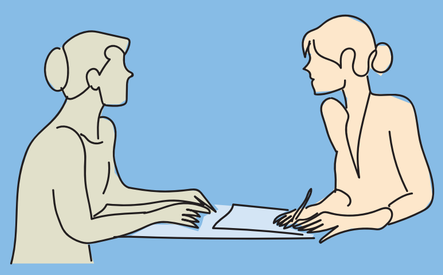
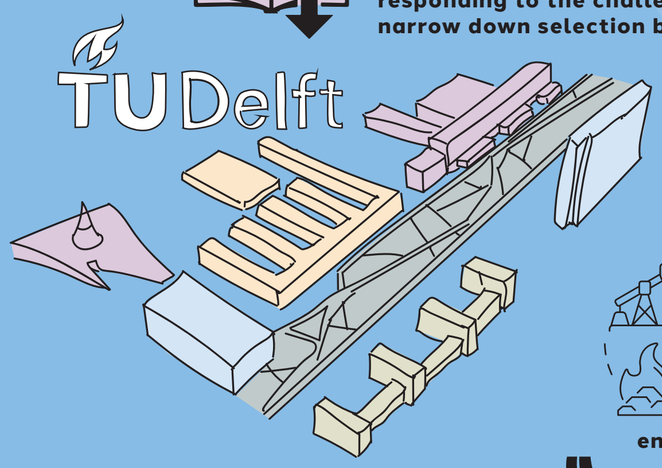
METHODS



4. interviews
1-on-1 conversation with course coordinators

3. identify relevant courses from all TU faculties,
responding to the challenged identified below
narrow down selection based on defined criteria



energy

delta

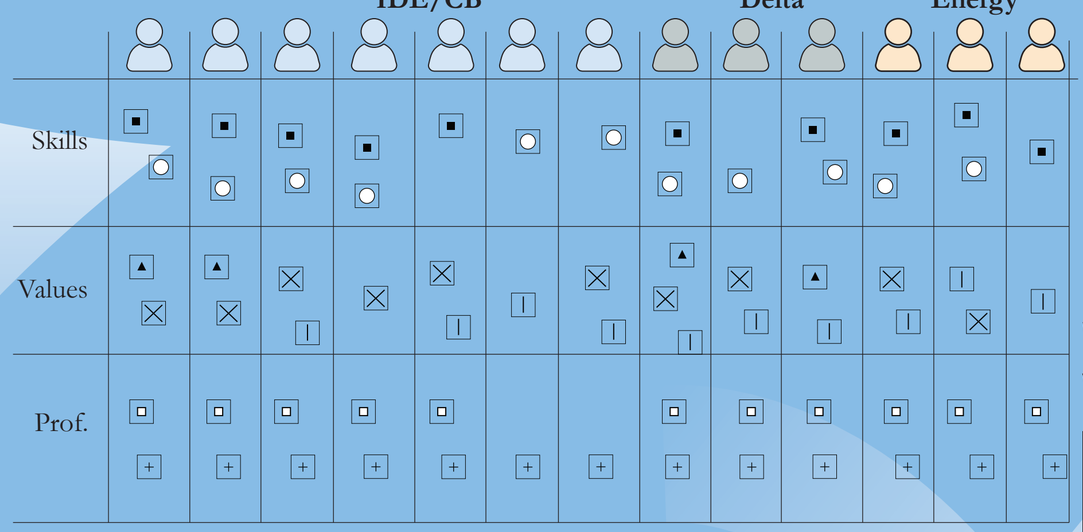
2. identify challenges

mobility

1. literature review

RESULTS

What we heard within themes...



Skills

Traditional softskills
Team work, Feedback, Communication, Project management, Reflection

Traditional disciplinary
System design, Modelling, Simulation, Scenario Analysis, Literature Review

Inter/trans skills
Integrate knowledge, Openness, Appreciate others, Work with limited and chaotic info

Values

Professional
Inquisitive, Critical, Seeking feedback Transparency

Personal
Awareness of multiplicity Self-esteem, Solidarity Emapthy, Responsibility

External
Political tradeoffs Sustainability Resilience, Justice

Prof.

Challenges
Expensive, Students at different levels, Fluid learning goals, Time restraints, Specific skills (social, flexible, openness) of teachers, CB = not 1 solution

Teaching Methods
Workshops, Team coach, Group discussions, Project, Reflection personal development, Literature from other disciplines, Role-playing game

UNSPEAKABLE

While education is daily practice at the university, some matters remain unspeakable, because they are part of the hidden curriculum, delicate to define or grasp, have different names, never made explicit or maybe even are considered a taboo. The skills addressed in challenge based education remain unspeakable between us (initiators from AE, A+BE, TPM and Teaching Academy), and remain implicit in several courses. This 4TU project explores these skills, both explicit and implicit, the related values in challenge based education and the actual and desired professionalisation of educators involved.

