International Views of Indicators and Rankings
Developing a Shared Understanding of Expected Learning Outcomes
- A Case Study from Japan –
  Why is this important?
  How can this be accomplished?
  Future Directions

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DEVELOPING A SHARED UNDERSTANDING OF EXPECTED LEARNING OUTCOMES:

WHY IS THIS IMPORTANT?

- THE JAPANESE HIGHER EDUCATION CONTEXT -
Quality Concerns

• **University Quality Assurance System**
  1. The Establishment Approval System (Deregulation, 1991-)
     • Standards for Establishing Universities: organizational structure, graduation requirements, faculty qualifications, enrollment, facilities and equipment, etc.
     • To review whether universities have kept in compliance with the establishment standards. Required every 7 years.
  3. National University Corporation Evaluation (based on individual universities’ 6-year goals and plans). (Introduced upon corporation of national universities, 2004)
     • Conducted yearly, and at the end of the 6 year term.

• **The Traditional Approach to Assuring Academic Standards**
  • A highly competitive university entrance examination.
     • Wide access to HE made possible by a uniform K-9 National Curriculum Framework (10-12 loosely specialized), free public education, and teacher rotation at the prefectural level (equalization of quality).
National funds are allocated mainly to national universities.

...management expenses grants have been shrinking annually.

Private universities rely heavily on tuition fees.

...largely autonomous from government control, but subject to market dynamics.

Competitive funds have become increasingly important to national, public, and private universities.
The Declining 18-year old Population

• Many universities are no longer able to “select” college-ready students.
  • 30% of 4 year universities, and 70% of 2 year junior colleges are under-enrolled (private).
• University Degrees no-longer Guarantee Successful Careers
  • In 2013, 16% of college graduates were unemployed, or employed on a temporary basis.
  • Societal attention to what students actually know, understand, and can do upon graduation, not just whether or not they have degrees.

(http://www.mext.go.jp/b_menu/hakusho/html/hpab201501/detail/1361896.htm)
A Series of Policy Initiatives Focusing on Learning Outcomes (Central Council of Education)

- **The Future of Higher Education in Japan, 2005**
  - The Bologna Process introduced, calling for university reform in tune with the knowledge-based society.

- **The Reform of Bachelor Program Education, 2008**
  - U.S. and European HE reforms introduced, calling for the clarification of HE learning outcomes, and alignment with curriculum and assessment (PDCA).
  - A request to the Science Council of Japan to define learning outcomes in the disciplines (20 reports issued as of July 2015).

- **The Transformation of University Education to Construct a new Future, 2012**
  - Recommendations on systemic curriculum reform, introduction of rubrics, assessments, portfolios, encouraging longer quality study hours.

- **Systemic Reform to Promote the Alignment of High School and University Education, 2015**
  - Management of teaching and learning through the alignment of admission policy, curriculum policy, and diploma policy.

- **Redesigning The Quality Assurance and Accreditation System (Third cycle starting 2018).**
  - Focus on learning outcomes (reference points) and internal quality assurance (PDCA).
Competitive Grants Aligned to the Initiatives.
A flood of grant applications pledging execution of initiatives.

- Acceleration Program for University Education Rebuilding (FY2015: 1.2 billion yen)
- Program for Promoting Inter-University Collaborative Education (FY2015: 2.2 billion yen)
- Top Global University Project (2014-2023)(FY2015: 7.7 billion yen)
  - required to demonstrate attainment of global standards in research and education, including organizational reforms that would lead to increased international mobility of students and faculty, such as offering more courses taught in English, the establishment of double-degree programs, introduction of flexible academic calendars, etc. In effect, faculty are becoming familiar to the concepts of “learning outcomes,” “reference points,” “degree programmes,” etc.
  - Globalization: another key policy concern.
- Block Funds to Strengthen National Universities (2015: 10 billion yen).
Selected universities for “Top Global University Project”

(Excerpt: MEXT 2015)

