Towards a future-proof engineering curriculum
Luc Taerwe

1. Proposed discussion statements

Teletijdcafé - discussiestellingen

1 Aanbieders van onderwijs

- In 2050 basic math and science courses will no longer be part of an engineering curriculum. The content of these courses must be acquired through private partners or self-study.
- In 2050 excellence and leadership in education will be valued as much as those in research. By further interweaving research and real-life challenges, both are increasingly seen as two sides of the same coin.
- In 2050 each research center will open up its own state-of-the-art research through three-month modules that may or may not be taken up in a student's individual learning track
- In 2050 the engineering program offering the best education is the one
  - with the best lecturers
  - with the best algorithms
  - with the best coaches

- In 2050 basic math and science courses will no longer be part of an engineering curriculum. The content of these courses must be acquired through private partners or self-study.

I do not agree

Fundamental knowledge remains for ever: basis for LLL

Difficult to study yourself in sufficient depth

Basic question: how much math and science

now [education] < [research] ?

➡ personal perception ?

- In 2050 excellence and leadership in education will be valued as much as those in research. By further interweaving research and real-life challenges, both are increasingly seen as two sides of the same coin.

No clear statement: confusing

may or may not ?
how will this fit in a learning line ?
more suitable for LLL

- In 2050 each research center will open up its own state-of-the-art research through three-month modules that may or may not be taken up in a student's individual learning track
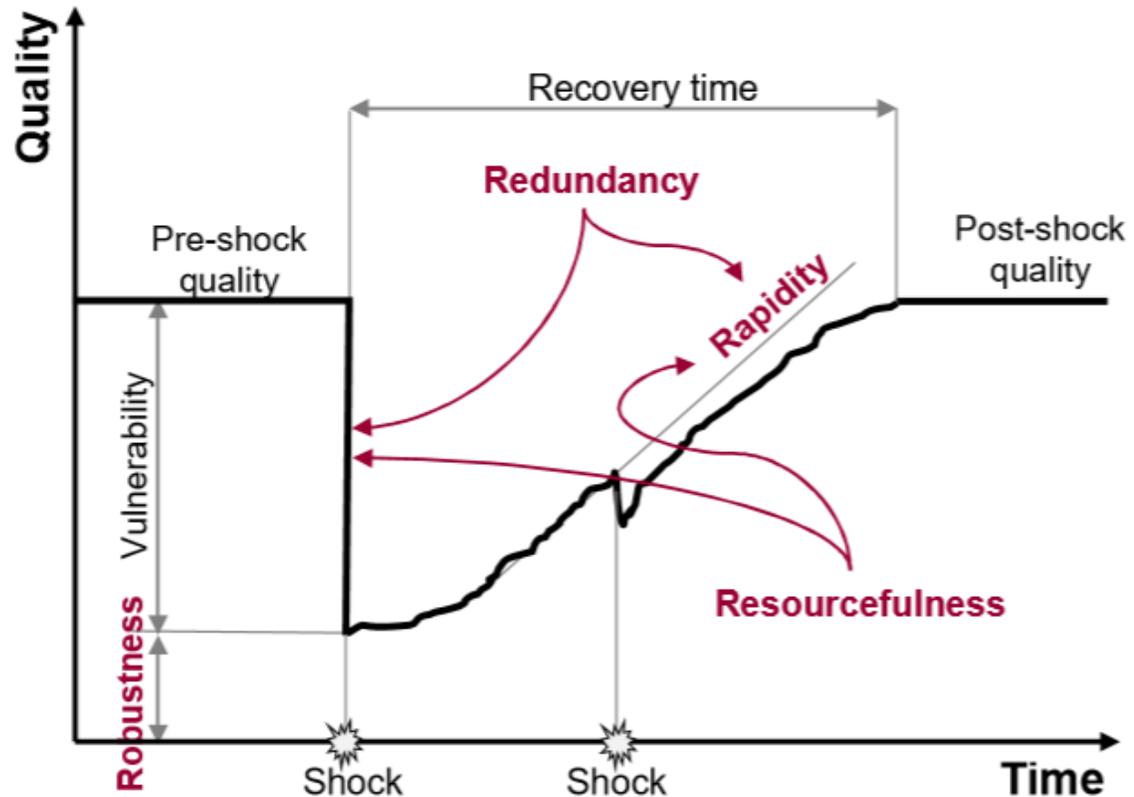
No clear message

- In 2050 the engineering program offering the best education is the one
  - with the best lecturers
  - with the best algorithms
  - with the best coaches

lecturers ≠ good coaches ?

What about content ?

2. Challenges in society and technology

**Resilience or flexibility
-> key attitude to "survive"**

Shock = structural accident (explosion, impact, natural hazard (earthquake), ...
    = Covid, war, energy crisis, ...

We easily deal with slow fluctuations (DE's) but not with shocks.

