



# CBL-COMPASS FOR TEACHERS

Visualise your colour of Challenge Based Learning  
and optimize your programs

TU/e



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## INTRODUCTION

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**Position your own challenge-based learning (CBL) course or innovation project alongside the dimensions of the CBL-tool.**

You can use this instrument to start the conversation about how CBL is implemented in your course or innovation project, what variance or development is possible within the larger programme or curriculum. Think how well the current characterisation of CBL aligns with the desired situation, and thus what needs to be changed or improved.

## TWO DIMENSIONS

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### vision

- Real-life challenges
- Global themes
- Involvement of stakeholders



### teaching and learning

- T-shaped engineers
- Self-directed learning
- Assessment
- Teaching
- Collaborative learning
- Interdisciplinarity

## REAL LIFE OPEN ENDED CHALLENGES

Real life authentic

Open ended

Complex

## GLOBAL THEMES

Transforming business-  
as-usual and raising  
awareness

Short-term and long-  
term societal impact

## INVOLVEMENT OF STAKEHOLDERS

Challenge owner from  
science, industry,  
government or culture

External stakeholders



## VISION INDICATORS

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### 1. REAL LIFE CHALLENGES

CBL focusses on relevant real-life, authentic, open-ended challenges, which can be mono- and interdisciplinary, derived from various sources (challenges trigger learning). Authentic here refers to resembling or being derived from the activities of real-world professionals'.

### 2. GLOBAL THEMES

Thematic content areas addressed in CBL are predominantly rooted in themes of global importance, such as sustainability or war. In that

respect CBL is value-driven, with a focus on transformative value and integrative value.

**Transformative value** is perceived as outcomes that challenge business-as-usual practices understood as unsustainable.

**Integrative value** can be described as awareness raised and trust built when a diverse group of actors, disciplines, and perspectives are brought together in dialogue to explore a common issue. Both types of value can have either a short-term or long-term societal impact, of which students need to be aware.

### 3. INVOLVEMENT OF STAKEHOLDERS

CBL engages students by involving science, industry, and the societal context. A distinction can be made between 1) **university developed challenges**, reflecting little collaboration with external stakeholders, and 2) **challenges brought by stakeholders**.



## T-SHAPED ENGINEERS

Rigorous treatment  
fundamental knowledge  
and skills

Deep understanding  
and broader view

Critical thinking

Creative thinking

Problem formulating  
and designing

## SELF-DIRECTED LEARNING

Acquisition and  
application of  
knowledge and skills in  
context

Development of meta-  
cognitive skills and self-  
regulatory capabilities

Ownership and self-  
directed learning

Dealing with uncertainty  
(entrepreneurial  
mindset)

## ASSESSMENTS

Balance between  
product and process

Balance between  
individual and team  
learning

Balance between  
(in)formative and  
summative assessment

## TEACHING

Scaffolding students'  
learning

Balance between  
openness and scaffolding

Teachers act as coaches,  
colearners and  
cocreators

## COLLABORATIVE LEARNING

Cycles of divergent and  
convergent reasoning

Peer feedback and peer  
support

## INTER DISCIPLINARITY

Interdisciplinary  
teamwork

Combination of  
individual and team  
work

Development  
interdisciplinary  
professional skills

# TEACHING AND LEARNING INDICATORS

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## 1. T-SHAPED ENGINEERS

CBL challenges educators to present learning activities that contribute to an in-depth disciplinary expertise, by creating a rigorous treatment of engineering fundamentals. In CBL this is coupled with the ability to work with a broad range of people and situations. Furthermore, innovation and creativity are considered important aspects in many CBL cases. This can be operationalised in critical thinking and creative thinking. Finally, CBL is characterized by a combination of problem formulating and designing, which implies working in an iterative cyclical way, involving both analysis and synthesis.