Hokkaido Region
- Hokkaido U

Tohoku Region
- Tohoku U
  - Akita International U
  - U of Aizu

Kanto Area
- U of Tsukuba
- U of Tokyo
- Tokyo Medical and Dental U
- Tokyo Institute of Technology
- Keio U
- Waseda U
- Chiba U
- Tokyo U of Foreign Studies
- Tokyo U of the Art
- International Christian U
- Shibaura Institute of Technology
- Sophia U
- Toyo U
- Hosei U
- Meiji U
- Rikkyo U
- Soka U

Kinki Region
- Kyoto U
- Osaka U
- Kyoto Institute of Technology
- Nara Institute of Science and Technology
  - Ritsumeikan U
  - Kwansei Gakuin U

Tohoku Region
- Tohoku U
  - Akita International U
  - U of Aizu

Chugoku, Shikoku Region
- Nagoya U
- Kanazawa U
- Nagaoka U of Technology
- Toyohashi U of Technology
- International U of Japan

Kinki Region
- Kyoto U
- Osaka U
- Kyoto Institute of Technology
- Nara Institute of Science and Technology
  - Ritsumeikan U
  - Kwansei Gakuin U

Chugoku, Shikoku Region
- Nagoya U
- Kanazawa U
- Nagaoka U of Technology
- Toyohashi U of Technology
- International U of Japan

Hokuriku, Koshinetsu, Tokai Region
- Nagoya U
- Kanazawa U
- Nagaoka U of Technology
- Toyohashi U of Technology
- International U of Japan

Kanto Area
- U of Tsukuba
- U of Tokyo
- Tokyo Medical and Dental U
- Tokyo Institute of Technology
- Keio U
- Waseda U
- Chiba U
- Tokyo U of Foreign Studies
- Tokyo U of the Art
- International Christian U
- Shibaura Institute of Technology
- Sophia U
- Toyo U
- Hosei U
- Meiji U
- Rikkyo U
- Soka U

Kyushu, Okinawa Region
- Kyushu U
- Kumamoto U
- Ritsumeikan Asia Pacific U

Type A (global excellence): 13 universities
Type B (good practice): 24 universities
Affecting 20% of all students, and 20% of all faculty.
Challenges

• The need for “a framework of expected learning outcomes - reference points” that can be shared among faculty within Japan and among global partners.

• How can we develop a shared understanding of what students are expected to know, understand, and be able to do upon completion of their degree programs?
  – How abstract must they be for diverse institutions and autonomous faculty to be able to accept and share?
  – How concrete must they be to provide a meaningful framework for institutions/faculty to refer to when designing programs and courses?
DEVELOPING A SHARED UNDERSTANDING OF EXPECTED LEARNING OUTCOMES:
HOW CAN THIS BE ACCOMPLISHED?
Lessons Learnt from the OECD-AHELO Feasibility Study

A study to test if it is possible to conduct a direct assessment of student performance, testing what students in higher education know and can do upon graduation.

Test development in “generic skills,” “economics,” and “engineering”

Participation: 17 countries, 248 universities, and 22,977 students.

1. Confirmed that a shared understanding of higher education learning outcomes is under development in the field of engineering.
   - International Engineering Association – Graduate Attributes (Washington Accord)
   - Japan Accreditation Board for Engineering Association

2. Learnt how to develop constructive response tasks measuring how well students can “think like an engineer.”
   - Requires a thoughtful balance between preciseness and open-endedness...more experience necessary.
   - Not suitable at this point for high stakes testing.

3. The exercise of scoring, and of modifying test items and scoring guides proved to be an invaluable opportunity for national and international experts to engage in concrete-level discussion about abstract-level competence frameworks, and reach consensus on the scope and level of learning outcomes expected for final year engineering students.
   - The need to discuss and share the experience with a wider group of experts.

4. An international assessment of higher education learning outcomes can become a useful tool for educators to globally benchmark and update their teaching practices.
   - It raises student awareness of their learning, too!
   - The need to provide meaningful feedback for educational improvement.
The Tuning Test Item Bank
- Generating a Shared Understanding of Expected Learning Outcomes through Collaboration in Test Item Development.
More Opportunities for Discussion and Sharing – Mechanical Engineering.

- Development of exemplary items
- Review of submitted items
- Working Language: Japanese
- Translation of Japanese items into English
- (Feedback to institutions/academics)
- Website (Japanese)

2014: 6CRT, 40MCQ 32 experts
2015: work in progress. 38 experts in 3 regional hubs.

