INNOVATION IN ENGINEERING EDUCATION

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PRESENTATION OF SEFI

✓ It is the largest network of higher engineering institutions and of individuals involved in engineering education in Europe

✓ It has the mission to contribute to the development and the improvement of the engineering education in Europe

✓ SEFI wishes to contribute to the development and improvement of EE in Europe as well as to the improvement of the position of both EE in society and of the engineering professionals

SEFI

European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

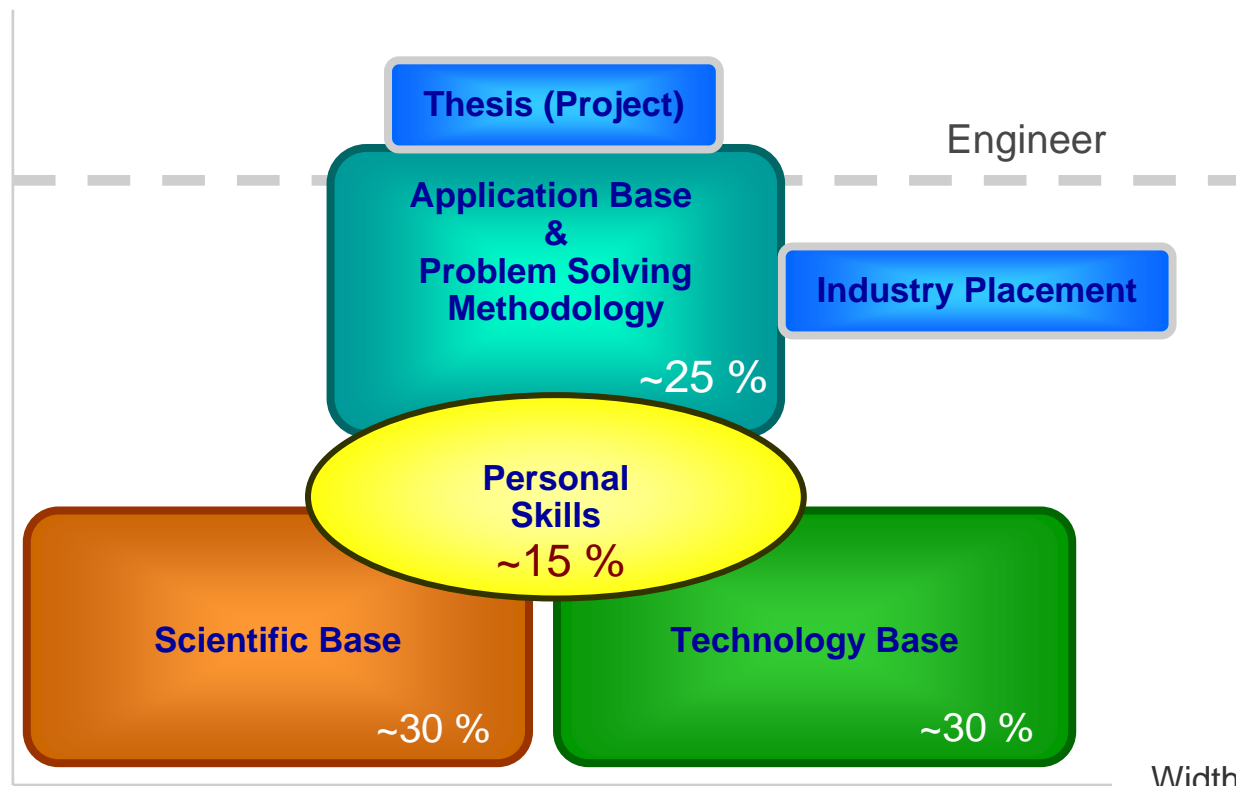# SEFI CURRICULUM DEVELOPMENT WORKING GROUP (CDWG)

- ✓ The CDWG aims at providing a forum for people interested in the development of EE curricula in Europe.

- ✓ The CDWG consists of people highly involved in all aspects of modern engineering education. Through sharing our experiences we all gain in insight and knowledge.

