CBL Poster Market

Brought to you by ECIU @ UT

12 June 2024
11.00-14.00 CET
Ravelijn - Atrium

UNIVERSITY OF TWENTE.

ECIU university

ECIU Poster Market @ UT

CBL projects

Educational innovation

ECIU-fuelled

Welcome to our CBL Poster Market. We, as ECIU University (ECIU-U) at UT Team, have assembled 9 posters for you to inspire, motivate, and inform you on CBL projects at UT. Why do we do this?

As ECIU-U, we are the first European university where learners, teachers and researchers cooperate with cities and businesses to solve real-life challenges. We use innovative educational pedagogy such as Challenge-Based Learning and MicroModules to do so.

As we wish to invite you to take a peek in the World of CBL at UT, we´ve invited 9 poster holders to introduce their projects to you. The posters showcase both current and recent CBL-projects.

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Tiny Luiten

“I use CBL for most of my projects in my work now.”

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Educational programme manager

ITC Geo-Information Science and Earth Observation

Team member(s): Tiny Luiten, Thomas Groen, Justine Blanford, Adina Imanbayeva Mila van Druten. Rogier van der Velde, Mark Brussel, Cheryl de Boer and Justine Blanford

I am dedicated to creating a challenging work environment where I can leverage my skills and knowledge to contribute to the growth of people, organizations, and the environment. I specialize in program and project management, organizational culture, lifelong learning, change management, career coaching, human resources development, geographic information, development cooperation, land evaluation, and physical geography.

presents

Challenge-based learning in M-SE case study projects. The process of finding out if CBL is a fitting approach for the premaster Spatial Engineering.

Since the development of the posters, a year has been gained on the implementation of CBL in the (pre)master courses. Let´s talk about how it worked out.

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CBL The process of finding out if CBL is a fitting approach for the premaster Spatial Engineering

Why did we get funding for this:
Due to the multidisciplinary approach, the implementation of challenge based learning (CBL) poses a number of new and different demands on the faculty (Malmqvist, Radberg, & Lundqvist, 2015). Although CBL has been around since 2008, more research is needed before implementation (Leijon, et al., 2021).

What did we investigate:
The usefulness of the approach for a distance Premaster.

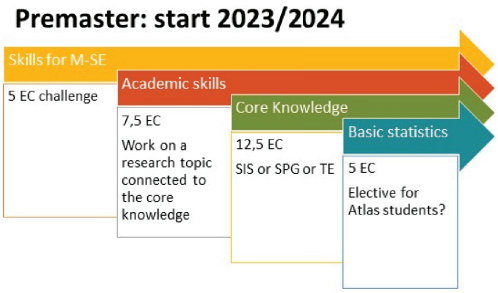
How did we investigate:
As if it were a challenge
- combining the CBL approach with the ADDIE model for course development.

Expected usefulness CBL:
- increase the impact of our master's programme to achieve societal change by working in real life environments;
- prepare students for the master's programme by requiring, amongst others, increased levels of self-regulation;
- activate preknowledge;
- prevent fragmentation of learning.

Main outcomes
We do not intend to implement all UT fundamentals into the premaster. We focus on:
- Authentic 'problems' / real world challenges by including a challenge in the premaster.
- Self-directed student learning by including reflection, documentation and sharing.
- Stakeholder involvement by including an intended learning outcome (ILO) on contacting stakeholders.

Main outcomes
- Constructive alignment starts with the outcomes we intend students to learn, and align teaching and assessment to those outcomes.
- The masters programme aims for societal impact. Which means that communication, teamwork, negotiation and student centered learning skills need to be learned and assessed during the premaster.
- The assessment will be differentiated as each of the elements will be assessed separately using its own intermediate formative and final summative assessments.
- Usa a personal development plan and portfolio including the use of concept mapping (living textbook).

Main outcomes
- Distance course is what we are going to do to ensure accessibility for everyone (inclusivity).
- Core knowledge course content needs to be delivered in a non-integrated focused way.
- A basic statistics course and the academic and research skills courses are mandatory for all students.
- Climate adaptation is chosen as the challenge for both individuals and groups to integrate, activate and apply knowledge gained.
- Innovative ways of assessment will be used be used.



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Project team:
Tiny Luiten, Thomas Groen, Justine Blanford, Adina Imanbayeva

Mila van Druten.
This poster is to complete the ECIU CBL grant project activities on Challenge-based learning in a distance premaster for M-SE project.

Reference:
- Malmqvist, J., Radberg, K.K., Lundqvist, U. COMPARATIVE ANALYSIS OF CHALLENGE-BASED LEARNING EXPERIENCES. Proceedings of the 11th International CDIO Conference, Chengdu University of Information Technology, Chengdu, Sichuan, P.R. China, June 8-11, 2015
- Leijon M, Gudmundsson P, Staaf P, Christersson C. Challenge based learning in higher education— A systematic literature review, Innovations in Education and Teaching International. Innovations in Education and Teaching International. 2021. doi: 10.1080/14703297.2021.1892503.
- ADDIE model: https://educationaltechnology.net/the-addie-model-instructional-design/

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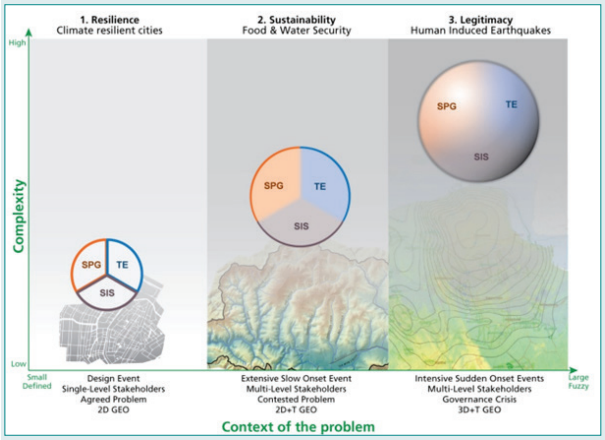
Challenge-based learning in M-SE case study projects

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).



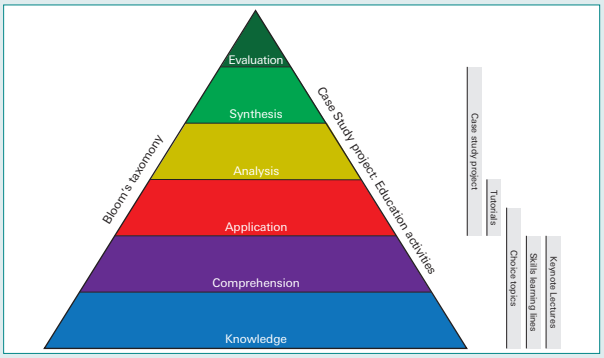
The M-SE core knowledge areas are: Technical Engineering (TE), Spatial Planning for Governance (SPG), Spatial Information Science (SIS).

The M-SE Challenge

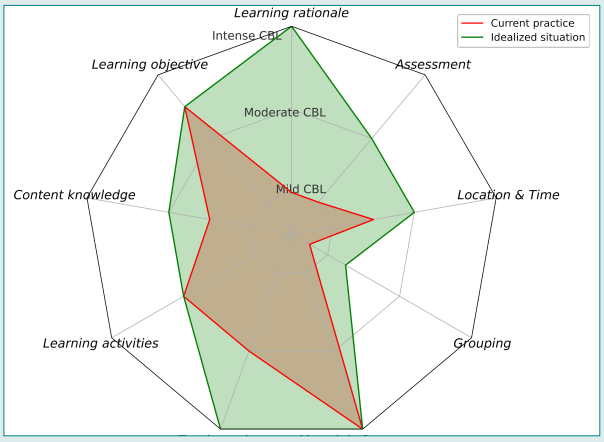
1. Is connected to a 'wicked' problem that is socially relevant and applicable to various places across the world.	The problem structuring framework proposed by Hisschemöller and Hoppe (1996) is adopted in M-SE, which discerns problems based on certainty about the relevant knowledge and consensus on 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.

