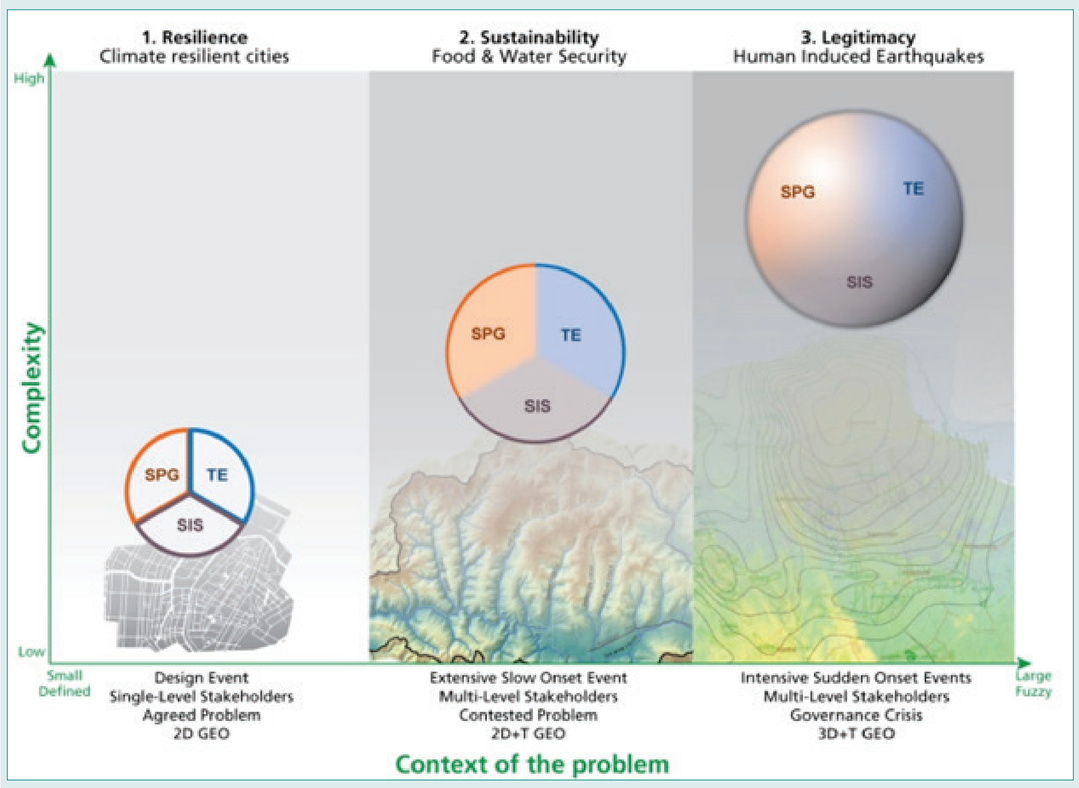
Challenge-based learning in M-SE case study projects

Many of the Challenge-based learning (CBL) elements are intuitively included in the education offered in Spatial Engineering (M-SE) programme The European Consortium of Innovative Universities (ECIU) grant has been used to investigate:

- the extent the M-SE programme already includes CBL principles to guide future developments,
- how the M-SE programme can be made attractive for ECIU students.

M-SE programme

M-SE is an NVAO accredited Masters programme offered by the Faculty of ITC of the University of Twente since 2018. M-SE is built upon a project-led education philosophy implemented in three case study project (quartiles) centred around the themes resilience, sustainability and legitimacy. The three case study projects increase in complexity in terms of i) wickedness, ii) disciplinarity, iii) dimensionality of the socio-ecological system (SES).



