

Challenge-based learning (1)

Design your own challenge (ADDIE Model, Morrison, et, al 2019)

Prepare

Analyze

Design

Develop

Implement

Complexity : ☕☕☕
Group size: 5, 6 to 7 students per group (preferable)
Format: in-person for group discussions; individual and group assignments and tasks; hybrid CBL is also possible.

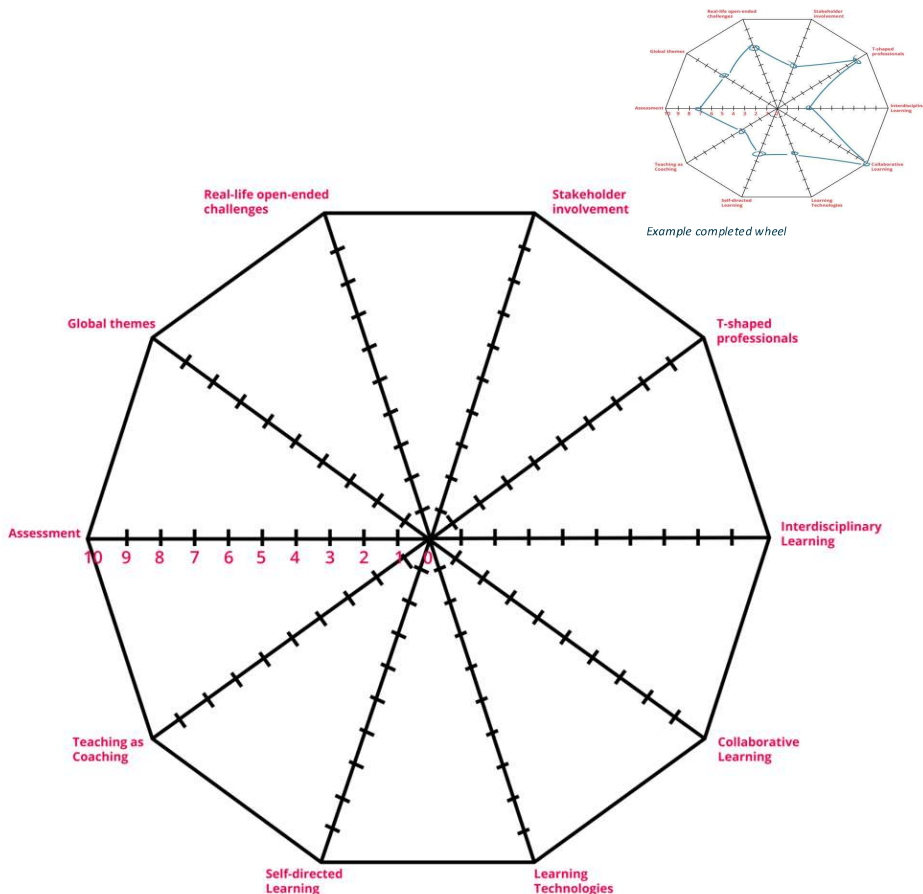
Learning benefits for students

Deeper Understanding of Knowledge:

- Connects theory to real-life problems
- Promotes conceptual understanding rather than memorization
- Encourages integration of knowledge across disciplines
- Makes learning more meaningful and relevant
- Supports competence development

Increased Motivation & Engagement

- Real-world relevance makes learning purposeful.
- Students feel ownership of their work.
- Autonomy increases intrinsic motivation.
- Working toward impact (social, environmental, technological) boosts commitment.



Recommendations to map your current project

1. Look at the wheel from the next page and print it out.
2. Consider your own course/project and give yourself a score for each dimension of the CBL, by marking it on the wheel below.
3. 1 (= performing poorly, or not present at all)
4. 10 (= performing in an excellent way and fully implemented)
5. Connect the marks on the wheel: the resulting "spiderweb" is the visualization of how you currently perceive each element of CBL in your course/element. What insight does this give you?