Project team:

Rogier van der Velde, Mark Brussel, Cheryl de Boer and Justine Blanford

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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Frank van den Berg

“CBL is an educational philosophy that can be a great way to let our students develop competencies they will need in their future (working) life.”

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Assessment; Educational Leadership; CBL

CELT

Team member(s): Robin de Graaf

Frank van den Berg is Senior Educational Consultant at CELT - the Centre of Expertise in Learning and Teaching. At CELT he is responsible for the Educational Leadership Programme, the Senior University Examination Programme and the support of (new) Programme Directors. He has been active in the ECIU for more than 5 years, co-designing the CBL-activities in the ECIU University and organising and supporting the different CBL pilots at the UT. He also was a member of the ECIU taskforce Assessment in CBL.

presents

Assessment in CBL @ UT

CBL is used in more and more courses at the UT. A question that many teachers have is what and how to assess in a CBL-course. This poster will elaborate on the research that we are executing to find out how teachers at the UT have designed their assessment, and we will explain how we will translate the findings into concrete suggestions for other teachers who want to implement CBL in their education.

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Assessment in CBL : what and how?

CBL and assessment, what and how?

Challenge Based Learning (CBL) is part of the UT vision on Learning and Teaching. CBL is an educational philosophy that can help students in gaining relevant competences for their future career. It offers students lots of freedom and choices, not only in how and when to learn, but also what to learn. This leads to questions regarding the assessment: if we want to determine what the students have learned but they themselves choose what to learn, how can we assess that? And is assessment even needed in a CBL-course? In the literature on CBL not much can be found on assessment in CBL-courses.

Research: how is CBL assessed @ UT

To bridge this knowledge gap and be able to help teachers with concrete suggestions for how to organise the assessment, a small scale research is set up at the UT. Teachers who currently have set up their course according to CBL, will be interviewed on the how, why and what of their assessment.

Goal of research

Come up with a list of practical tips on what and how to assess in a CBL course, and show best practices.

Planning

* summer 2024: interviews
* autumn 2024: analysis, summary and presentation of first results
* 2025: expand research to other universities

Want to participate or further information?

Contact Frank van den Berg, f.m.j.w.vandenberg@utwente.nl
Centre of Expertise in Learning and Teaching (CELT) - University of Twente

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* Van der Vleuten, C., D. Sluijsmans, and D. Joosten-ten Brinke. 2017. "Competence Assessment as Learner Support in Education." In Competence-based Vocational and Professional Education, edited by M. Mulder, 607–630. Cham: Springer.
* William, D. 2011. "What is Assessment for Learning?" Studies in Educational Evaluation 37 (1): 3–14. doi:10.1016/j.stueduc.2011.03.001
* UT vision on learning and teaching, https://ut.nl/dzsovop

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Nikola Nizamis

"CBL encouraged me and my students to actively engage with real-world challenges and address them."

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Humanitarian engineering education

ET faculty - DPM department

Team member(s): Alberto Martinetti, Laura Franco Garcia, Nina Trauernicht, Peter Chemweno

I am an educational coordinator and lecturer in humanitarian engineering. My main focus is curriculum design, challenge-based and community-based learning in the context of engineering education.

presents

The future of assessment: Comparative judgment in the context of humanitarian engineering

Addressing complex global issues requires engineers with advanced competencies, yet assessing these skills in education remains challenging. Discover innovative assessment with our latest research on comparative judgment, a method promising more consistent and fair summative competency-based assessment.

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COMPARATIVE JUDGMENT:
ASSESSING COMPETENCE DEVELOPMENT IN THE CONTEXT OF HUMANITARIAN ENGINEERING EDUCATION

Nikola Nizamis*
Alberto Martinetti
Laura Franco Garcia
Nina Trauernicht
Peter Chemweno

INTRODUCTION

Addressing current complex societal issues requires a new generation of engineers equipped with the competencies to work in challenging, volatile and complex contexts. While much work focuses on how can students develop such competencies, the inclusion of **competency-based assessment** requires new objective and reliable assessment methods [1, 2].

Comparative judgment emerges as a promising method that can address some competency-based summative assessment challenges:

Challenges	Potential solutions
Potential biases of coaches in assessment	Involvement of more assessors
Traditional assessment rubrics based on micro-judgment	Holistic assessment rubric
Limited staff availability	Involvement of less experience assessors & peer feedback

Research questions:

Can comparative judgment be used to assess competence development reports in a challenge-based learning course, and if so, how?

How do assessors experience using comparative judgment?

METHODOLOGY

Data Analysis: Comparative and absolute judgment ranking comparisons

The self-reflection part of an individual report in the master´s elective course Introduction to Humanitarian Engineering was assessed using absolute (traditional) and comparative judgment. The results and the rankings of 18 reports were then compared and grouped into three segments: six lower-scoring, six average-scoring, and six higher-scoring essays.

Survey: Perceived experience of assessors

The assessors completed an anonymous survey, consisting of Likert-Scale and open questions, after completing comparisons to share their experience with comparative judgment and the Comproved tool. Seven out of eleven assessors completed the survey.

RESULTS

Data Analysis

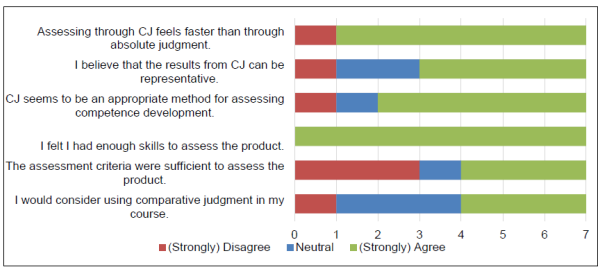
Eleven assessors (PhD candidates, lecturers, assistants and associate professors) assessed 18 essays, resulting in 245 comparisons. The results indicate that higher-scoring students are penalised, and lower-scoring students are rewarded when comparative judgment is used.

Segment	Essay ID number	Absolute rank	Comparative rank	Δ	Avg Δ per segment
1	17	1	5	-4	-4.83
	19	2	10	-8	
	1	3.5	6	-2.5	
	14	3.5	9	-5.5	
	18	6	7	-1	
	16	6	14	-8	
2	10	6	16	-10	-0.17
	13	8.5	2	6.5	
	22	8.5	18	-8.5	
	15	10	3	7	
	20	11.5	8	3.5	
	3	11.5	11	0.5	
3	4	14	4	10	+5.5
	21	14	13	1	
	2	14	15	1	
	9	17	1	16	
	8	17	12	5	
	12	17	17	0	

Differences in ranking between comparative and summative judgment. The symbol Δ is used to indicate the change in rank. Red indicates a negative change in rank, green indicates a positive change in rank, and yellow indicates no change in rank.

Survey

In general, the assessors had a positive experience with comparative judgment. They appreciated the time-saving aspects of comparative judgment and the options to give an overall judgment without diving into minor details. At the same time, they lacked a detailed assessment rubric and expressed their wish to give written feedback and "equally good" when essays demonstrated similar quality.