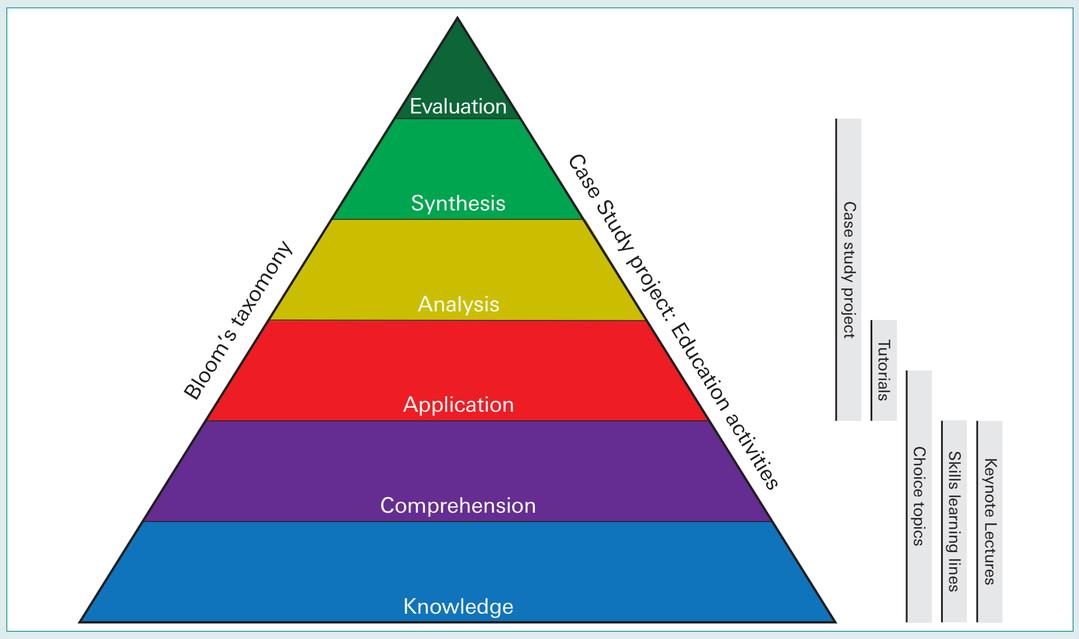
The M-SE core knowledge areas are: Technical Engineering (TE), Spatial Planning for Governance (SPG), Spatial Information Science (SIS).