## 2. ASSESSMENTS

CBL stimulates forms of assessment between product focused assessment and process focused assessment. In product focused assessment the deliverable represents what is learnt in terms of content knowledge and understanding, and the mastery of real-world skills. Process focused assessment evaluates whether the knowledge and skills have been obtained. The balance between these two represents the extent to which intended learning behaviour becomes visible in both product and process. Balancing both forms of assessment also implies that CBL aspects such as team progress, interdisciplinarity, and

advanced knowledge and skills are evaluated during regular checkpoints with teams and individuals.

## 3. SELF-DIRECTED LEARNING

### Contextualised learning

CBL creates a learning urgency, by encouraging students to both acquire and apply new knowledge and skills that are needed to work on a specific challenge, which makes their learning contextualised. The materials and learning activities will be different for each student, thus enhancing student participation in conceiving and defining their 'learning trajectories'.

### Deep learning

CBL fosters deep learning by supporting the development of meta-cognitive skills that help the student to purposely integrate new knowledge and skills with existing knowledge and skills.

### Active learning

CBL is active learning that allows students to construct a network of knowledge and take ownership of their own learning process, including the freedom to co-define within a broader challenge the specific problem they want to focus on. Active learning creates student engagement with learning materials through interactions such as reading, watching, listening, writing, analysing,

experimenting, and thinking. It also includes an entrepreneurial mindset, which finds ways to deal with uncertainty and open-endedness.

## 4. TEACHING

CBL involves adaptive teacher and expert guidance of construction of knowledge by students. Students need scaffolding towards content (also known as clear sign-posting), and towards active learning.

## 5. COLLABORATIVE LEARNING

CBL means working in an iterative cyclical way in teams. These cycles consist of divergent and convergent



## TEACHING AND LEARNING INDICATORS

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reasoning bringing students closer to possible solutions to the challenge. Divergent reasoning includes a variety of perspectives and solutions, while convergent reasoning brings focus and priority to this variety. Ideally these cycles are discussed and evaluated in groups, which in turn enables room for peer feedback and support.

Interdisciplinarity thus requires some level of integration between fields of expertise. The result, at least in theory, is that participants emerge from such interactions speaking “one language.”

### 6. INTERDISCIPLINARITY

Interdisciplinary CBL facilitates students from different (sub-) disciplines to learn to work in a team. Their interdisciplinary interactions are attempts to integrate heterogeneous knowledge bases and knowledge-making practices.

## HOW THE CBL-TOOL WORKS

### Position your own Challenge-based learning (CBL) course or innovation project alongside the dimensions and indicators of this instrument.

In short, use the instrument to visualise your flavour of CBL by scoring all dimensions. Discover your priorities and formulate concrete actions. By the way, if the need exists to dig deeper and have a more granulated view, the detailed set of indicators for one or more characteristics can be used.

The instrument starts from three must have indicators (*Authentic, Knowledge and skills, Broader view*), followed by the ten dimensions clustered in 2 categories, *Vision* and *Teaching & learning*.

Start from the three must have indicators: are these indicators present in your course/project, and what will they look like? And how would your course or innovation project be positioned on the dimensions? What do the teaching and learning aspects look like?

How can the vision behind this teaching and learning be characterised? There is no right or wrong; this instrument helps to make a well-considered choice for how much CBL will be included in your course or innovation project, following the (learning) goals and intended target group.

In CBL, challenges are seen as self-directed work scenarios in which students engage. The objective is not to solve the problem itself, but to use it for the development of learning. The final deliverable can be tangible or a proposal for a solution to the challenge.

### THREE MUST HAVE INDICATORS

#### authentic

the challenge is real-life and authentic

#### knowledge and skills

the learning activities in the challenge create a rigorous treatment of fundamental

#### broader view

the challenge stimulates a combination of deep understanding and broader view



Support and advice is available from teacher supporters and the CBLexpert pool.



[www.tue.nl/cbl](http://www.tue.nl/cbl)

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