- ✓ CDWG Members:Employers, Engineering students, Managers of HEI, Teachers

Two ways of designing educational curricula

✓ **Input oriented**

✓ **Output/ learning oriented**

Depth of Qualification

Engineer

Thesis (Project)

**Application Base
&
Problem Solving
Methodology**

Industry Placement

~25 %

**Personal
Skills**
~15 %

Scientific Base

~30 %

Technology Base

~30 %

Width of Qualification

TEACHING STYLES

Transfer

The teacher is the expert who transfers knowledge to the students

Guidance

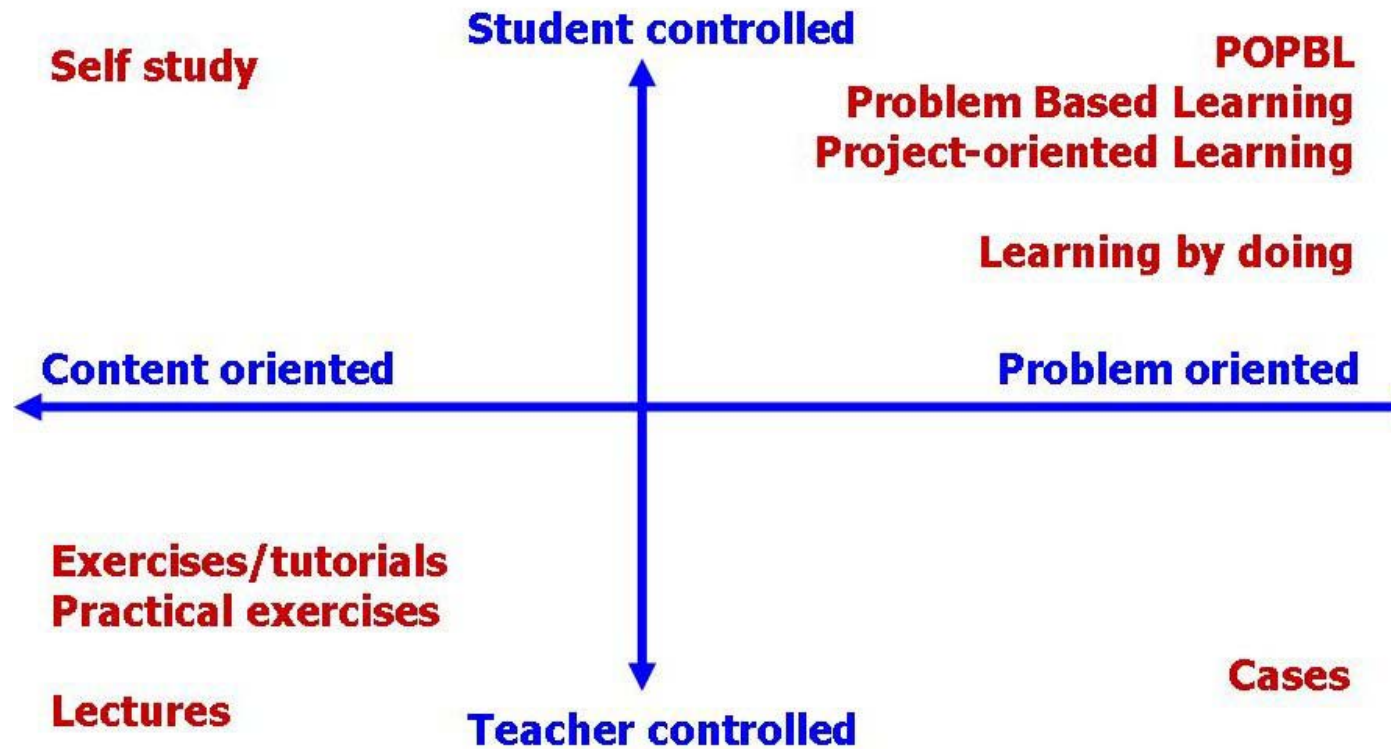The teacher guides the students towards a predefined goal

Shaping

The teachers shapes the students using an example or a mold

Growth

The teachers facilitates the student's independent development

✓ Source: de Graaff.

