

Assessment of learning outcomes: a challenge for peer reviews

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European Network for the Accreditation of
Engineering Education

**The European Network for
the Accreditation
of Engineering Education (ENAE)
awarding the EUR-ACE[®] label
(2018- 15 authorized agencies – about 3000 labelled
programmes)**

Assessment of learning outcomes: a challenge for peer reviews

1. **Learning outcomes** in the context of engineering education
2. The **assessment of** learning outcomes

Assessment of learning outcomes: a challenge for peer reviews

Learning outcomes in the context of engineering education

What matters most in higher education?



The quality of the process ?



The quality of the result ?

In order to cope with the diversity of educational systems
To encourage innovation in education

**Focus on the assessment of the learning
outcome/graduate profiles**

A worldwide trend

- Requirements and objectives of the educational process to provide graduates (in engineering) with training that meets recognized standards:
 - ✓ **Quality Assurance** for the programme providers and for the accreditation agencies
- What an (engineering) graduate is supposed to know and be able to do:
 - ✓ **Programme outcomes/graduate attributes**

European education frameworks (for engineers)

Quality assurance

Bergen Communiqué (2005)
« Guarantee of Quality in HE »



European Standards and
Guidelines (ESG, ENQA,...)



QA Register (EQAR)



EUR-ACE
Framework Standards and
guidelines (EAFSG)

Learning outcomes

European Qualification
Framework



Dublin descriptors



EUR-ACE Framework Standards
and guidelines (EAFSG)

The 2 pillars of ENAEE policy

Quality assurance

Assessment of the processes and procedures:

- Programme aims
- Teaching and learning procedures resources
- Students (from admission to graduation)
- Internal quality assurance

Compliant with the

- ESG -European standards and guidelines for Quality Assurance in the EHEA-
- « Best practice in engineering programme accreditation » (IEA/ENAEE)