Host Institutions:
West Japan Hub: Kyushu University & Nagoya University.
Kanto Area Hub: Tokyo Institute of Technology & Meiji University.
East Japan Hub: Tohoku University & Hokkaido University
Engineering Assessment Framework

  - International Engineering Association – Graduate Attributes (Washington Accord)
  - Japan Accreditation Board for Engineering Association

Constructive Response Tasks, CRT measuring how well students can “think like an engineer.”

Multiple Choice Questions, MCQ measuring mastery of basic knowledge and skills.
Wind Electrical Power Generation Example (http://www.nier.go.jp/tuning/centre.html)

Wind power generation is the conversion of wind kinetic energy into electrical energy or electricity, through the use of wind turbines....Respond to the following questions which focus on the wind turbines used for wind power generation from a mechanical engineering point of view.

Question 1. Examine the locational condition or site of a wind farm for wind power generation.

Figure 2 shows a wind farm for wind power generation. List and explain two reasons below why this is a good site for wind power generation.

Question 2. Examine the “shape of the blades” of wind turbines used for wind power generation.

Compare the shapes of the blades for a traditional windmill and a wind turbine shown in Figures 3a and 3b, respectively. Explain from a mechanical engineering point of view two features of blades that characterize wind turbines for wind power generation.

Figure 2: An example of a wind farm
Photograph of Otonrui Wind Farm, provided by Horonobe City

Figure 3a Traditional windmills.

Figure 3b Wind turbines used for wind power generation.
http://sozai-free.com/sozai/01541.html
Learning outcomes to be assessed: The ability to analyze and to examine the function and efficiency of machines by applying basic knowledge of mechanical engineering by explanation of the locational condition of a wind farm.

**Underlying competences:**
BES2: The ability to demonstrate a systematic understanding of the key aspects and concepts of their branch of engineering.
EA2: The ability to apply knowledge and understanding to analyze engineering products, processes and methods.
EA6: The ability to analyze mass and energy balances, and efficiency of systems.

**Viewpoints:**
Lists two features out of three below or equivalent, and explains the reasons for each of them appropriately.
(a) The wind farm is located on flat land along a seashore and hence there is no obstacle to block the wind from flowing around the wind turbines.
• The wind kinetic energy can be utilized effectively with little loss because the wind directly blows against the wind turbines to a maximum degree.
• The wind turbine blades rotate freely because the wind flows around the stationarily tower and against the turbines.
(b) Many wind turbines are installed in one location.
• All wind turbines can be manufactured to the same design requirements because the local environment for all turbines is basically the same. This reduces the manufacturing and design costs required in designing and producing the turbines.
• The cost for installation and maintenance of wind turbines is reduced because many turbines are located adjacent to each other.
• The cost for installation and maintenance of accompanying facilities to recover the electric energy generated by all turbines is reduced because such facilities can be also installed on-site.
(c) No building or structure is located around the wind farm.
• A wind turbine can be designed specifically for the wind conditions at the location because there is no limitation on size of the wind turbine. This increases the efficiency in generating the electric energy.
• There is no possibility to cause damage to the neighboring buildings or structures in case of accidents such as the collapse of wind turbine column.
DEVELOPING A SHARED UNDERSTANDING OF EXPECTED LEARNING OUTCOMES:

FUTURE DIRECTIONS

• 2016 and beyond.
  – Large scale implementation and feedback in Japan (and with global partners).
    • To provide meaningful feedback for educational improvement.
      – International benchmarking and diagnosis of student competencies.
      – Cross-tabulation of contextual information and test scores.
  – Symposium at the Japan Society of Mechanical Engineers (September, Kyushu University).
    • To discuss and share the experience with a wider group of experts.

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  – Designing model degree programs/ modules aimed at developing the competencies measured in the test item bank.
    • How can we better support students to “think like an engineer?”
  – Explore development of international joint degree programs.
  – Application of the approach to other disciplinary areas, particularly the humanities and social sciences.
THANK YOU!

The Tuning Test Item Bank in Mechanical Engineering
http://www.nier.go.jp/tuning/centre.html

Japanese Engineers Scoring Student Responses

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