically under given constraints
- (i) An ability to work in a team



4. OECD-AHELO Project

■ What is AHELO?

- AHELO will test what students in higher education know and can do upon graduation. AHELO is a direct evaluation of student performance. It will provide data on the relevance and quality of teaching and learning in higher education. The test aims to be global and valid across diverse cultures, languages and different types of institutions.

■ Background

- The expansion of Higher Education, and the resulting demand for quality assurance.
- The globalization of Higher Education, and the resulting demand for transferability and comparability of degrees and credits.



Organisation for Economic Co-operation and Development, OECD
Assessment of Higher Education Learning Outcomes, AHELO

Assessment of Higher Education Learning Outcomes

Country Participation by Strand

- Generic skills: Colombia, Egypt, Finland, Korea, Kuwait, Mexico, Norway, the Slovak Republic and the US (Connecticut, Missouri, Pennsylvania).
- Economics: Belgium (Fl.), Egypt, Italy, Mexico, the Netherlands, the Russian Federation and the Slovak Republic.
- Engineering: Abu Dhabi, Australia, Canada (Ontario), Colombia, Egypt, Japan, Mexico, and the Slovak Republic.



Organisation for Economic Co-operation and Development, OECD
Assessment of Higher Education Learning Outcomes, AHELO

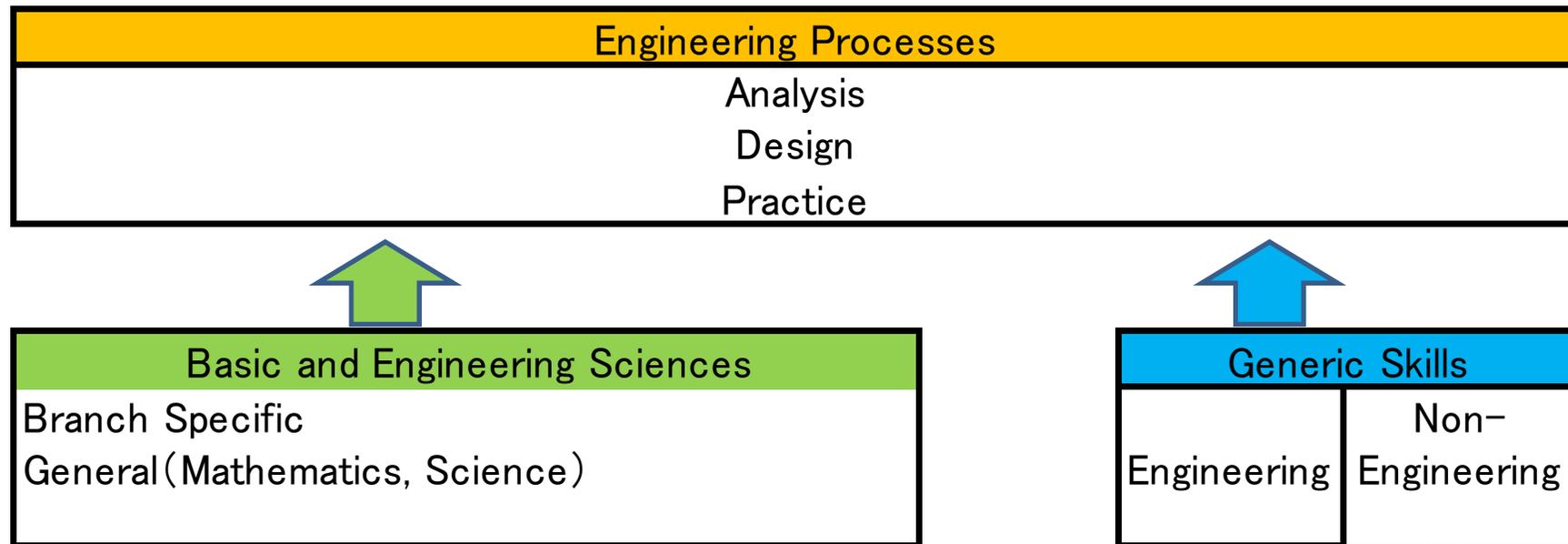
Assessment of Higher Education Learning Outcomes

A Tuning-AHELO Conceptual Framework of Expected/Desired Learning Outcomes in Engineering

EUR-ACE	ABET	Tuning-AHELO
Knowledge and Understanding	a) an ability to apply knowledge of mathematics, science, and engineering	Basic and Engineering Sciences
Engineering Analysis	b) an ability to design and conduct experiments , as well as to analyze and interpret data e) an ability to identify, formulate, and solve engineering problems	Engineering Analysis
Engineering Design	c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	Engineering Design
Investigations	–	(to Engineering Analysis)
Engineering Practice	f) an understanding of professional and ethical responsibility j) a knowledge of contemporary issues k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	Engineering Practice (Part of Generic Skills)
Transferable Skills	d) an ability to function on multi-disciplinary teams g) an ability to communicate effectively h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context i) a recognition of the need for, and an ability to engage in life-long learning	Generic Skills (Part of Knowledge and Understanding)

ENGINEERING ASSESSMENT FRAMEWORK

AHELO Feasibility Study



ENGINEERING ASSESSMENT FRAMEWORK

([http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=edu/imhe/ahelo/gne\(2011\)19/ANN5/FINAL&oclanguage=en](http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=edu/imhe/ahelo/gne(2011)19/ANN5/FINAL&oclanguage=en))

Tertiary Engineering Capability Assessment (TECA): Concept Design
 Hamish Coates & Alexandra Radloff, Australian Council for Educational Research (ACER)
 ([http://www.oecd.org/officialdocuments/displaydocumentpdf/?cote=EDU/IMHE/AHELO/GNE\(2008\)9&doclanguage=en](http://www.oecd.org/officialdocuments/displaydocumentpdf/?cote=EDU/IMHE/AHELO/GNE(2008)9&doclanguage=en))

Instrument Development

■ Original items proposed by the Consortium

- ✓ **Constructed Response Tasks** developed by ACER
- ✓ **Multiple Choice Items** proposed by NIER

Items based on examinations developed by:

- The Institution of Professional Engineers, Japan
- Japan Society of Civil Engineers

■ Engineering Expert Groups

- ✓ Choosing items from a large pool prepared by the consortium
- ✓ Modification and verification of items



Organisation for Economic Co-operation and Development, OECD
Assessment of Higher Education Learning Outcomes, AHELO

Assessment of Higher Education Learning Outcomes

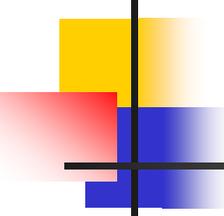
Main achievements from Japanese side:

- A tangible and substantive understanding of a conceptual framework of engineering competencies and learning outcomes that can be shared globally.
- Concrete and innovative ideas for conceptualizing and measuring competencies and learning outcomes.
- A delightful experience to work on an international team, to learn from global partners, and to be able to make unique contributions.



Organisation for Economic Co-operation and Development, OECD
Assessment of Higher Education Learning Outcomes, AHELO

Assessment of Higher Education Learning Outcomes



5. Concluding Remarks

1. Educational and professional accords for mutual recognition of qualifications and registration in engineering are developing.
2. Several accrediting bodies for engineering qualifications have developed outcomes-based criteria for evaluating programs.
3. Transferability and comparability of degrees of bachelor, master as well as doctor/PhD, across national borders are desired.

Thank you for your attention