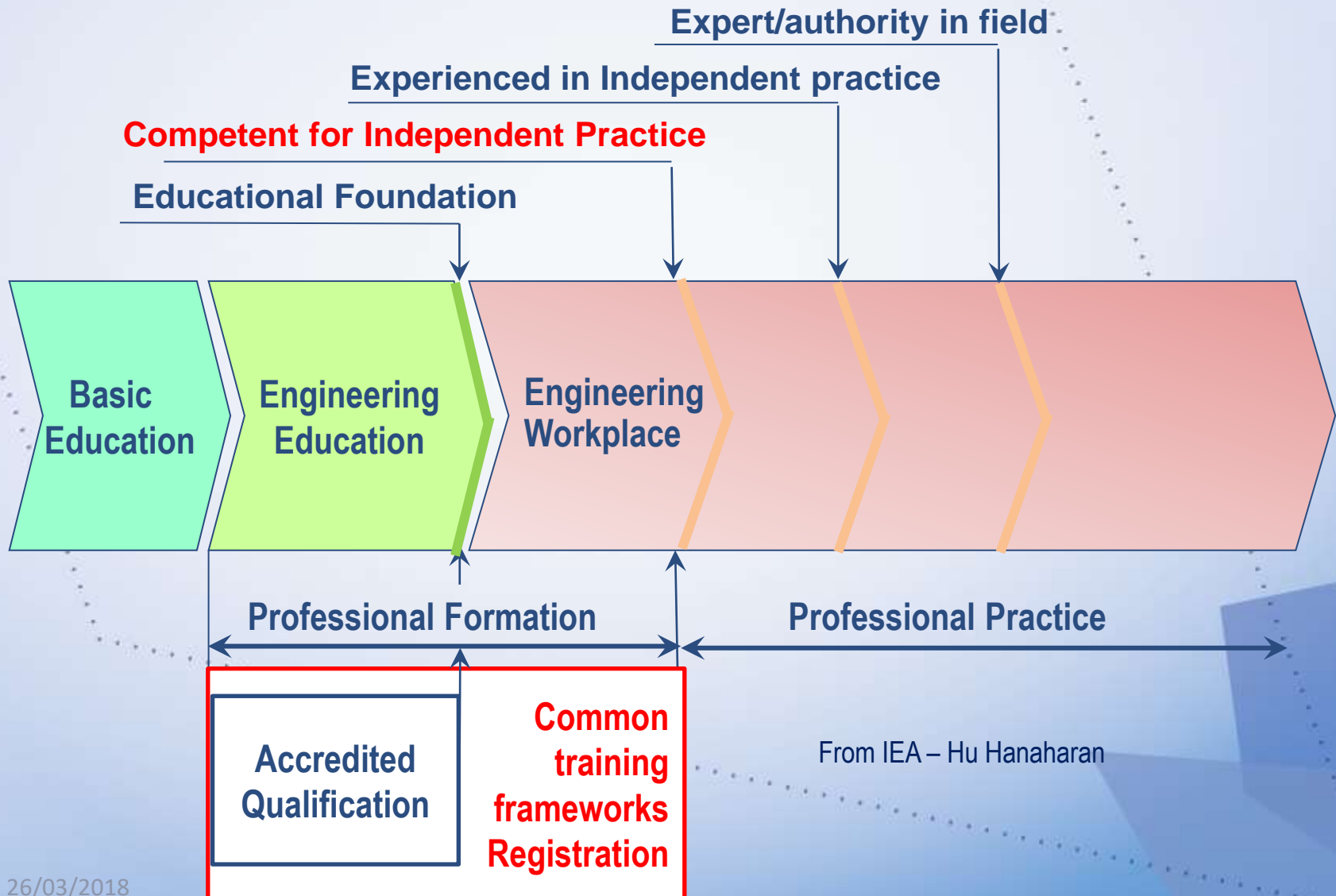
Programme outcomes

What an engineering degree must enable a graduate to demonstrate

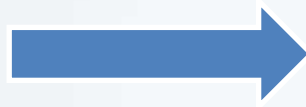
8 domains for the knowledge, understanding, skills and abilities

- Knowledge and Understanding;
- Engineering Analysis;
- Engineering Design;
- Investigations;
- Engineering Practice;
- Making Judgement Skills;
- Communication and Team-working Skills;
- Learning Skills

Global vision of the engineer professional trajectory



ENAE authorizes accreditation agencies to award the EUR-ACE® Label to engineering degree programmes they accredit, at Bachelor and Master degree level.



**Accreditation
Agencies**



EUR-ACE® Label



**Bachelor & Master
Engineering
Degree
Programmes**



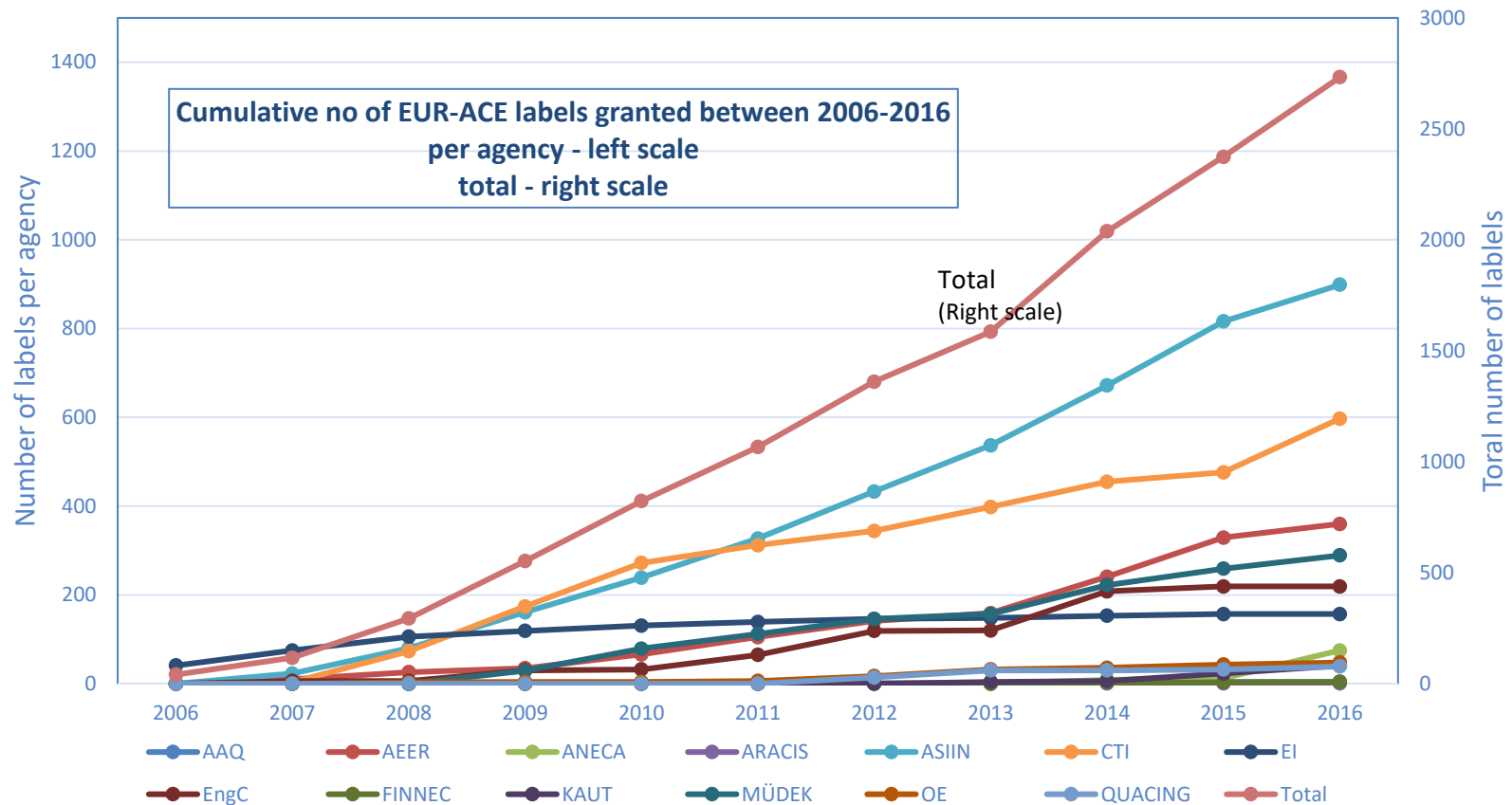
Authorized agencies (Nov 2017)