Miro design tool

https://miro.com/app/board/uXjVNXDN_o0=/

Resources and support CBL Toolkit
<https://drive.tue.nl/>

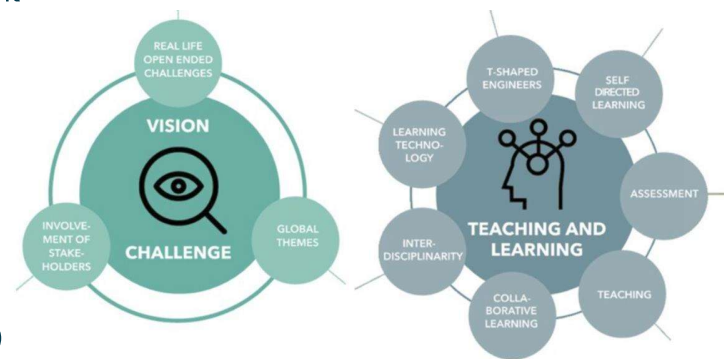
Further reading

More information: Sonia M. Gomez Puente TU/e
s.m.gomez.puente@tue.nl

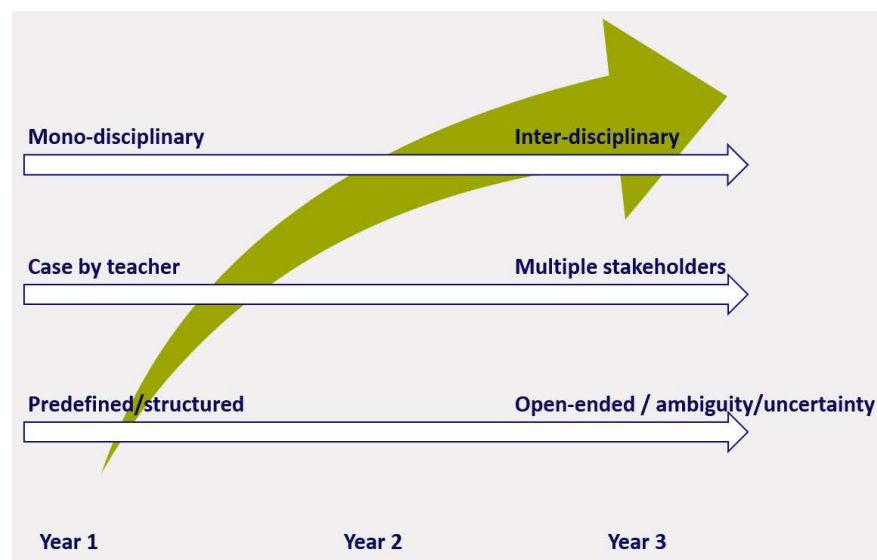
Challenge-based learning (2)

Design principles for Challenge-based learning

1. Start from a Real (Complex) Challenge
2. Connect Theory and Practice
3. Engage External Stakeholders
4. Ensure Collaboration
 - Compose diverse (multi/Interdisciplinary) student teams
5. Promote Student Ownership & Agency
 - Students define sub-questions and approaches
 - Encourage autonomy in decision-making
 - Let teams shape their learning path
6. Encourage early experimentation
 - Test ideas with users or stakeholders
 - Use feedback to refine solutions
7. Scaffold the Process (Without Over-Structuring)
 - Provide milestones and checkpoints
 - Offer guiding frameworks (e.g., design thinking, inquiry cycles, diamond model)
 - Support teams in managing ambiguity
8. Embed Reflection & Metacognition
9. Assess Both Process and Outcome



- **Multidisciplinarity**
 - Challenge
 - Team composition
 - Team work
- **Real-life problems**
 - Role teacher
 - Real life challenge owner
 - Multiple stakeholders
- **Open-endedness**
 - Solution
 - Process
 - Problem



Further reading

Doulougeri, Karolina & Vermunt, Jan & Bombaerts, Gunter. (2024). Challenge-based learning implementation in engineering education: A systematic literature review. *Journal of Engineering Education*. 113. 1076-1106. 10.1002/jee.20588.

Doulougeri, K., van den Beemt, A. A. J., Vermunt, J. D., Bots, M., & Bombaerts, G. (2022). *Challenge-based learning in engineering education: Toward mapping the landscape and guiding educational practice*. In E. Vilalta-Perdomo, J. Membrillo-Hernández, R. Michel-Villarreal, G. Lakshmi, & M. Martínez-Acosta (Eds.), *The Emerald Handbook of Challenge Based Learning* (pp. 35–68). Emerald Publishing Limited. https://doi.org/10.1108/978-1-80117-490-9_002

More information: Sonia M. Gomez Puente TU/e
s.m.gomez.puente@tue.nl