THE EDUCATIONAL ENVIRONMENT

Student controlled

Self study

POPBL
Problem Based Learning
Project-oriented Learning

Learning by doing

Content oriented ← → Problem oriented

Exercises/tutorials
Practical exercises

Cases

Lectures

Teacher controlled

✓ Source: de Graaff

THE ROLES OF TEACHERS

The teacher as:

- Expert

- Designer

- Evaluator

- **Explaining, answering questions and sharing his enthusiasm with the students**

- **Defines learning goals, chooses methods to stimulate the learning process**

- **Assess learning results, evaluates the effectiveness of the education**

✓ Source: de Graaff

Outcomes of education	Process of education	Stakeholders of education	Organisation for education (academic social world)
Ultimate purpose **Sustainable society (social, economical and ecological)**	International/ national level	Society - incl taxpayers	Context (society, profession)
Values **Critical thinking, diversity, creativity, innovation, intellectual rigour, ethics**	Institutional level	Students and family	System structures - rules, managing structures
Engineering competences **Integration and application of knowledge. Enabling skills (incl teamwork, communication)**	Curriculum (program) level	Working life - industry, professional bodies, practicing engineers, graduates	Praxis within the organization (what people do)
Technical knowledge **Conceptual understanding of content**	Course (module) level	Higher education/univer sity	Culture (what people say and think)
	Learning activity	**School**	**Identity (who people are or see themselves)**

TECHNOLOGICAL INNOVATION

EDUCATIONAL INNOVATION

INNOVATION
- ✓Methods
- ✓Contents

EVALUATION AND ASSESSMENT
- ✓Of new methods
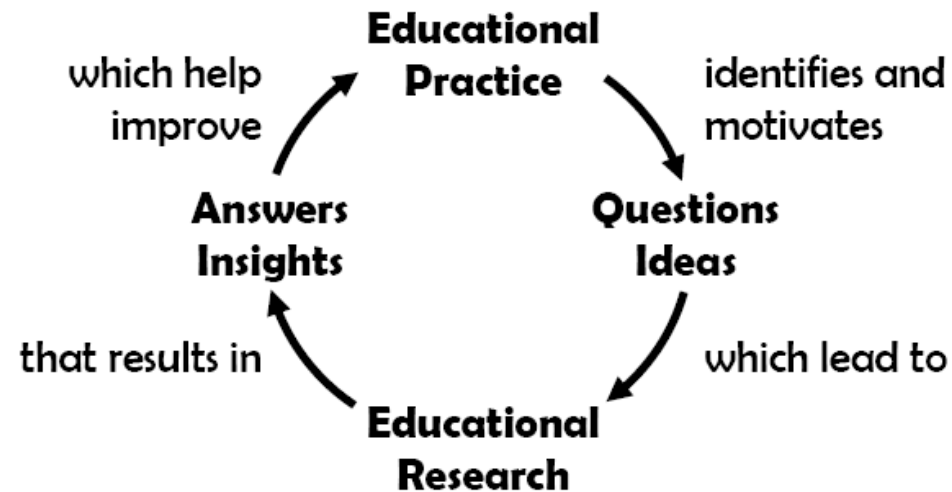- ✓Of curricula
- ✓Of students

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WHY TO INNOVATE?

As an answer to new requirements.

- Technical
- Economical
- Social
- Environmental

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THE CYCLE OF EDUCATIONAL INNOVATION

The Innovation Cycle of
Educational Practice and Research

Adapted from Booth, Colomb, and Williams, 2008

Source: ASEE: Creating a Culture... (2009)

COMPETENCES FOR LIFE- LONG LEARNING

The European Reference Framework sets out the following competences:

✓ Communication in the mother tongue

✓ Communication in foreign languages

✓ Mathematical competence and basic competences in science and technologyDigital competence

✓ Learning to learn

✓ Social and civic competences

✓ Sense of initiative and entrepreneurship

✓ Cultural awareness and expression

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INNOVATIVE CURRICULA

- ✓ Use of new teaching/learning methods and technologies
- ✓ Flexible enough to address different students needs and learning demands
- ✓ Orientated towards life- long learning
- ✓ Holistic approach of curriculum development
- ✓ Development of competences
- ✓ Integrating industrial practice

INNOVATIVE METHODS IN ENGINEERING EDUCATION

- ✓ Active Learning

- ✓ Problem Based Learning

- ✓ Project Oriented learning

- ✓ Research Oriented Learning

- ✓ Work Integrated Learning

THANKS
FOR YOUR
ATTENTION

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