EUROPE AND THE EUR-ACE® SYSTEM

Countries with authorized agencies



EUR-ACE® labels granted



EUR-ACE® Accord

On 19th November 2014, the 13 (15, in 2017) authorised agencies signed a Mutual Recognition Agreement whereby they accept each other's accreditation decisions in respect of Bachelor and Master of Engineering degree programmes which they accredit.



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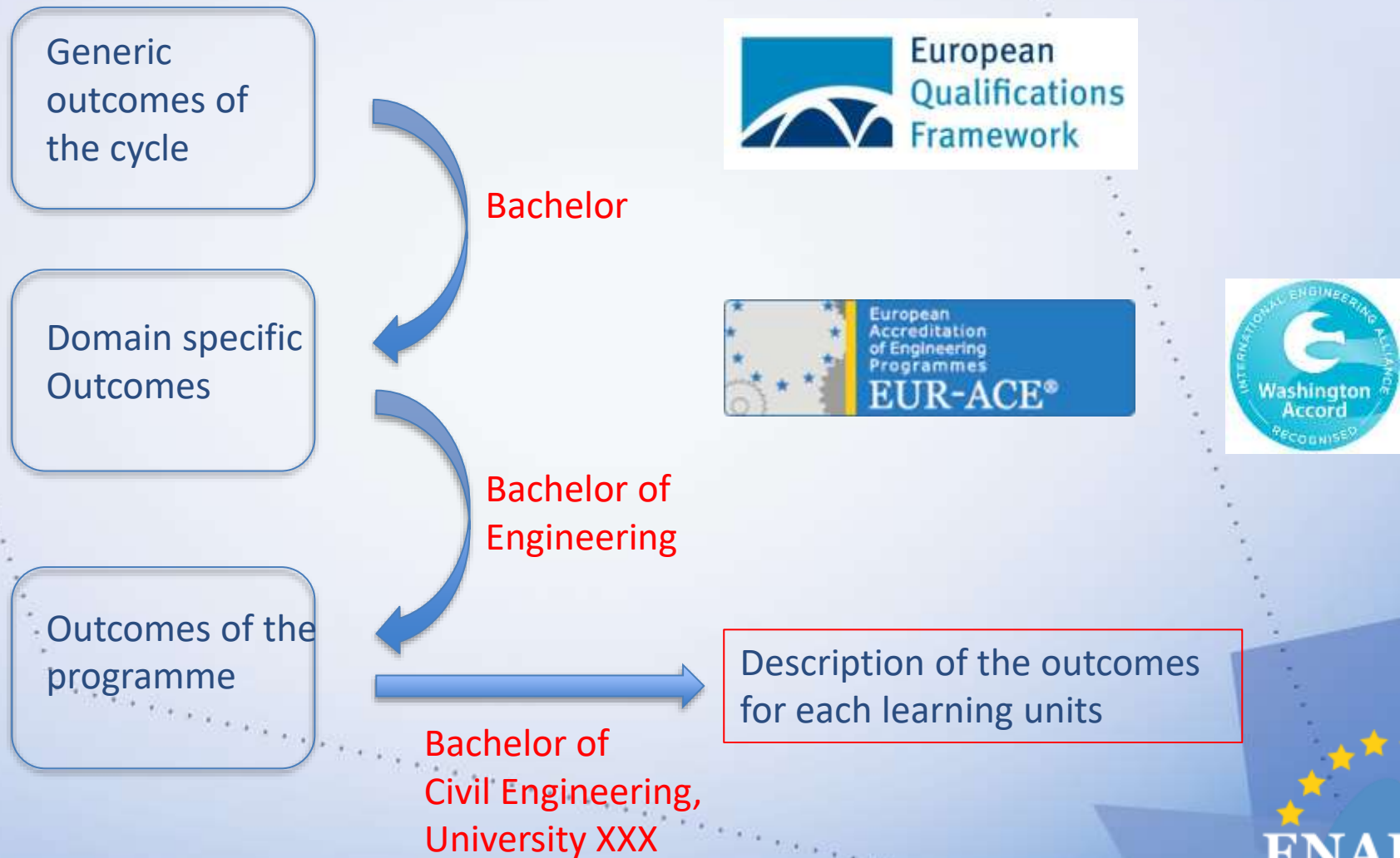
Learning outcomes in the context of engineering education