The M-SE Challenge

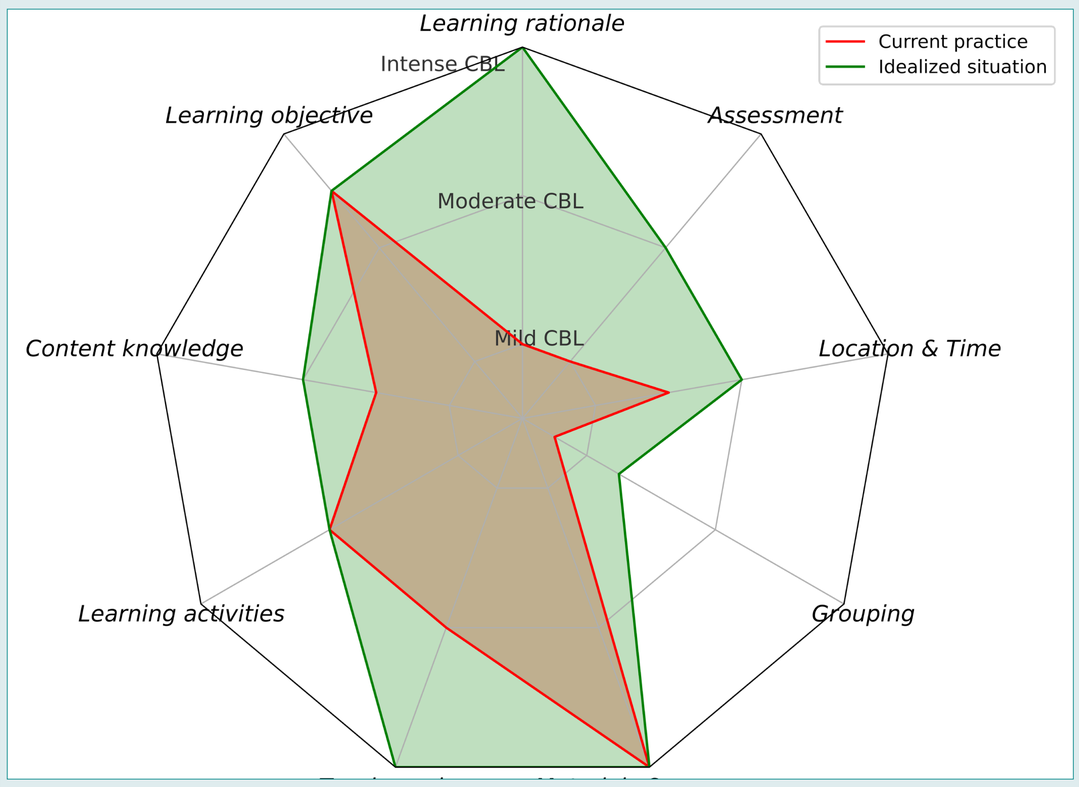
1. Is connected to a 'wicked' problem that is socially relevant and applicable to various places across the world.	The problem structuring framework proposed by Hisschemöller and Hoppe (1996) is adopted in M-SE, which discerns problems based on certainty about the relevant knowledge and consensus on the relevant norms and values. A spatial engineer is trained in the structuring of wicked problems or challenges.
2. Is spatial in nature and directed at sustainability and resilience	M-SE challenges focus on spatial processes within SES's. In addressing a challenge, students contribute to the increased resilience, sustainability and legitimacy of this system.
3. Is thematically related to expertise that is available in ITC's scientific departments	Thematic expertise is essential for students to access relevant and state-of-the-art knowledge and skills.
4. Requires collaboration with a variety of stakeholders.	Many stakeholders are involved, all with a certain idea, position, and role towards a certain wicked problem. We value the involvement of external stakeholders as challenge and knowledge providers. Our research shows that this motivates students because they can contribute to a solution that is relevant in real life. A feedback moment with the stakeholder after the course has ended is important for students to see the impact.
5. Requires multi-disciplinary knowledge and facilitates inter- and trans-disciplinary use of knowledge.	Knowledge from the three M-SE core knowledge areas (SPG, TE, SIS) is required to analyse wicked problems and design interventions to structure the wicked problems.
6. Is directed towards the design and implementation of an intervention	Rather than only creating scientific knowledge by analysing a problem in its social-ecological context, students in M-SE are also required to use scientific to design interventions that contribute to the structuring of the wicked problems. The working group considers this process fundamental to engineering.

Case study projects

The education is organized in quartiles where students follow individually choice topics, skills activities and tutorials, and work in teams on study cases inspired by a project with a societal relevant character that was carried out by ITC or designed by ITC for the M-SE programme.



M-SE case study project on the CBL continuums model



The working group has identified the *learning rationale* as the key CBL principle where M-SE case study project can improve the most. Specifically the active and immediate impact on the real world is an element that motivates students and is currently absent. Other CBL principles on which M-SE case study projects can improve are:

- *Teacher role*: case study project tutors are ideally co-learners
- *Location & time*: more flexible learning should be facilitated with more focus on re-flecting and sharing
- *Assessment*: students should be able to contribute (in part) to their assessment

Conclusion and lessons learnt

On the scale of the continuums model the M-SE case study projects are currently mild to moderate CBL and the ambition is expressed to develop towards moderate to intense CBL. Key for achieving this goal is to develop a long term/faculty-wide strategy to consolidate the involvement of stakeholders and be able to create active and immediate impact.

The current M-SE case study projects include elements that match with CBL principles and are potentially attractive for ECIU students. In the near future collaborations will be sought with ECIU partner universities to explore if M-SE case study projects can be offered to their students.

The CBL continuums model is found to be a useful tool for benchmarking and for guiding developments. The applicability of the tool could further improve by making the rubrics used to classify the CBL intensity more distinctive and less redundant.

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This poster is to complete the ECIU CBL grant project activities on Challenge-based learning in M-SE case study project

Literature:

Hisschemöller, M., & Hoppe, R. (1995). Coping with intractable controversies: The case for problem structuring in policy design and analysis. Knowledge and Policy, 8(4), 40-60. https://doi.org/10.1007/BF02832229

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