Survey results (x-axis: number of respondents per answer, y-axis: Likert-Scale question statements)

KEY FINDINGS

- ✓ Comparative judgment has potential benefits like **reducing** biases, **simplifying** rubrics, and **enabling** peer feedback.
- ✓ Research suggests that comparative judgment may **not** be ideal for **competency** summative assessment.
- ✓ Flexibility of comparative judgment in grading assessments **may clash with grading norms**, especially in countries like the Netherlands.
- ➢ Further research is needed with **larger samples** to understand comparative judgment effectiveness better.
- ➢ Hypothesis: Students with **lower** absolute grades might score **higher** in comparative judgment.
- ➢ Exploration is needed on whether comparative judgment is more suitable for **peer learning** or **formative** assessment.

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[2] Petrová, N., Chapel, L., Buunk, L., and Kaptijn, G. H. "Assessment of competency development in a challenge-based learning course: Can coaches be objective assessors?" In Proceedings SEFI 50th Annual Conference 2022 (2022): 615–624.

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UNIVERSITY OF TWENTE. | Humanitarian Engineering Research Group

Jovana Jezdimirovic Ranito

“CBL brought real life to my classroom.”

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CBL

University College Twente

Team member(s): Aida Guerra

I'm Assistant Professor at UCT. My main area of expertise is social (political) sciences, but I have been researching in educational innovation in last few years. My coordination of the CBL project brought me possibility to tackle student difficulties in this environment with providing supporting tools.

presents

ColTool

CBL projects can be intimidating because the focus often shifts from content to process. Students have difficulties working together, they are uncertain how to involve stakeholders and what to do with their inputs. Are you prepared to make your students feel they own the process and are in control in their collaboration with others?

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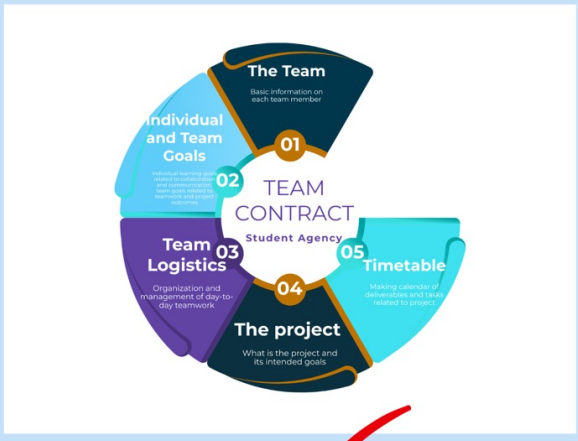
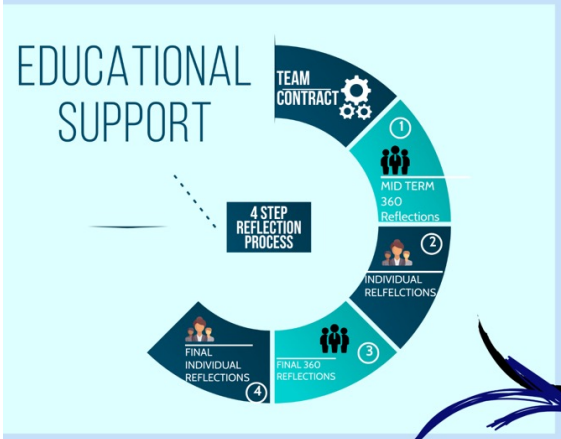
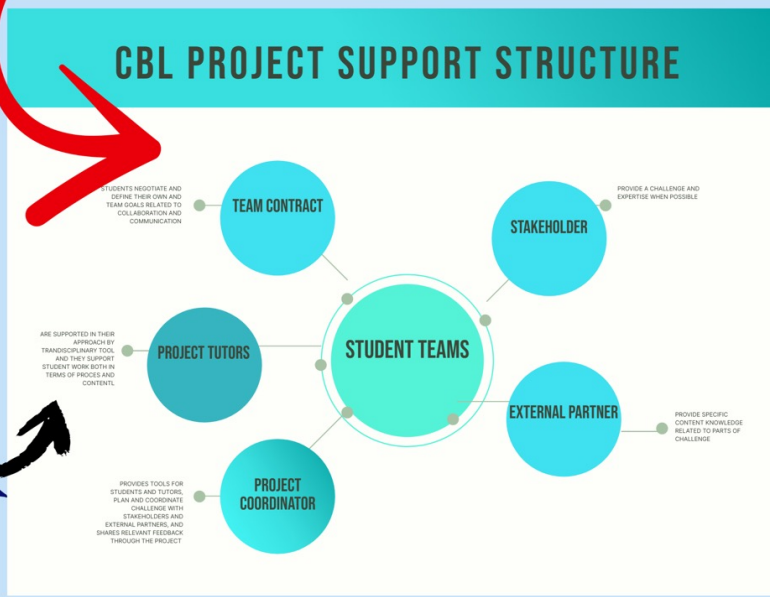
CoLTooL







Trandsiciplinary support tool

This project was funded by ECIU

ECIU university

Mathieu Odijk

“CBL has improved my joy in teaching, as it is also challenging and intellectually stimulating for the tutors involved.”

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Nanotechnology

EEMCS / BIOS Group

Team member(s): Niels Tas, Rainer Harms

Prof. Odijk holds a chair of Micro- and Nanodevices for Chemical Analysis (UT) since 2021. In his work, he develops microfabricated tools for a wide variety of applications, including biology, Negative Emission Technology, and catalysis. Educational activities include coordinating and teaching in (elective) bachelor modules, and various master courses in the programs Nanotechnology and Electrical Engineering.

presents

Big challenges solved with nanodevices; How to coach nanotechnology students to learn independent design skills?

In the 10EC nanotechnology (NT) design project, we coach NT students on how to design a prototype of a nanodevice to solve a societally relevant problem, develop a business, and bring the device to the market. Students work on their own ideas, often leading to interesting (nano)products. Developing a proper business canvas, including stakeholder interviews, ensures prototypes are developed following a market pull rather than a technology push.

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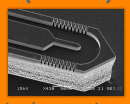
Big Challenges Solved with Nanodevices

How to coach nanotechnology students to learn independent engineering skills?

Hanneke Becht – Erwin Berenschot – Rainer Harms – Mathieu Odijk* – Niels Tas
Contact: (m.odijk@utwente.nl)

Nanotechnology Design Project (NTDP)



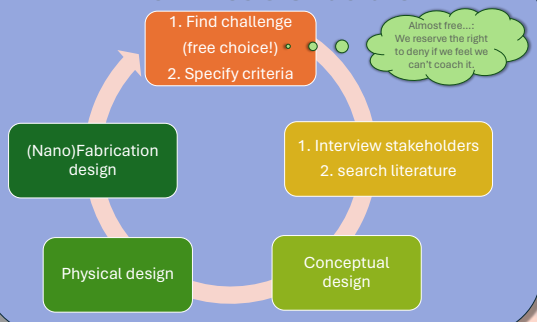
What is it?

- Project: designing a prototype of a nanodevice to solve a "big" challenge.
- Develop a business canvas to bring the device to the market.

Organisation

- 7EC technology + 3EC business dev.
- Teachers act as coach, students provide the challenge
- Interfaculty collaboration: EEMCS, TNW, BMS

Activities & Structure



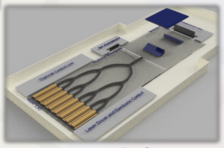
Example Projects

FeathIR
ASML makers award 2018

RapidNose
Finalist Ideation 2021

CTCPure
runner up in 2018

Accellent
ASML makers award 2019



MIRiad
Finalist Ideation 2020

Several groups from NTDP have participated in the UT Challenge over the years. Photo's curtesy of: https://utchallenge.nl/.