Source: Paolo Franchin

FACULTEIT INGENIEURSWETENSCHAPPEN 1835 – 2010

175 JAAR

40 VRAGEN VOOR 2020

'EEN HOOPVOLLE TOEKOMST? INGENIEURS WERKEN ER VANDAAG AAN.'

FRANK DE WINNE

LUC TAERWE, HANS ROMAEN, KEVIN VAN GEEM, KIM VERBEKEN

LANNOO CAMPUS

2010 -> 2023 Basic difference?

2023 -> 2050
      (better than e.g. 2030: in 2050 confrontation with consequences not possible anymore)

2008: new content of study program -> no significant differences with actual situation?

-> Basic content didn't change too much

Content versus educational tools

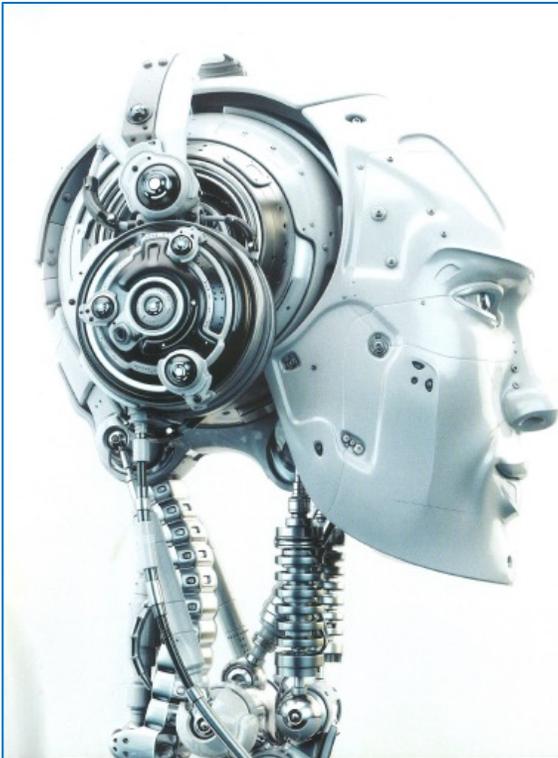Educational tools: mismatch with the real world
      ipad?
      metaverse, AI, VR?

Tremendous impact of Digitalization:

acceleration of evolutions that were already taking place before Covid started!
Covid was a trigger for this

Human intelligence versus AI

WHEN
MACHINES
START
THINKING

3. The campus of the future

5,548 undergraduate
3,157 graduate

A campus should create a community feeling and a relaxing atmosphere. Students and staff should find an identy on a campus, feeling 'at home'

Also a feeling of tranquility is necessary
    To reflect
    To be creative
    To develop new ideas

No mega campus for me

4. The Engineer of the future

White paper 'Engineer of the Future'

CESAER

General topics to be treated

- Who is the engineer of the future: requirements and expectations from society and companies?

- What is and isn't, working in contemporary engineering education practice?

- How can engineers be better prepared to the future through engineering education and training: improved curricula ?

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Five key topics

1. **Shaping knowledge societies to face the challenges of today and tomorrow**

- Engineers that are adaptable and flexible enough to face future needs

- Circular economy

- "The" engineer of the future does not exist, there are many different features

- Reaching out to primary and secondary education to attract more students to engineering and build competencies before starting university studies

2. Transition to a sustainable, green and digital world

- Twin transitions (green and digital)

- Solutions for sustainability - UN SDGs - most of them need to be solved by engineers to protect society from global challenges

- Engineers create and make a sustainable future

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3. Global cooperation across sectors and borders

- Interdisciplinarity

- Inter-institutional cooperation; networks of HEI's

- Linking SSH with STEM - What can SSH bring to STEM, and what can STEM bring to SSH

- Cope with conflicting priorities of different sectors

- How to make researchers who are becoming teachers aware of the need to teach in an interdisciplinary manner?

SSH: social sciences and humanities

4. A future-proof and groundbreaking engineering curriculum

- Foundation courses are still essential - how to balance with professors' desires to introduce their specialty early on?
- What really is essential for foundation courses? For example, many physics concepts are never revisited later in education.
- Responsive learning environments
- Problem-based learning and research
- Developing reflective learning environments
- Group based education
- Gamification
- Implementation in existing courses

5. Life-long learning for all

- Equality, diversity and inclusion

- Lifelong learning - having the attitude to refresh knowledge

       (Master after Master, micro credentials, …)

- Making it easy to acquire additional knowledge throughout an engineer's career

5. Summary

Towards a future-proof engineering curriculum

Make engineering curriculum attractive for incoming students

Make engineers adaptable and flexible to face future needs (resilience)

Emphasize that engineers create the sustainable future for our planet

Include interdisciplinarity

Make use of digitalization at different levels

Implement an international perspective

Prepare for life-long learning