The **assessment of** learning outcomes

What comes first for the design of programmes?



Defining the outcomes



Defining the outcomes

The European Qualification Framework

For example – level 6 - Bachelor

Knowledge

Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles

Skills

advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study

Competences

manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups

Master

can **apply their knowledge and understanding**, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;

Engineering Practice

- comprehensive understanding of **applicable techniques and methods of analysis**, design and investigation and of their limitations;
- **practical skills, including the use of computer tools, for solving complex problems**, realising complex engineering design, designing and conducting complex investigations;
- comprehensive **understanding of applicable materials, equipment and tools**, engineering technologies and processes, and of their limitations;
- ability **to apply norms** of engineering practice;
- knowledge and understanding of the **non-technical** – societal, health and safety, environmental, economic and industrial - **implications of engineering practice**;
- critical awareness of **economic, organisational and managerial issues** (such as project management, risk and change management)

Outcomes

The institution provides the students and public with a break-up of the expected outcomes into learning units

MATRIX OF PLO & PAI RELATIONSHIP

NO	PROGRAMME LEARNING OUTCOMES (PLO)	PAI					GSA & LD								
		PAI 1	PAI 2	PAI 3	PAI 4	PAI 5	LD 1	LD 2	LD 3 GSA 4	LD 4 GSA 3	LD 5 GSA 1	LD 6 GSA 2	LD 7 GSA 6	LD 8 GSA 7	GSA 5
1.	Apply knowledge of mathematics, science and engineering fundamentals to well defined electrical and electronic engineering procedures and practices.	√					√	√				√			
2.	Demonstrate practical skills which includes the ability to troubleshoot, repair and do maintenance work for electrical and electronics equipment.	√					√	√							
3.	Demonstrate awareness and consideration for societal, health, safety, legal and cultural issues and the consequent responsibilities, taking into account the need for sustainable development.	√	√		√	√	√	√	√	√					
4.	Communicate effectively with the engineering community and the society at large.	√		√	√		√				√				
5.	Function individually or in teams, effectively, with a					√	√			√					

Outcomes

A specific issue: « soft skills » or transversal outcomes

Making Judgements



The learning process should enable **Master Degree graduates to demonstrate:**

- ability to integrate knowledge and handle complexity, to formulate judgements with incomplete or limited information, that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgement;

• ...