Assessment & teamwork coaching

Preliminary mark based on:
Literature report, Final report, presentations, Canvas.

Do you believe everyone should get an equal grade?

Teamwork coaching

- Questionnaire & discussion teamwork in wk4.
- We coach & keep an eye on the group process.
- Repeat in wk10, followed by a discussion on how to **distribute grades within team** (coach has final say).

Learning aims

Students should be able to:

1. Formulate and specify the required functionality
2. Make a feasible & realistic conceptual design [0.125]*
3. Make an in-depth physical model of the device [0.225]
4. Choose dimension, materials and driving parameters (like voltage, pressure etc.)
5. Design a (cleanroom) fabrication scheme for the device [0.225]

a. Carry out a systematic literature search & use correct referencing. [0.225]
b. Clearly report, present & discuss the different phases of the design process
c. Function in a small team of students, being able to effectively communicate, cooperate and demonstrate teamwork skills [0.2]

i. Learn and apply basics of qualitative market research
ii. Learn and apply basics of entrepreneurial finance
iii. Design a business model for a nano-tech based device

* Numbers in [] refer to weight factor in assessment in the 7EC technical part.

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Acknowledgements:
The authors of this poster would like to acknowledge the contributions of Robert Ukropec, Bjorn Borgelink, Dean de Boer, Koen Jorissen, Loes Kleinsmit, and Celine Steenge for their assistance during this project over the years. A similar technical design format is followed in the MEMS Design course. We acknowledge the conceptual contributions of Remco Wiegerink.

Heidi Muijzer-Witteveen

“CBL in the master Robotics created a new, challenging, but very interesting job for me.”

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Robotics

ET/EEMCS - MSc Robotics

Team member(s): Jan Broenink, Thelma Stobbelaar-van der Laan

I started my study here at the UT (Biomedical Engineering) in 2002 and never really left. Since 2019 I've been involved in the setup of the MSc Robotics programme and now (since September 2022) bringing it to life as master coordinator and Challenge-Based Learning teacher.

presents

Formative assessment in Challenge-Based Learning in MSc Robotics

We would like to share how CBL in the MSc Robotics is integrated in the whole programme and connected to the compulsory courses. Furthermore, we would like to show how formative assessment is applied at different levels within CBL in the MSc Robotics. We would love to hear about your thoughts and ideas on how to further improve our approach and how to deal with new challenges, like increasing student numbers

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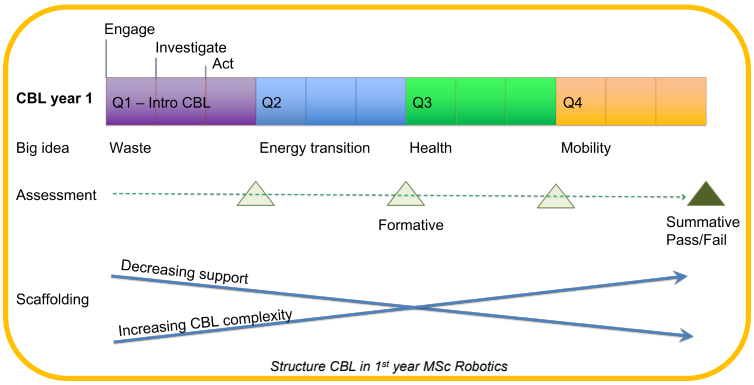
ECIU university

Challenge-Based Learning in MSc Robotics

Heidi Muijzer-Witteveen, Eduardo Hermsen, Jan Broenink

Rationale

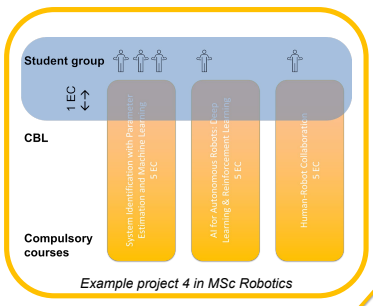
- Prepare for MSc-thesis project & future career
  - Control own learning process
  - Multi-disciplinary field
  - Real-life open-ended problems



Structure CBL in 1st year MSc Robotics

Structure

- Robotics challenge
  - Robotics end solution
  - Framed to compulsory Robotics courses



Example project 4 in MSc Robotics

- 4 CBL projects in year 1
  - Different focus
    - Interactions
      - Individual
      - Team
      - Cross-teams
      - External
    - CBL phases
      - Engage
      - Investigate
      - Act
      - Free choice
  - Increase in complexity
    - More courses involved
    - More stakeholders
    - Less support
- Multi-disciplinary teams
  - 4-6 students
  - Different specialisation, profile, and BSc background

Support

- Course teachers
  - Define and assess course specific elements
- CBL teachers
  - Provide feedback and final assessment of individual portfolio
  - Support CBL coaches
- CBL coaches (TAs)
  - Support CBL process of teams (no content knowledge)

Assessment

- Document, Reflect, and Share
  - Groupwork report
    - Course specific elements
  - Individual portfolio
    - CBL process
    - Teamwork process
    - Personal learning goals
- Feedback
  - Formative feedback after each project
  - 10 min. meetings with CBL teachers
- Final assessment
  - Pass/fail end of year 1
  - Based on progress over four projects

drs. E.M.P. Hermsen (Eduardo)	eduardo.hermsen@utwente.nl	CBL Expert at Centre of Expertise in Learning and Teaching & Challenge-Based Learning Teacher
dr. H.J.B. Muijzer - Witteveen (Heidi)	h.j.b.witteveen@utwente.nl	Programme Coordinator MSc Robotics & Challenge-Based Learning Teacher/Coordinator
dr.ir. J.F. Broenink (Jan)	j.f.broenink@utwente.nl	Programme Director MSc Robotics

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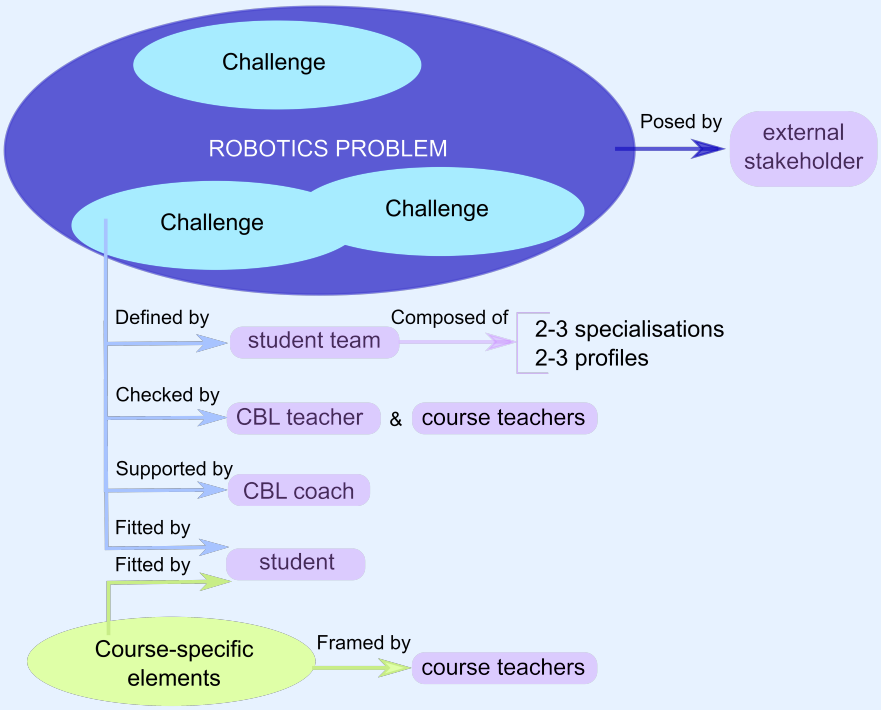
Formative Assessment in Challenge-Based Learning in MSc Robotics