QUESTIONS

Q1: What transversal skills do students need to acquire to benefit from challenge-based education, particularly synthesis and integration skills for problem-solving?

Q2: What are the epistemological criteria of different knowledge systems in the quintuple helix, and how do we train students to acquire these epistemological criteria to be able to work across different contexts?

Q3: A) What kind of professional development do educators need to build strong CBE curricula that facilitate student learning in environments with multiple stakeholders?
B) How can educators evaluate and guide student learning (of transversal skills) in these varied and complex setting?

We asked...

DISCUSSION

inter- and transdisciplinary
courses are field specific and involve narrow interdisciplinarity (eg just Delft MSc's) or limited actors (a company, rather than a nested community), or mono-discipline with a company project.

challenge-based
educational assignments are defined and limit students in self-determination of the challenge.

little agreement on definition of terms
lack of clarity blurs application of challenge, skill or value based education and applications of transdisciplinary approaches.

professional desires
tutors require both access to practical educational methodologie and challenges in e.g. allowing students autonomy in determining the challenge.

RELEVANCE

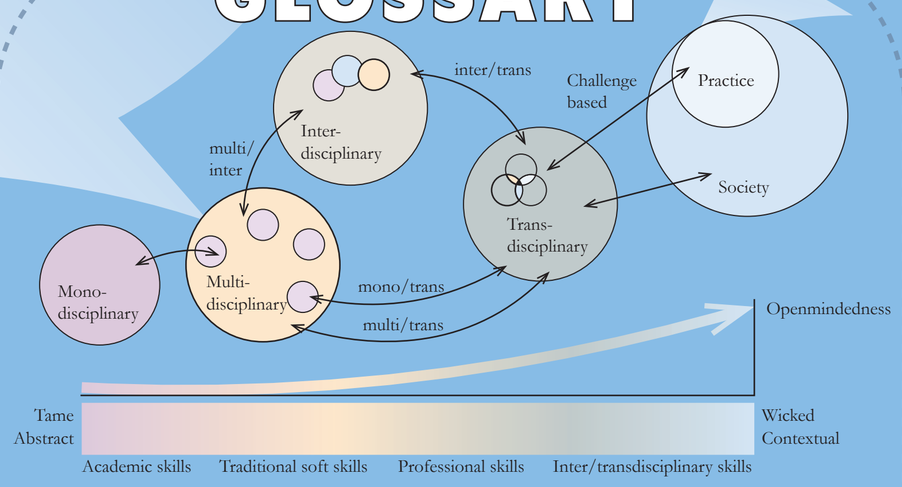
To contribute to contemporary issues such as climate change, energy transition, food shortage, inequalities, war and pandemics, engineers will need to adapt and go beyond classical engineering and problem-solving skills. The problems' complexity requires the involvement of multiple disciplines, external stakeholders and society; and a flexibilisation of problem-solving processes. Synthesis, however, presents heightened cognitive demands and requires deliberate guidance. It implies integrating epistemic knowledge and modes of thinking in two or more disciplines and non-specialist knowledge in a search for better understanding. Therefore, we need a better comprehension of how individuals learn to integrate different forms of knowledge and expertise, thus enabling them to explain a multifaceted phenomenon, fashion a new technology or propose a sustainable environmental solution.

WHAT'S NEXT?

further research into value systems
Additional interviews to understand what value systems are guiding

intervision with interviewees
Focus on the application and development of education methods that help teach the skills necessary for CBE and IE. To go beyond the focus that currently still lies on traditional skills.

GLOSSARY



Monodisciplinarity: Student learn specific professional and disciplinary skills. Problems are tame and/or abstract.
Multidisciplinary: Different disciplines work together but they do not integrate knowledge.
Interdisciplinary: Knowledge is truly integrated, leaving behind disciplinary biases. An increased openness is required of people to make this possible.
Transdisciplinary: Practice is involved.

Challenge-based: These challenges are increasingly wicked and lack single solutions. To work with such open-ended wicked challenges in transdisciplinary configurations, tradidtional soft skills (e.g. communication and collaboration) are not longer sufficient, and specific inter- and transdisciplinary skills are needed.
It is in a collaborative learning setting, and is based on real-world problems.

It distinguises itself from **problem-based learning** which revolves around fictional cases, and **project-based learning** where the problem is pre-defined by teachers.

CONTACT

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