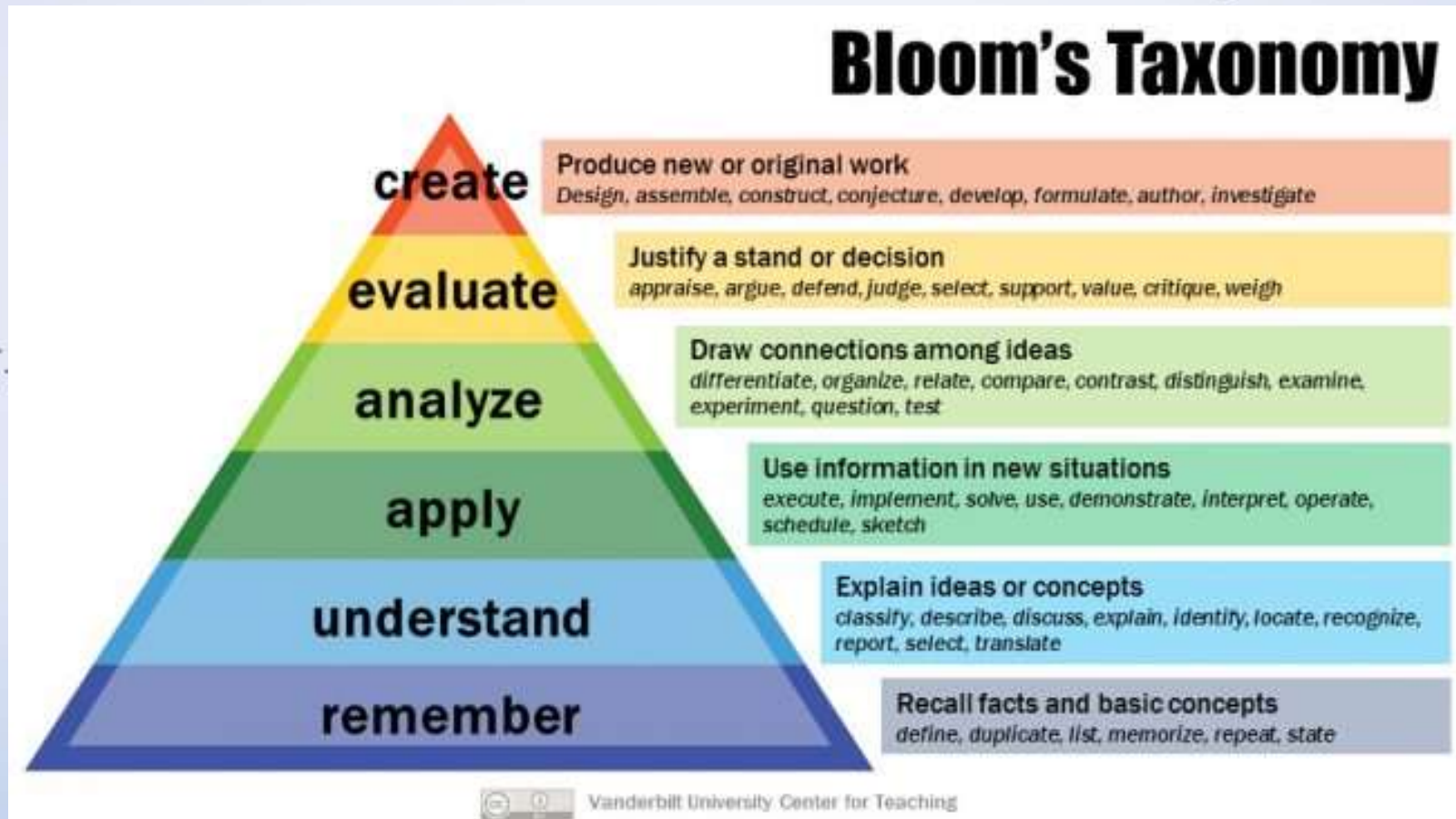
Communication and Team-working



- ability to function effectively in national and international contexts, as a member or leader of a team, that may be composed of different disciplines and levels, and that may use virtual communication tools...

Where are they learnt, where are they assessed?

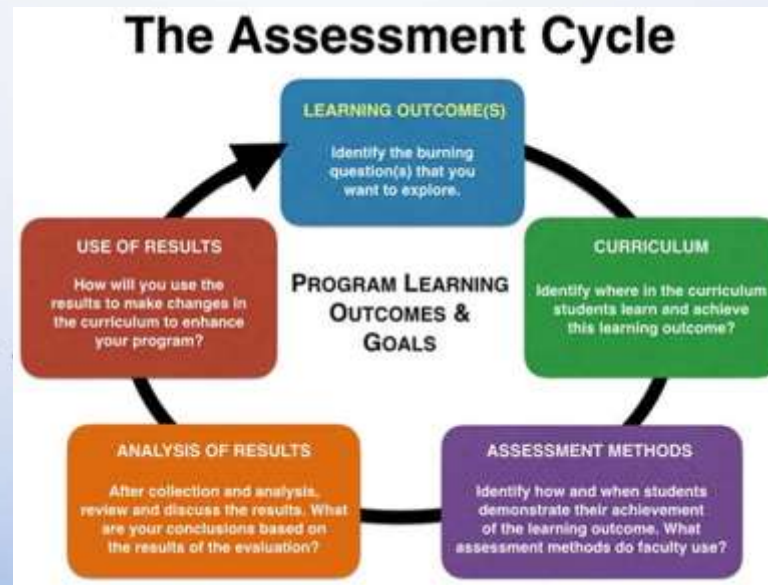
A framework for defining outcomes



Programme learning outcomes

Two issues for the peer review:

- Are the expected outcomes well-described and consistent with the requirements? (as an example: do the expected outcomes for the scientific and technic outcomes comply with the standards expected from a Bachelor in engineering)
- Does every graduate achieve the expected outcomes



Assessment – peer review

A - Assessment of the institutional context

- The institution has a **comprehensive training policy** which is clear, diversified and adapted to needs.
- **Decision and consultation bodies** ensure the proper representation of stakeholders in programme training, in particular employers, teachers and students.
- The management of the programme and its **decision-making processes** are well organised in order to properly carry out programme development.
- The curriculum is described clearly and is properly structured. It is **made available to the relevant stakeholders**, particularly students and faculty.

Outcome institutional assessment (1)

Assessment of the institutional context

Some clues for the assessment

- The institution has a **comprehensive training policy** which is clear, diversified and adapted to needs.

Dean's statement, mission statements

- **Decision and consultation bodies** ensure the proper representation of stakeholders in programme training, in particular employers, teachers and students.

Bodies' membership, samples of minutes, ...

Outcome institutional assessment (2)

Assessment of the institutional context

Some clues for the assessment

- The management of the programme and its **decision-making processes** are well organised in order to properly carry out programme development.

What is the formal process for the design and approval of new engineering programmes?

Analysis of a recent programme evolution/creation: why, which diagnostic, which decision process, who was in charge of the implementation, who does the follow-up?

- The expected programme outcomes are systematically broken down into **learning outcomes** assigned to the individual modules.
- The curriculum is described clearly and is properly structured. It is **made available to the relevant stakeholders**, particularly students and faculty.

Available to the students, there are documents describing each learning unit, its contribution to the expected outcomes, its content and its assessment modes.

Outcome assessments

B- Some clues

- Are the expected results provided consistent with the requirements?
Teaching activities combine classical (deductive) methods with problem-based or project-based learning methods.
The programme workload is reasonable and enables students to achieve the programme outcomes with enough time left for personal work, and for engaging in independent learning.
Besides compulsory modules, there is a sufficient range of elective subjects to enable students to build their own profile (soft skills).
The programmes are regularly reviewed and updated to assess their relevance.
- Does every graduate achieve the expected results?
Students and alumni are aware of the expected outcomes
Alumni and employers can report on the program weaknesses and strengths (Interviews)
Analysis of samples of student works, copies of exams, final theses, ...

Outcome orientation (8)

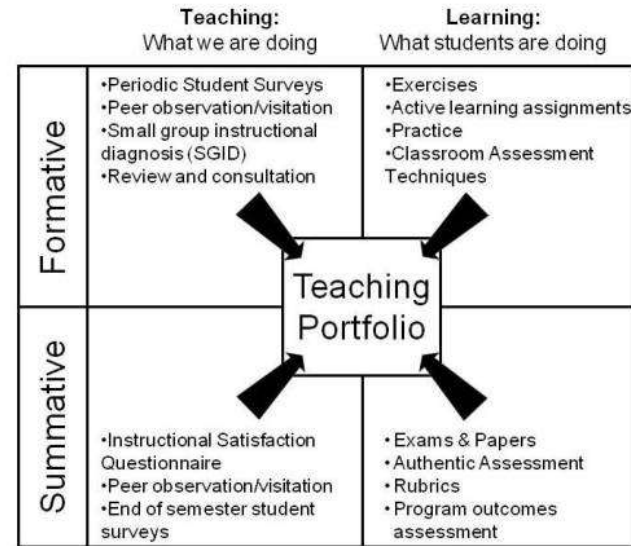
Good practice

Students' portfolio

E-portfolio

- A portfolio is a collection of work that a learner has collected, selected, organized, reflected upon, and presented to show understanding and growth over time. Additionally, a critical component of a portfolio is the combination of a learner's reflection on the individual pieces of work (often called artifacts), as well as an overall reflection on the story that the portfolio tells. (Barrett, 2006)

Modes of Assessment of Teaching and Learning



Prepared by the Office of Faculty Enhancement

See for example CESC 2013 “The assessment of learning outcomes” by R.Lile & C.Bran

Thank you for your attention

www.enaee.eu

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