Heidi Muijzer-Witteveen, Thelma Stobbelaar-van der Laan, Jan Broenink



CBL in MSc-Robotics Programme

- Open-ended, real-life, problems
- Better preparation for MSc-Thesis project
- Better preparation for professional career
- Better preparation for continuous learning

One Project per Quartile

- Each quartile one CBL project
- Multidisciplinary student teams
- Feedback / assessment per project
- Growing complexity of projects

Coordination / teaching

- CBL coaches (TAs)
- CBL teachers
  - next to course teachers

End products

- Groupwork report
  - Graded by course teachers
- Individual portfolio
  - Feedback by CBL teachers
  - Pass/Fail at end of year

Assessment & Feedback

Three levels of feedback

1) Weekly feedback on process
   - By CBL coaches
   - CBL process, learning goals, groupwork
2) After each project
   - By CBL teachers
   - In consultation with CBL coaches
   - On individual portfolio
   - Rubric in Canvas Speedgrader
   - "Needs attention", "on track", "stands out"
   - + 10 min. meetings
3) After four CBL projects
   - By CBL teachers
   - On CBL in MSc Robotics
   - Pass/Fail
   - Based on all previous feedback

Logbook & Rubric

Student:	**Xxx Xxx (s000000)**		
Project 1	**Project 2**	**Project 3**	**Project 4**
Group: x Coach: X Comments by coach: xxxx	Group: x Coach: X Comments by coach: xxxx	Group: x Coach: X Comments by coach: xxxx	Group: x Coach: X Comments by coach: xxxx
Feedback portfolio: Assessment criterium 1 Needs attention:xxx On track: Stands out: Assessment criterium 2 Needs attention:xxx On track: Stands out: Assessment criterium 3 Needs attention: On track:xxx Stands out:	Assessment criterium 1 Needs attention: On track:xxx Stands out: Assessment criterium 2 Needs attention:xxx On track: Stands out: Assessment criterium 3 Needs attention: On track:xxx Stands out:	Assessment criterium 1 Needs attention: On track:xxx Stands out: Assessment criterium 2 Needs attention: On track:xxx Assessment criterium 3 On track:xxx	Assessment criterium 1 Needs attention: On track: Stands out:xxxx Assessment criterium 2 Needs attention: On track:xxx Assessment criterium 3 On track:xxx
10 min. meeting: Xxxx	**10 min. meeting:** Xxxx	**10 min. meeting:** Xxxx	**10 min. meeting:** Xxxx
Final assessment: xxxxxx			PASS

Assessment Rubric
The feedback provided on the previous project(s) has been taken into account and implemented in the portfolio

The three CBL phases of the project have been clearly described.

Clear overview of the information gathered during the project and how it is used in the project, including proper referencing

The connection between the CBL project and the involved compulsory courses is made clear for each of the CBL phases
...

More information:
https://www.utwente.nl/CBL/

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Adina Imanbayeva

“CBL has inspired me to promote authentic and meaningful education while also opening doors to a vibrant community of like-minded people.”

a.imanbayeva
@utwente.nl

CBL training and research

CES-CELT

Team member(s): Robin de Graaf

I work as an educational development officer at CELT (Centre of Expertise in Learning and Teaching) at the University of Twente. My current role involves supporting UT teachers in implementing CBL and designing a teacher training trajectory aimed at enhancing teachers' CBL expertise. Additionally, I'm pursuing a PhD focused on student empowerment.

presents

ChallengeUp: A Digital Tool For Facilitating The Transition Towards Challenge-based Learning In Existing Higher Education Courses

Introducing Challenge Up, a newly launched digital tool for facilitating the transition towards CBL in existing higher education courses. Discover how the tool incorporates Van den Akker's curricular design components and CBL intensity levels to guide teachers on bridging the gap between their current and desired levels of CBL.

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BEST POSTER AWARD WINNER AT THE FIRST NATIONAL CBL CONFERENCE EINDHOVEN, 2023

CHALLENGE UP!

A DIGITAL TOOL FOR THE TRANSITION TOWARDS CBL IN EXISTING HIGHER EDUCATION COURSES

Robin de Graaf - Adina Imanbayeva

University of Twente

OVERVIEW

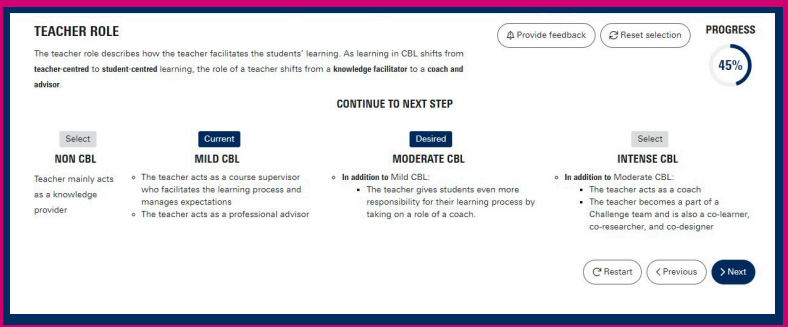
The adoption of Challenge-Based Learning (CBL) in higher education is growing, but integrating it into existing curricula has challenges. To support this process, we created a free online tool that assists teachers in implementing CBL principles. The tool draws on Van den Akker's curricular design components and incorporates CBL intensity levels, guiding teachers in bridging the gap between their current and desired CBL levels.

COMING TO THE LEVELS & ADVICE

To define levels of CBL intensity, we first linked CBL elements, as described in relevant literature, to the components of Van den Akker's Curricular Spider Web. Then, CBL intensity levels were established based on CBL experiences at the University of Twente, resulting in a heuristic prototype description of Mild-Moderate-Intense CBL levels. At the Mild level, we guide the incorporation of CBL essentials into existing educational structures. The Moderate level introduces more CBL elements and adds depth to the CBL experience. The Intense level represents a full-scale implementation of CBL, with all elements fully integrated into the curriculum. The advice database initially draws from CBL experiences at the UT, but we also hope to gather input from other universities and CBL practices.

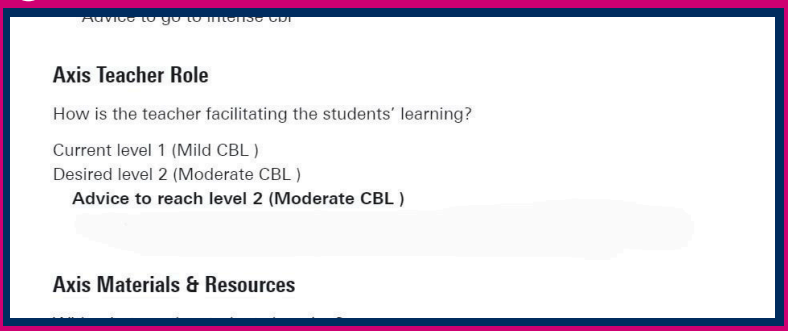
HOW DOES IT WORK?

1 Indicate your current & desired levels of CBL per component

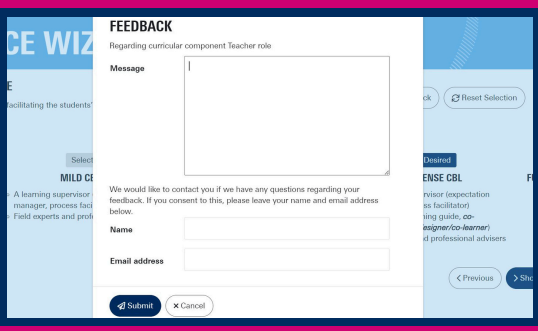


2 Receive an overview

3 Receive tailored advice per curricular component



OPTIONAL: Give feedback and contribute



A TOOL WITH MULTIPLE BENEFITS

- Guidelines for CBL beginners
- Support for CBL implementation on different levels
- Data source for systematic research
- Instrument for educational policymakers

CURRENT STATUS

WE ARE NOW LIVE @

challengeup.utwente.nl

KEY REFERENCES

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4TU.Centre for Engineering Education

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Cora Salm

“I failed 50% of the students. So I am leaning to going back to regular project education.”

c.salm@utwente.nl

Innovation

EEMCS

Team member(s): Jurriaan Schmitz, Cheryl de Boer, Chris Hecker, Kirsten Pondman, Nataly Banol, Frank van den Berg

Cora Salm has a MSc in Applied Physics and a PhD in Electrical Engineering. Since 2020 she is the program director of Electrical Engineering. She received the Senior-UTQ diploma in 2018 and participated in the Educational Leadership Programme in 2021/22.

presents

Energy Transition Challenges: first experiences and second thoughts about CBL in a bachelor module

We have run two version of this CBL module as an elective minor. The first one was considered a success by both tutors and students. The second version received mixed feelings from the students and was disappointing for the teachers. We have a list of suggestions to improve next year but would welcome discussion with fellow teachers who successfully apply CBL in the bachelor.

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Energy Transition Challenges

First impressions and second thoughts about CBL in a BSc minor module

Cora Salm, Jurriaan Schmitz

TOPIC: Energy Transition on CAMPUS

- 15 EC minor module
- Multidisciplinary groups
- Pre-knowledge: minor ET-Perspectives

(meaning lack of BMS and ITC students)

OFFERED RESOURCES

Organised sessions by teacher team:

Intro CBL

Presentations by stakeholders/experts on ET

Group formation +Initial topic choice

Stakeholder analysis

Update and final Presentations

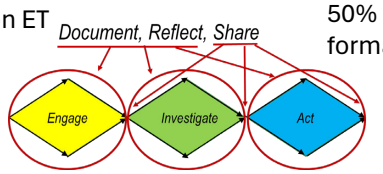
ASSESSMENT

- Group report (pilot)
- Final presentation
- Individual reflection
- Team reflection
- Outreach deliverable

For second version:

- NO final report
- Extended presentation +Q&A session

50% grade technical content
50% reflection
formative feedback (not graded)



RESULTS Pilot (22/23)

Pilot was announced late so students had to actively de-enroll from another minor

10 Highly motivated students

Student satisfaction (100% SEQ response !)

8,6

5 Ideal group size

Input from students

Students prefer P/F over grade!

First regular minor version (23/24)

15 students

Several students not intrinsically motivated

"I choose a project minor since it is easy to combine with resits"

Observations from teachers:

Self motivation missing

Troublesome group formation process (including topic choice)

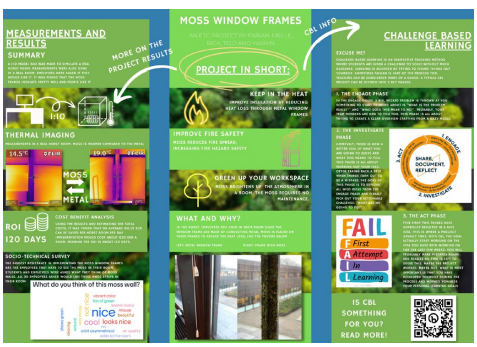
Time and effort put in the module sub optimal

student 1 *"I spent 20h/wk on the module"*

answer student 2 "that much?!"

Students ask for more steering , organised sessions and deadlines

7 of the 15 students FAILED



Conclusion from teachers

\+ Outreach deliverable: keep for next year

\+ Some students need to be forced out of their comfort zone

\- Technical content difficult to judge without report

-- If 50% of the grade is given to reflection, perhaps better instruction is needed.

+/- Both students and teachers feel that a regular project would have resulted in more (better?) technical output.

Discussion: Does CBL work in a regular BSc module?

Mina Shahi

m.shahi@utwente.nl

Heat conversion and storage

ET

Team member(s): Aayan Banerjee, Amir Mahmoudi

I am leading the research line of heat conversion and storage at the TFE department. My research is focused on model-based analysis, design, and improvement of heat conversion and storage concepts and devices through the fundamental understanding of transport phenomena. Together with my team of PhD and postdoc students, we are striving to achieve 100% sustainable heating and cooling in buildings.

presents

Challenge Based Learning in energy storage course

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Course name:

Energy Storage

Course Coordinator: Mina Shahi
Course teachers: Mina Shahi, Aayan Banerjee and Amir Mahmoudi
Coaches: Zhu Tingting, Max Berkers, Ahmad Shaur
CBL experts: Eduardo Hermsen, Gianluca Ambrosi, Olga Karageorgiou
Teaching Assistants: Patrick Zieverink, Olga Karageorgiou

Course content:

The course delved into different energy storage technologies. The working principles of each technology were taught by either the teachers themselves or guest lectures, who were experts on the topic. Students worked on **five different challenges**:

- ✓ P3 as virtual mega batteries
- ✓ 100% wind energy, 100% of the time
- ✓ All-season waste heat for hangars
- ✓ Solar energy – 100 MW in 100 months
- ✓ Liquid H2 in the energy mix

For each topic, the students:

- Received input during the lectures
- Applied their knowledge during the tutorials
- Challenged their skills during the CBL workshops

The outcomes were presented during a **public conference**.

CBL approach:

The course utilized the Challenge Based Learning (CBL) approach, where the students come in contact with real stakeholders, define their own challenge (aka project topic) from the big idea of the needs of the stakeholders **[Engage phase]**, dive into the topic through guiding questions and the support of their coaches **[Investigate phase]**, and develop an outcome solution to their challenge **[Act phase]**.

The big idea: How can Schiphol airport be more sustainable in 2030?
Goal 2030: Zero emission
Vision 2050: Energy positive

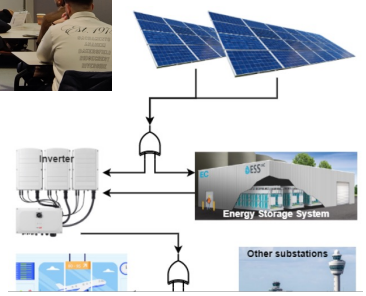
Stakeholders:

1. Royal Schiphol Group
2. Dutch Organization for Applied Scientific Research (TNO)

Working pattern:
Inter-disciplinary groups of 5-6 students

Course Evaluation:

The course was offered for the first time (with the CBL application).
4.1/5 – The content of the course was interesting.
3.8/5 – Overall appreciation of CBL in the course
2.5/5 – The utilization of CBL for the course was easy to understand
Conclusion: The course content & CBL application are positively valued, but there is space for improvement regarding organization and finetuning of CBL in the course material.



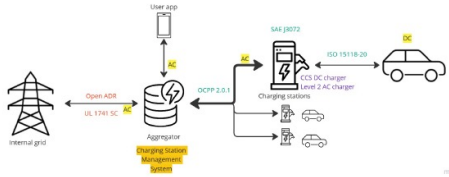


Fig. 1: Hardware, software and protocols of V2G integration.

Products/ Outcomes:

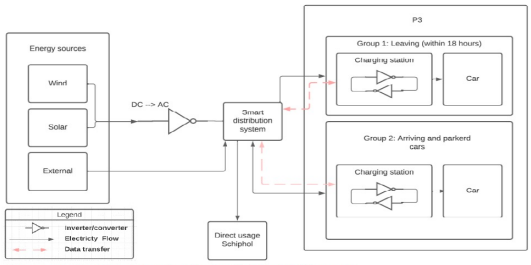
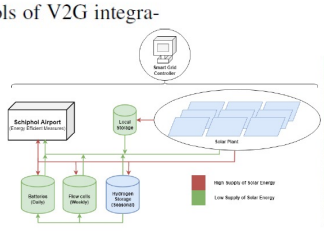


Figure 9: Overview of the integration of P3 in Schiphol's electricity system.



(a) Integrated solar energy system for Schiphol

(b) Planned locations for the solar power plant and storage facility

Figure 3.4: Overviews of the integrated system design.

Contact information:
Mina Shahi - m.shahi@utwente.nl

CBL in ECIU

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ECIU CBL program at Trento University
‘Engaging with the Future’

https://www.soi.unitn.it/courses/engaging-with-the-future/

Coordinators:
Francesca Odella (Unitn): francesca.odella@unitn.it and Martin Fredriksson (LIU): martin.fredriksson@liu.se

Challenge provider
Mazingira Voluntary Association (Italy)

Period

Spring Semester 2024

ECTS 4

Participants:

BA and MA students from 12 universities (ECIU and Erasmus partners), multidisciplinary groups

Duration:

from March to mid of May 2024 (2 and ½ months).

Societal involvement: one stakeholder (NGO), seminars with experts from Unitn, Center for International Cooperation (IT), University of West England and Unesco.

Learning and socializing activities: seminars and workshops with experts, study visits to research facilities, local cooperatives and museums involved in SDGs programs.

Hybrid format: online seminars + 1 week short mobility (Trento).

CBL monitoring tools: group tutoring sessions, final project work implementing Future Studies approach, feedback of participants (survey, interviews).

Evaluation: dynamic view of learning processes at group and individual level (tutors), rubrics and observation notes about the overall learning outcomes (coordinators and stakeholder, experts).

Calendar of the Challenge

February 2024 - Confirmation message to selected participants

4-8 March 2024 - KICK-OFF week in Trento (short mobility)

1 st seminar online and tutoring sessions (21 march)

Project work preparation supervised by Teamchers from LIU and Unitn

2 nd seminar online and tutoring sessions (11 april)

3 rd seminar online and tutoring sessions (24 april)

Preliminary presentation of Project work (tutors and Unitn / LIU)

13-14 May 2024 - Final presentation of Projects (online and in presence at Norrkoping Campus - LIU)

ECIU university

Multiculturality and knowledge variety

The students were involved by the stakeholder in setting the general objective of the CBL and supported with guidelines about the final outputs/ projects.

Tutors provided support to groups for developing their projects; to communicate their futures scenario some students preferred a 'traditional' output, such as a report; others preferred to use an artistic format (comics, gaming..).

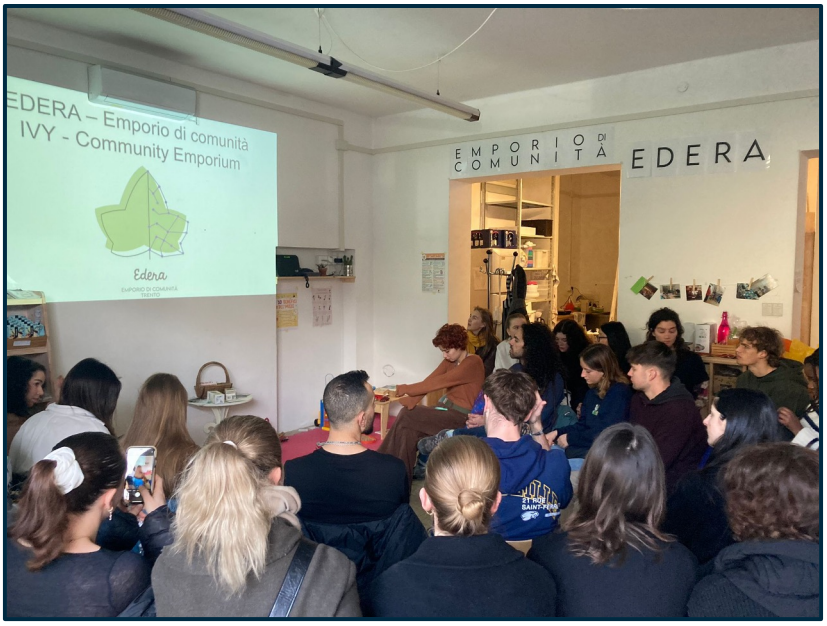
Dear diary,

Today I am turning 40. As I reached the age of my mother, I decided to celebrate my birthday with my grandmother. It was such a nice day… We were sitting in the forest and talking about things now and then. I discovered so many things I was not aware of! Granny said she used to go to the Udzungwa Mountains forest and collect the wood from there for building

Projects and outputs

Students discussed and developed different scenarios of the future focusing on

- the possible roles of the stakeholder in a changing geopolitical panorama (eg. EU and Africa relationships)
- the significance of individual choices in planting good seeds for a better future (eg. volunteering, civic engagement)
- SDGs as crucial elements for socio-economic anticipation policies.



School of Innovation Trento

ECIU university

UNIVERSITÀ DI TRENTO
Department of Sociology and Social Research

LINKÖPING UNIVERSITY

Hydrogen – a relevant factor for tomorrow's carbon-free aviation?

Teamchers: Akın Öğrük, Siska Simon

Teamwork

Presentations from experts

Hydrogen has great potential to contribute to the decarbonization of industry and transportation. One sector in which hydrogen is expected to play an important role is aviation. Aircraft manufacturers, airlines, and airports are developing new technologies and utilization concepts.

Host University

Hamburg Airport, for example is preparing for the future use of hydrogen. But is it realistic to think that we are moving towards carbon-free aviation? What are the limiting factors? What ideas do you have for developing an efficient and reliable hydrogen supply system?

Airport site trip

Industry Partners:

Hamburg Airport

AIRBUS

TUHH Hamburg University of Technology

Challenge-based learning and examples of CBL implementation

Sanaz Masoumeh Shahverdi

masoumeh.shahverdi@uis.no

PhD in Social Entrepreneurship

Extracuriculumn CBL Challenge at University of Stavanger (UiS):

- **Spring 2021**
  - Three-days CBL Challenge : Make urban area and complexes greener (Byverksted))
  - Four weeks Challenge: Intimate cityscapes (Byverksted)
  - Four months CBL challenge: **Mapping the constructions' recyclable, reusable and renewable materials** (Site 4016)
- **Fall 2021**
  - Implementing CBL in Three Challenges in Hackathon at UiS:
    - Reducing car traffic at UiS - Kolumbus
    - Circular economy for heavy industries – Lyse
    - **Drone surveillance of the power grid** - KVS Technologies
- **Spring 2022**

  Alpine Smart Working Challenge, Collaborating to implementing CBL Hackethon in Italy
- **Fall 2022**
  - Train-the-trainer CBL workshop at UiS
  - Three days CBL Challenge: How to make UiS greener campus
- **Spring 2024**
  - Smart Education for Innovative Teaching" - ECIU "Train the Teamchers" CBL Workshop at the University of Stavanger (38 ECIU teachers)
  - Green Transition in Offshore Wind , REDUCE THE ENVIORONMENTAL FOOTPRINT OF OCEAN RENEWABLE SYSTEMS (38 ECIU students)

Intracuriculumn CBL implementation project (in the courses):

- **2021**
  - Information and Technology Management, Fall 2021

- **2022**
  - Information Management and Digitalization, MSB204-1 22V, Spring 2022
  - Corporate Social Responsibility in service organizations, BHO308-1 22H, Fall 2022
  - Sustainable Entrepreneurship, MSB415-1 22H, Fall, 2022
- **2023**
  - Business Development and Innovation, ECS110-1 23V, Spring 2023 (1 ECIU Student)
  - Sustainable Entrepreneurship, MSB415-1 23H, Fall, 2023 (3 ECIU students)
  - Bærekraft og grønn omstilling, SV100-1 23H, Fall 2023
  - **Offshore Field Development, OFF516/515, (one week) Fall 2023**
  - Fysisk aktivitet og helse, MID401, (one day) Fall 2023

- **2024**
  - Sustainable Business Development and Innovation, MSB416-1 24V, Spring 2024 (1 ECIU student)
  - Bærekraft og grønn omstilling, SV100-1 23H, Fall 2024 (next semseter)
  - Fysisk aktivitet og helse, MID401, Fall 2024 (next semester)

CHALLENGE

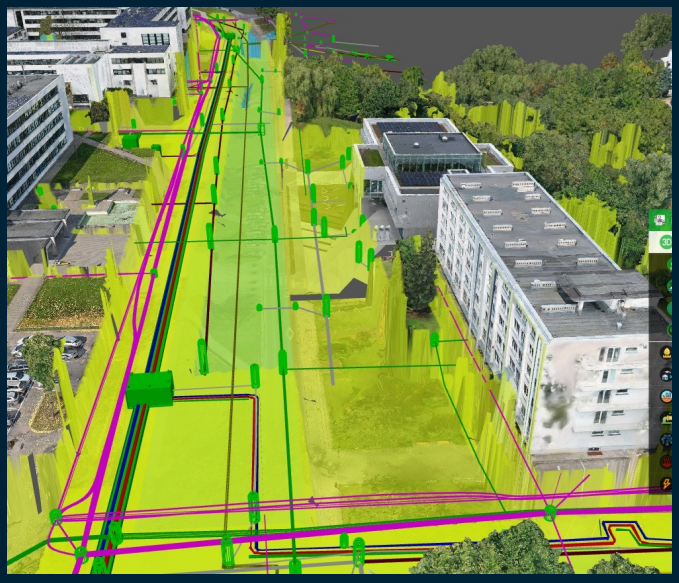
Open for application

Urban Digital Twins for Sustainability

HOW CAN INNOVATIVE TECHNOLOGIES BE APPLIED FOR IMPROVEMENT OF SUSTAINABILITY INDICATORS WITHIN THE BUILT ENVIRONMENT?

Our challenge

- Develop innovative solutions using digital twin technology to advance sustainability.
- Work on real-world case studies from Dublin and Kaunas.
- Create methodologies and applications for tracking and improving urban sustainability.
- Showcase your findings and proposed solutions through a detailed poster and a video presentation.



Topics
Entrepreneurship, technology and innovation
Critical and innovative thinking
Inter-personal skills
Media and information literacy

Study format
Online

Application period
1 June – 22 September 2024

Study period
1 October – 23 December 2024

Credits
6 ECTS

Pace
0%

Hosting university
Kaunas University of Technology

Lennart Osterhus, Ulrike Bulmann, Viktoria Constanze Schneider & Kaline Pagnan Furlan

ENGINEERING SOLUTIONS FOR A MORE INCLUSIVE SOCIETY: A CASE STUDY WITH EUROPE-WIDE CHALLENGE-BASED LEARNING

Introduction

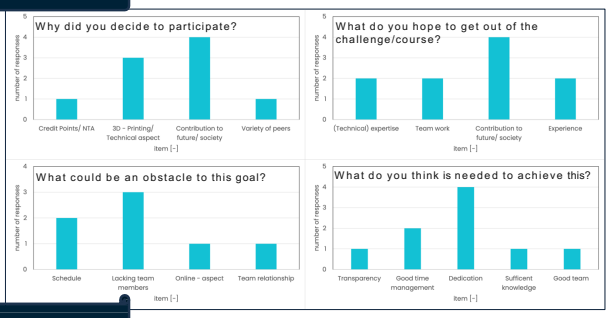
- a course to increase societal awareness and promote social-conscious engineering practices
- framework of the European Consortium of Innovative Universities (ECIU)
- challenge addressed the issue of an increasingly aging European society and the physical hurdles brought by aging
- cooperation with a local senior citizens' residence
- 3D printed solutions for the challenges of daily life for older people
- sustainable filament
- data were collected, analysed and evaluated with questionnaires

Challenge

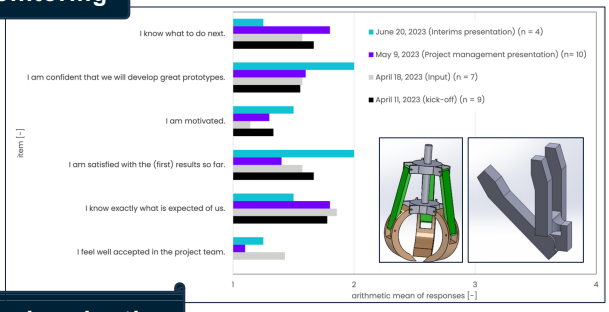
- one semester (3,5 months, 3 ECTS)
- 14 international participants
- developing their own challenge tackling approach and solutions while being supported by the teamchers
- learning goals: (a) identifying and analysing societal challenges related to ageing, (b) developing and testing engineering solutions to address these challenges, (c) enhancing critical thinking and problem-solving abilities through a human-centered design approach, (d) gaining experience in collaboration and teamwork, (e) strengthening confidence and communication skills through presentations and discussions, and (f) understanding and reflecting on concepts of inclusivity in engineering solutions and their impact on society through participatory engagement

Pre-survey

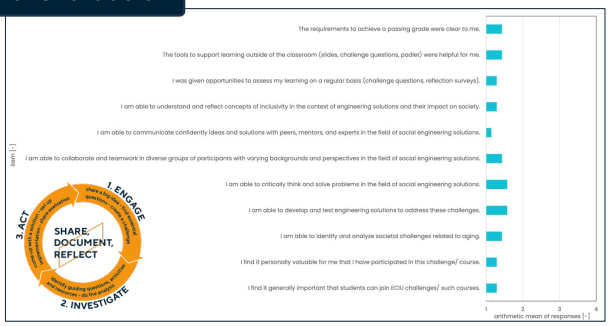
Results



Monitoring



Final evaluation



Evaluation

- explore how challenge participants engaged in the challenge, reflected on their experience, and evaluated their development of social awareness
- mixed-method approach
- one pre-survey
- four reflection surveys along the project progress (at the end of the milestone meetings)
- one final evaluation after participants completed the course
- analysed the data using descriptive statistics
- one week before the closing event, we held an oral feedback discussion meeting where the two project teams used a flinga board and were asked separately to reflect on their work within the teams

Conclusion

- our CBL approach elevated social awareness in engineering students by incorporating seniors' experiences and promoting the use of 3D printing with sustainable filament
- results suggested that the course successfully facilitated collaboration and the development of a socially conscious perspective
- this course allowed participants to navigate various experiences, from "Highs" to "Lows", fostering complex learning and increased awareness of daily aging issues
- while our findings are limited by methodological factors and the number of participants, they indicate that our approach was effective
- solutions were found for the obstacles from the teamchers point of view

SEFI ANNUAL CONFERENCE 11-14 September 2023 TU Dublin
ENGINEERING EDUCATION FOR SUSTAINABILITY

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